

## **200-125.exam**

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Cisco

**200-125**

**Cisco Certified Network Associate (CCNA)**

**Version 1.0**

## Exam A

### QUESTION 1

You want to encrypt and transmit data between peer routers with high confidentiality. Which protocol option should you choose?

- A. Authentication Header (AH) in tunnel mode
- B. Authentication Header (AH) in transport mode
- C. Encapsulating Security Payload (ESP) in tunnel mode
- D. Encapsulating Security Payload (ESP) in transport mode

**Correct Answer: C**

**Section: (none)**

**Explanation**

#### **Explanation/Reference:**

Explanation:

You should choose Encapsulating Security Payload (ESP) in tunnel mode to encrypt and transmit data between peer routers with high confidentiality. Two protocols can be used to build tunnels and protect data traveling across the tunnel:

- Authentication Header (AH) uses protocol 51.
- ESP uses protocol 50.

AH is defined in Request for Comments (RFC) 1826 and 2402. AH does not perform data encryption and therefore, information is passed as clear text. The purpose of AH is to provide data integrity and authentication, and anti-reply service (optional). It ensures that a packet that crosses the tunnel is the same packet that left the peer device and no changes have been made. It uses a keyed hash to accomplish this.

ESP is defined in RFC 2406. ESP can provide data integrity and authentication, but its primary purpose is to encrypt data crossing the tunnel. There are two reasons why ESP is the preferred building block of IPSec tunnels:

- The authentication component of ESP does not include any Layer 3 information. Therefore, this component can work in conjunction with a network using Network Address Translation (NAT).
- On Cisco devices, ESP supports encryption using Advanced Encryption Standard (AES), Data Encryption Standard (DES), or Triple DES (3DES).

Tunnel mode is used between Virtual Private Network (VPN) gateways such as routers, firewalls, and VPN concentrators.

Transport mode is used between end-stations or between an end-station and a VPN gateway.

The options AH in tunnel mode and AH in transport mode are incorrect because AH does not provide encryption.

The option ESP in transport mode is incorrect because transport mode is used between end-stations or between an end-stations and a VPN gateway.

Objective:

WAN Technologies

Sub-Objective:

Describe WAN access connectivity options

References:

[Cisco > Articles > Network Technology > General Networking > IPSec Overview Part Two: Modes and Transforms](#)

[Cisco > The Internet Protocol Journal > The Internet Protocol Journal - Volume 3, No. 1, March 2000 > IP Security](#)

### QUESTION 2



Which of the following is NOT a mode of Dynamic Trunking Protocol (DTP)?

- A. dynamic auto
- B. dynamic trunk
- C. dynamic desirable
- D. nonegotiate

**Correct Answer:** B

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

Dynamic trunk is not a DTP mode. DTP is a Cisco proprietary trunk negotiation protocol and is used to determine if two interfaces on connected devices can become a trunk. There are five modes of DTP:

- Trunk: Puts the interface into permanent trunking mode and negotiates to convert the link into a trunk link. The interface becomes a trunk interface even if the neighboring interface does not agree to the change.
- Access: Puts the interface into permanent nontrunking mode and negotiates to convert the link into a nontrunk link. The interface becomes a nontrunk interface even if the neighboring interface does not agree to the change.
- Dynamic desirable: Makes the interface actively attempt to convert the link to a trunk link. The interface becomes a trunk interface if the neighboring interface is set to trunk, desirable, or auto mode.
- Dynamic auto: Makes the interface willing to convert the link to a trunk link. The interface becomes a trunk interface if the neighboring interface is set to trunk or desirable mode. This is the default mode for all Ethernet interfaces in Cisco IOS.
- Nonegotiate: Puts the interface into permanent trunking mode but prevents the interface from generating DTP frames. You must configure the neighboring interface manually as a trunk interface to establish a trunk link. Use this mode when connecting to a device that does not support DTP.

If one side's mode of link is in trunk mode, dynamic desirable mode, or dynamic auto mode, and the other side is trunk or dynamic desirable, a trunk will form. Nonegotiate mode enables trunking but disables DTP.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Configure and verify Layer 2 protocols

References:

### QUESTION 3

Which Cisco IOS command is used to view the information about the interfaces on which Cisco Discovery Protocol (CDP) is enabled?

- A. show cdp interface
- B. show interfaces
- C. show cdp
- D. show cdp interfaces

**Correct Answer:** A

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The show cdp interface command is used to view the information about the interfaces on which Cisco Discovery Protocol (CDP) is enabled.

The syntax of the command is as follows:

## **Router# show cdp interface [type number]**

The parameters of the command are as follows:

type: specifies the type of interface for which information is required

number: specifies the number of interfaces for which information is required

The output of the show cdp interface command is as follows:

```
Router#show cdp interface
Serial0 is up, line protocol is up, encapsulation is SMDS
Sending CDP packets every 100 seconds
Holdtime is 300 seconds
Serial1 is up, line protocol is up, encapsulation is SMDS
Sending CDP packets every 60 seconds
Holdtime is 180 seconds
Ethernet0 is up, line protocol is up, encapsulation is ARPA
Sending CDP packets every 120 seconds
Holdtime is 360 seconds
```

The show interfaces command is incorrect because this command is used to view configured interfaces on the router. The output of this command can be very useful, especially when troubleshooting a connection with no connectivity. Consider the output of the command on the following two routers that are connected with a serial interface:

```
NewYork#show interfaces s0
Serial0 is up, line protocol is up
Hardware is HD64570
Internet Address is 192.168.10.1/24
MTU 1500 bytes,BW 1544 Kbit
Reliability 255/255
Encapsulation HDLC, loopback not set
Keepalive set (10 sec)
```

```
LosAngeles#show interfaces s1
Serial0 is up, line protocol is up
Hardware is HD64570
Internet Address is 192.168.11.2/24
MTU 1500 bytes,BW 56000 Kbit
Reliability 255/255
Encapsulation HDLC, loopback not set
Keepalive set (10 sec)
```

Notice that the following settings are correct:

- The encapsulation matches (HDLC)
- The physical connection is good (indicated by Serial0 is up)

Notice, however, that the IP addresses 192.168.10.1 and 192.168.11.2 are NOT in the same subnet when using a 24-bit mask. With a 24-bit mask, the two addresses should agree through the first three octets, and these do not. Problems such as this can be located through inspection of the output produced by the show interfaces command.

The show cdp command is incorrect because this command is used to view the global CDP information.

The show cdp interfaces command is incorrect because this command does not exist in the Cisco command reference. There is a show cdp interface command, which displays CDP activity on a per-interface basis.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Configure and verify Layer 2 protocols

References:

[Cisco > Cisco IOS Network Management Command Reference > show cdp interface](#)

#### QUESTION 4

If a routing table contains multiple routes for the same destination, which were inserted by the following methods, which route will the router use to reach the destination network?

- A. The route inserted by RIP
- B. The route inserted by OSPF
- C. The route inserted by BGP
- D. The route configured as a static route

**Correct Answer:** D

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

A static route will be preferred because it has the lowest administrative distance. Routing protocols are dynamic routing methods. With the default configuration, static routes are preferred over dynamic routes.

The default administrative distance for the offered options is:

- RIP 120
- OSPF 110
- eBGP 20
- Static 1

When Routing Information Protocol (RIP), Open Shortest Path First (OSPF), Border Gateway Protocol (BGP), and static routing is enabled on a router, the router will prefer the static route.

Objective:

Routing Fundamentals

Sub-Objective:

Interpret the components of routing table

References:

[Cisco Documentation > Internetworking Technology Handbook > Routing Basics](#)

#### QUESTION 5

You are the network administrator for your company. You recently configured Cisco Discovery Protocol (CDP) in the network. You want to view output regarding all of the neighboring devices discovered by CDP. This information should include network address, enabled protocols, and hold time.

Which Cisco Internetwork Operating System (IOS) command would allow you to accomplish this task?

- A. show cdp
- B. show cdp entry
- C. show cdp neighbor entries
- D. show cdp neighbors detail

**Correct Answer:** D

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

In this scenario, you should use the show cdp neighbors detail command to view the details of the neighboring

devices that were discovered by CDP. CDP is a Layer 2 (data link layer) protocol used to find information about neighboring network devices. The `show cdp neighbors detail` command is used to view details such as network address, enabled protocols, and hold time. The complete syntax of this command is:

### **show cdp neighbors [type number] [detail]**

The command parameters are defined in this way:

type: An optional parameter which specifies the type of interface used to connect to the neighbors for which you require information.

number: An optional parameter used to specify the interface number connected to the neighbors for which you want information.

detail: An optional parameter used to get detailed information about neighboring devices, such as network address, enabled protocols, software version and hold time.

The following code is a sample partial output of the `show cdp neighbors detail` command:

```
Device ID: RTR2511
Entry address(es):
IP address: 178.10.20.1
Platform: cisco 2511, Capabilities: Router
Interface Serial 0
Holdtime : 123 sec
<output omitted>
```

```
-----
Device ID: RTR2611-Edge
Entry address(es):
IP address: 10.10.1.2
Platform: cisco 2611, Capabilities: Router
Interface Ethernet 0
Holdtime : 123 sec
<output omitted>
```

The `show cdp` command is incorrect because this command is used to view global CDP information such as the timer and hold time.

The `show cdp entry` command is incorrect because this command is used to view information about a specific neighboring device.

The `show cdp neighbor entries` command is incorrect because this is not a valid Cisco IOS command.

Objective:

LAN Switching Fundamentals

Sub-Objective:

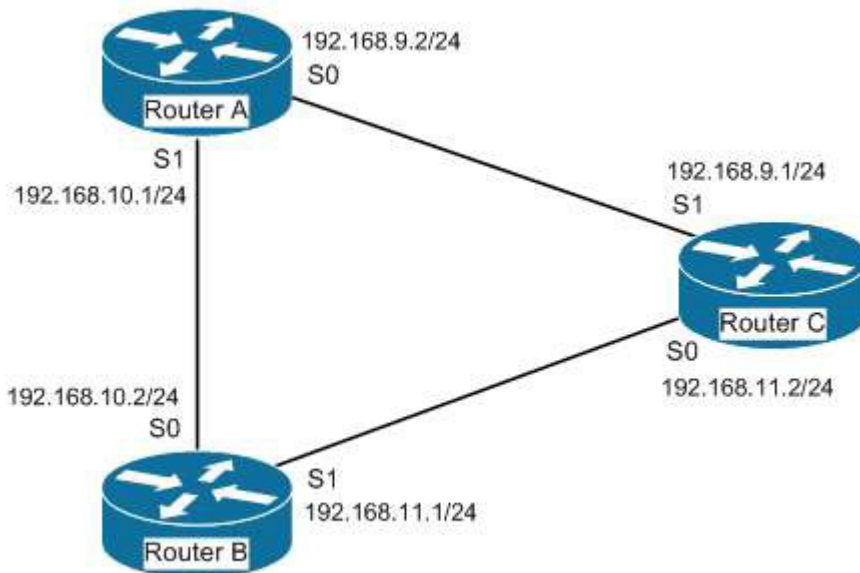
Configure and verify Layer 2 protocols

References:

[Cisco > Cisco IOS Network Command Reference, Release 12.4 > show cdp neighbors](#)

### **QUESTION 6**

You have three EIGRP routers that are connected as shown in the diagram below.



Router A and Router C do not seem to be exchanging information. You execute commands on all three routers, and receive as output the information shown below:

```
Router A# show ip eigrp neighbors
Address Interface holdtime uptime Q Seq SRTT RT0
192.168.10.2 S1 13 1:20:10 100 458 0 30

routerA# show run
<output omitted>
router eigrp 56
network 192.168.10.0
network 192.168.9.0
no auto-summary

routerC# show run
<output omitted>
router eigrp 56
network 192.168.11.0
no auto-summary
```

What needs to be done to make Routers A and C start exchanging information?

- A. Execute the auto-summary command on Router A
- B. Execute the network 192.168.9.0 command under EIGRP 56 on Router C
- C. Correct the IP address on the S1 interface of Router C
- D. Recreate the EIGRP configuration on Router C as EIGRP 55

**Correct Answer:** B

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

Router C is not displayed in the neighbor table of Router A, which indicates that Router C and Router A are not forming a neighbor relationship or exchanging information. This is because Router C does not have EIGRP configured for its S1 interface. You can see this is missing from its configuration in the output of the show run command for RouterC. To solve the issue, you should execute the network 192.168.9.0 command under the EIGRP 56 configuration on Router C. Then Router C will start sending hellos on that interface and the two routers will become neighbors.

The show ip eigrp neighbors command displays the following information for each EIGRP neighbor. In parentheses is the value of each found in the output of router A for Router B:

```
IP address (192.168.10.2)
Local interface (S1)
Retransmit interval (13)
Queue count (100)
```

There is no need to execute the auto-summary command on Router A. It will not affect the establishment of a neighbor relationship between Routers A and C.

There is no need to correct the IP address on the S1 interface of Router C. The address 192.168.9.1 is correctly located in the same subnet as the address on S0 of Router A.

Finally, changing the EIGRP configuration on Router C to EIGRP 55 will not help. Router C will not start sending hellos on its S1 interface until EIGRP is enabled on the S1 interface. Until then, the Routers A and C will not form a neighbor relationship and will not share information.

Objective:

Routing Fundamentals

Sub-Objective:

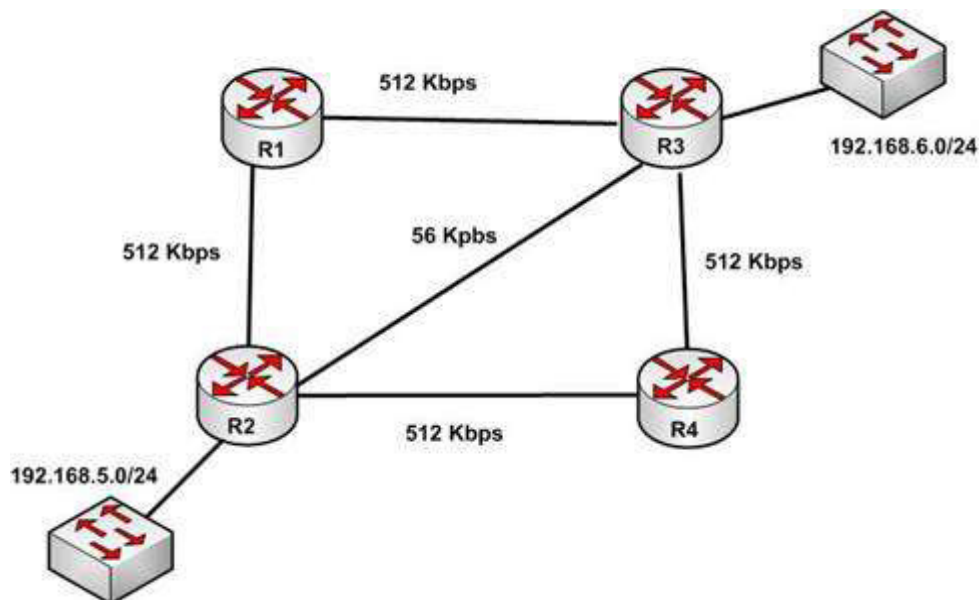
Configure, verify, and troubleshoot EIGRP for IPv4 (excluding authentication, filtering, manual summarization, redistribution, stub)

References:

[Cisco > Cisco IOS IP Routing Configuration Guide, Release 12.4 > Configuring EIGRP > Enabling EIGRP](#)

### QUESTION 7

With respect to the network shown below, which of the following statements are true when R2 sends a packet to the 192.168.6.0/24 network? (Choose all that apply.)



- A. If RIPv1 is in use, the path taken will be R2 - R4 - R3
- B. If both RIPv2 and EIGRP are in use, the EIGRP route will be placed in the routing table
- C. If EIGRP is in use, the only path taken will be R2 - R4 - R3
- D. If RIPv2 is in use, the path taken will be R2 - R3

**Correct Answer:** BD

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

If both RIPv2 and EIGRP are in use, the EIGRP route will be placed in the routing table. If RIPv2 is in use, the path taken will be R2 - R3.

EIGRP has a default administrative distance (AD) of 90, while RIPv2 has a default administrative distance (AD) of 120. The route learned by the routing protocol with the lowest AD will be placed in the routing table.

If you wanted to force R2 to use the RIPv2 route instead of the EIGRP route, this could be accomplished by changing the administrative distance of RIPv2 to a value less than 90, such as 80. The commands that would accomplish this are:

```
R2(config)# router rip
R2(config-router)# distance 80
```

If either of the versions of RIP is in use, hop count is used to determine the route. The path with the least number of hops is R2 - R3.

If RIPv1 is in use, the path taken would be R2 - R3, not R2 - R4 - R3, because R2 - R3 has a lower hop count.

If EIGRP is in use, the path R2 - R4 - R3 will not be the only path taken. EIGRP load-balances two equal cost paths when they exist, and R2 - R4 - R3 and R2 - R1 - R3 are of equal cost so would both be used.

Objective:

Routing Fundamentals

Sub-Objective:

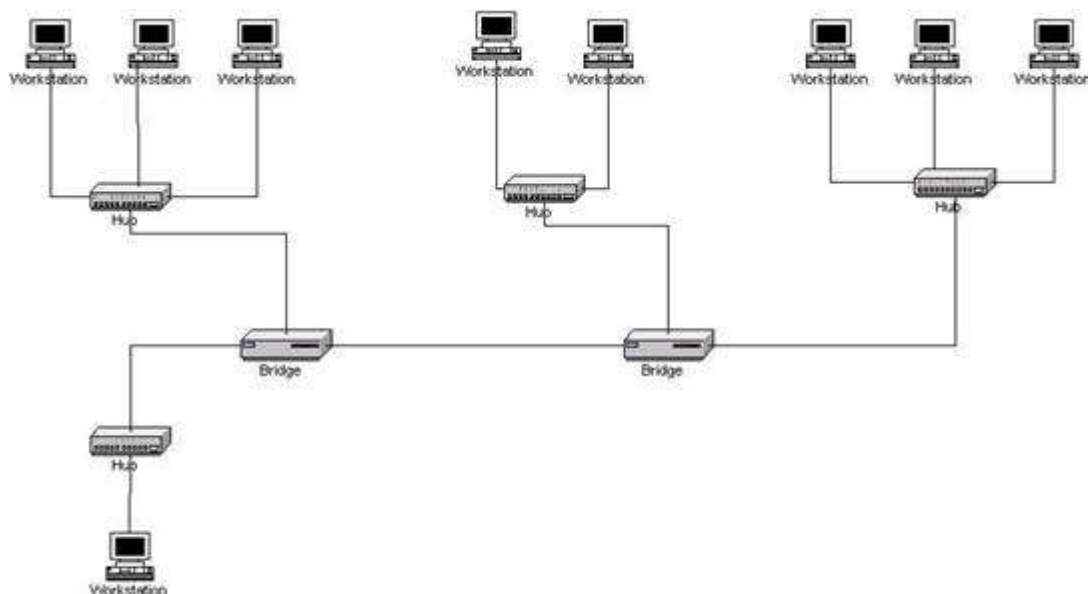
Compare and contrast distance vector and link-state routing protocols

References:

[Home > Articles > Cisco Certification > CCDA > CCDA Self-Study: RIP, IGRP, and EIGRP Characteristics and Design](#)

**QUESTION 8**

How many collision domains are in a LAN with four hubs and two bridges that are connected directly to each other, as shown in the following figure? (Click the Exhibit(s) button.)



- A. four
- B. five
- C. six
- D. fourteen

**Correct Answer:** B

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

A bridge segments the LAN into separate collision domains. The figure in this scenario has five segments created between these two bridges. Therefore, there will be five collision domains (segments) on the LAN if the two bridges are directly connected as shown in the exhibit. Hubs do not create LAN segments; they act as port aggregators and signal amplifiers.

It is also worth noting that with no router in the diagram, the entire network is a single broadcast domain. If a router were present, each of its interfaces could host a different subnet and each of those same interfaces would be a separate broadcast domain.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Describe and verify switching concepts

References:

[Internetwork Design Guide -- Designing Switched LAN Internetworks > Comparison of LAN Switches and Routers](#)

## QUESTION 9

Which of the following is NOT a characteristic of Open Shortest Path First (OSPF)?

- A. Is a Cisco-proprietary routing protocol
- B. Has a default administrative distance of 110
- C. Supports authentication
- D. Uses cost as the default metric

**Correct Answer:** A

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

OSPF is not a Cisco-proprietary routing protocol. It is an industry standard protocol supported by a wide range of vendors. The following are characteristics of OSPF:

- Uses Internet Protocol (IP) protocol 89.
- Has a default administrative distance of 110.
- Is an industry standard protocol (non Cisco-proprietary).
- Supports Non-Broadcast Multi-Access (NBMA) networks such as frame relay, X.25, and Asynchronous Transfer Mode (ATM). The default hello interval for NBMA networks is 30 seconds.
- Supports point-to-point and point-to-multipoint connections.
- Supports authentication.
- Uses 224.0.0.6 as multicast address for ALLDRouters.
- Uses 224.0.0.5 as multicast address for ALLSPFRouters.
- Uses link-state updates and SPF calculation that provides fast convergence.
- Recommended for large networks due to good scalability.
- Uses cost as the default metric.



Objective:  
Routing Fundamentals  
Sub-Objective:  
Compare and contrast interior and exterior routing protocols

References:

[Cisco > Articles > Cisco Certification > CCNP > Shooting Trouble with IP](#)

[Cisco > Internetworking Technology Handbook > Open Shortest Path First \(OSPF\)](#)

CCNA ICND2 Official Exam Certification Guide (Cisco Press, ISBN 1-58720-181-X), Chapter 9: OSPF, pp. 347-361.

## QUESTION 10

Examine the partial output from two adjacent routers:

```
RTR78# show ip ospf
Routing Process 201 with ID 192.0.2.1 VRF default
  Stateful High Availability enabled
  Graceful-restart is configured
  Grace period: 60 state: Inactive
  Last graceful restart exit status: None
  Supports only single TOS(TOS0) routes
  Supports opaque LSA
  This router is an autonomous system boundary
Administrative distance 110
Reference Bandwidth is 40000 Mbps
Initial SPF schedule delay 3000.000 msecs,
minimum inter SPF delay of 2000.000 msecs,
maximum inter SPF delay of 4000.000 msecs
Initial LSA generation delay 3000.000 msecs,
```

```
RTR79# show ip ospf
Routing Process 202 with ID 192.0.2.1 VRF default
  Stateful High Availability enabled
  Graceful-restart is configured
  Grace period: 60 state: Inactive
  Last graceful restart exit status: None
  Supports only single TOS(TOS0) routes
  Supports opaque LSA
  This router is an autonomous system boundary
Administrative distance 110
Reference Bandwidth is 30000 Mbps
Initial SPF schedule delay 3000.000 msecs,
minimum inter SPF delay of 2000.000 msecs,
maximum inter SPF delay of 4000.000 msecs
Initial LSA generation delay 3000.000 msecs,
```

Which of the following statements describes why the two routers are NOT forming an OSPF neighbor adjacency?

- A. The process IDs do not match
- B. The router IDs are misconfigured
- C. The distance is misconfigured
- D. The reference bandwidth does not match

**Correct Answer: B**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

The output shows that the router IDs for RTR78 and RTR79 are the same value, which should not be the case. One of the two routers has been misconfigured with the other router's ID. This will prevent an OSPF neighbor adjacency from forming.

Other issues that can prevent an adjacency are:

- Mismatched OSPF area number
- Mismatched OSPF area type
- Mismatched subnet and subnet mask
- Mismatched OSPF HELLO and dead timer values

The process IDs do not have to match. It does not matter whether they match or do not match because the process ID is only locally significant on the device.

The administrative distance is not misconfigured in the output. Both routers are using the default OSPF administrative distance of 110.

If the reference bandwidths do not match, it will affect the calculation of the path cost, but it will not prevent an adjacency from forming.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot single area and multi-area OSPFv2 for IPv4 (excluding authentication, filtering, manual summarization, redistribution, stub, virtual-link, and LSAs)

References:

[Support > Technology Support > IP > IP Routing > Troubleshoot and Alerts > Troubleshooting TechNotes > OSPF Neighbor Problems Explained](#)

### **QUESTION 11**

You execute the ping command from a host, but the router does not have a path to its destination.

Which of the following ICMP message types will a client receive from the router?

- A. ICMP redirect
- B. ICMP time exceeded
- C. ICMP destination unreachable
- D. ICMP echo-reply

**Correct Answer: C**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

When a router receives a ping packet and has no route to the destination in its routing table, it will respond to the client with an ICMP destination-unreachable message. Internet Control Message Protocol (ICMP) is a Layer 3 protocol used to test the connectivity between hosts in a network. There are six types of unreachable destination message:

1. Network unreachable
2. Host unreachable
3. Protocol unreachable
4. Port unreachable
5. Fragmentation needed and Don't Fragment (DF) bit set

## 6. Source route failed

An ICMP redirect message would not be received. This type of response is received when the router is configured to direct clients to a different router for better routing.

An ICMP time-exceeded message would not be received. This type of response occurs when the router successfully sent the packet but did not receive an answer within the allotted time; in other words, the time-to-live of the ICMP packet has been exceeded.

An ICMP echo-reply message would not be received. This would be the response received if the destination received the ping command and responded successfully.

Objective:

Routing Fundamentals

Sub-Objective:

Troubleshoot basic Layer 3 end-to-end connectivity issues

References:

[Cisco > Internetworking Technology Handbook > Internet Protocols \(IP\) > Internet Control Message Protocol \(ICMP\)](#)

### QUESTION 12

What Cisco Catalyst switch feature can be used to define ports as trusted for DHCP server connections?

- A. DHCP snooping
- B. port security
- C. 802.1x
- D. private VLANs

**Correct Answer: A**

**Section: (none)**

**Explanation**

#### Explanation/Reference:

Explanation:

DHCP snooping is used to define ports as trusted for DHCP server connections. The purpose of DHCP snooping is to mitigate DHCP spoofing attacks. DHCP spoofing is an attack that can be used to force user traffic through an attacking device. This is accomplished by an attacker responding to DHCP queries from users. Eliminating the response from the correct DHCP server would make this more effective, but if the attacker's response gets to the client first, the client will accept it.

The DHCP response from the attacker will include a different gateway or DNS server address. If they define a different gateway, the user traffic will be forced to travel through a device controlled by the attacker. This will allow the attacker to capture traffic and gain company information. If the attacker changes the DNS server in the response, they can use their own DNS server to force traffic to selected hosts to go to a device they control. Again, this would allow the attacker to capture traffic and gain information.

DHCP snooping can be used to determine what ports are able to send DHCP server packets, such as DHCP OFFER, DHCP ACK, and DHCP NAK, from the company DHCP server. DHCP snooping can also cache the MAC address to IP address mapping for clients receiving DHCP addresses from a valid DHCP server.

The three required steps to implement DHCP snooping are:

1. Enable DHCP snooping globally with the `ip dhcp snooping` command:

```
switch(config)# ip dhcp snooping
```

2. Enable DHCP snooping for a VLAN with the `vlan` parameter:

```
switch(config)# ip dhcp snooping vlan vlan #
```

(for example, `ip dhcp snooping 10 12` specifies snooping on VLANs 10 and 12)

3. Define an interface as a trusted DHCP port with the trust parameter:

```
switch(config-if)# ip dhcp snooping trust
```

When specifying trusted ports, access ports on edge switches should be configured as untrusted, with the exception of any ports that may have company DHCP servers connected. Only ports where DHCP traffic is expected should be trusted. Most certainly, ports in any area of the network where attacks have been detected should be configured as untrusted.

Some additional parameters that can be used with the ip dhcp snooping command are:

- switch(config)# ip dhcp snooping verify mac-address - this command enables DHCP MAC address verification.
- switch(config)# ip dhcp snooping information option allow-untrusted - this command enables untrusted ports to accept incoming DHCP packets with option 82 information. DHCP option 82 is used to identify the location of a DHCP relay agent operating on a subnet remote to the DHCP server.

When DHCP snooping is enabled, no other relay agent-related commands are available. The disabled commands include:

```
ip dhcp relay information check global configuration
ip dhcp relay information policy global configuration
ip dhcp relay information trust-all global configuration
ip dhcp relay information option global configuration
ip dhcp relay information trusted interface configuration
```

Private VLANs are a method of protecting or isolating different devices on the same port and VLAN. A VLAN can be divided into private VLANs, where some devices are able to access other devices and some are completely isolated from others. This was designed so service providers could keep customers on the same port isolated from each other, even if the customers had the same Layer 3 networks.

Port security is a method of only permitting specified MAC addresses access to a switch port. This can be used to define what computer or device can be connected to a port, but not to limit which ports can have DHCP servers connected to them.

802.1x is a method of determining authentication before permitting access to a switch port. This is useful in restricting who can connect to the switch, but it cannot control which ports are permitted to have a DHCP server attached to it.

Objective:

Infrastructure Security

Sub-Objective:

Describe common access layer threat mitigation techniques

References:

[Home > Support > Product Support > Switches > Cisco Catalyst 4500 Series Switches > Configure > Configuration Guides > Chapter: Configuring DHCP Snooping and IP Source Guard > Configuring DHCP Snooping on the Switch](#)

### QUESTION 13

Which command is NOT mandatory for inclusion in a plan to implement IP Service Level Agreements (SLAs) to monitor IP connections and traffic?

- A. ip sla
- B. ip sla schedule
- C. ip sla reset
- D. icmp-echo

**Correct Answer: C**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

The ip sla reset command is not mandatory for an implementation plan to configure IP SLAs for monitoring IP connections and traffic. This command causes the IP SLA engine to either restart or shutdown. As a result, all IP SLAs operations are stopped, IP SLA configuration information is erased, and IP SLAs are restarted. The IP SLAs configuration information will need to be reloaded to the engine.

The following commands are essential to the implementation plan:

```
ip sla
ip sla schedule
icmp-echo
```

The ip sla command allows you to configure IP SLAs operations. When you execute this command in the global configuration mode, it enables the IP SLA configuration mode. In the IP SLA configuration mode, you can configure different IP SLA operations. You can configure up to 2000 operations for a given IP SLA ID number.

The icmp-echo command allows you to monitor IP connections and traffic on routers by creating an IP SLA ICMP Echo operation. This operation monitors end-to-end response times between routers.

The ip sla schedule command allows you to schedule the IP SLA operation that has been configured. With this command, you can specify when the operation starts, how long the operation runs, and the how long the operation gathers information. For example, if you execute the ip sla schedule 40 start-time now life forever command, the IP SLA operation with the identification number 40 immediately starts running. This is because the now keyword is specified for the start-time parameter. Using the forever keyword with the life parameter indicates that the operation keeps collecting information indefinitely. Note that you cannot re-configure the IP SLA operation after you have executed the ip sla schedule command.

The information gathered by an IP SLA operation is typically stored in RTTMON-MIB. A Management Information Base (MIB) is a database hosting information required for the management of routers or network devices. The RTTMON-MIB is a Cisco-defined MIB intended for Cisco IOS IP SLAs. RTTMON MIB acts as an interface between the Network Management System (NMS) applications and the Cisco IOS IP SLAs operations.

Objective:

Infrastructure Management

Sub-Objective:

Troubleshoot network connectivity issues using ICMP echo-based IP SLA

References:

[Home > Support > Technology support > IP > IP application services > Technology information > Technology white paper > Cisco IOS IP Service Level Agreements User Guide](#)  
[Cisco IOS IP SLAs Command Reference > icmp-echo through probe-packet priority > ip sla](#)  
[Cisco IOS IP SLAs Command Reference > icmp-echo through probe-packet priority > ip sla schedule](#)  
[Cisco > Cisco IOS IP SLAs Command Reference > icmp-echo](#)

**QUESTION 14**

You are configuring an authenticated connection between two routers named Tacoma and Lansing. The connection on the Lansing end is correctly set up with a password of keypass. You are directing an assistant to configure the name and password on Tacoma.

Which of the following commands would be correct to complete this authenticated connection?

- A. username Tacoma password keypass
- B. username Lansing keypass password
- C. username Tacoma keypass password
- D. username Lansing password keypass

**Correct Answer: D**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

To complete the configuration, you should run the command `username Lansing password keypass`. This command creates a user account for the Lansing router with a password of `keypass`.

When creating an authenticated connection between the routers, a user account must be created for the other router. The password configured must match on both ends.

When examining the output produced by the `show running-configuration` command for two routers, the output should read as below:

<pre>Tacoma# show running-config &lt;some output text omitted&gt;  enable password cisco ! hostname Tacoma username Lansing password keypass !</pre>	<pre>Lansing# show running-config &lt;some output text omitted&gt;  enable password cisco1 ! hostname Lansing username Tacoma password keypass !</pre>
--	--

The lines that display `enable password cisco` and `enable password cisco1` represent local passwords to enable privileged mode on the local router. These passwords do not have to match. The lines of output that must display matching passwords are `username Lansing password keypass` and `username Tacoma password keypass`.

You should not run the command `username Tacoma password keypass`. The `username Tacoma` portion of the command will create an account named Tacoma. You need an account for the other router, Lansing.

You should not run the command `username Lansing keypass password`. The password portion of the command must follow the syntax `password [correct_password]`.

You should not run the command `username Tacoma keypass password`. The `username Tacoma` portion of the command will create an account for the wrong router, and the password portion of the command must follow the syntax `password [correct_password]`.

Objective:

WAN Technologies

Sub-Objective:

Configure and verify PPP and MLPPP on WAN interfaces using local authentication

References:

[Cisco > Support > WAN > Point-to-Point Protocol \(PPP\) > Design Technotes > Understanding and Configuring PPP CHAP Authentication > Document ID: 25647](#)

**QUESTION 15**

The partial output displayed in the exhibit is a result of what IOS command? (Click on the Exhibit(s) button.)



```
vlan 1 - Group 1
State is Active
  2 state changes, last state change 00:30:59
virtual IP address is 172.16.1.20
Active virtual MAC address is 0004.4d82.7981
  Local virtual MAC address is 0004.4d82.7981 (bia)
Hello time 4 sec, hold time 12 sec
  Next hello sent in 1.412 secs
Preemption enabled, min delay 50 sec, sync delay 40 sec
Active router is local
Standby router is 172.16.1.6, priority 75 (expires in 9.184 sec)
Priority 95 (configured 120)
IP redundancy name is "Group1", advertisement interval is 34 sec
```

- A. switch# show running-config
- B. switch# show standby vlan1 active brief
- C. switch# show hsrp 1
- D. switch# show standby

**Correct Answer:** D

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The command show standby produces the output displayed in the exhibit. This command displays information about HSRP on all configured interfaces and for all HSRP groups. Important information in the exhibit includes that this router is the active router, the virtual IP address for the HSRP group is 172.16.1.20, the address of the standby router is 172.16.1.6, and the router is configured to preempt.

The command show running-config will display the complete configuration of the device, including the configuration of HSRP, but will not display the current status of HSRP on the switch.

The command show standby vlan 1 active brief provides a summary display of all HSRP groups on the switch that are in the active state. This output would provide basic information, not nearly the detail indicated in the exhibit. The following is an example of output for show standby vlan 1 active brief:

```
Interface Grp Prio P State Active addr Standby addr Group addr
Vlan1 0 120 Active 172.16.1.5 Unknown 172.16.1.20
```

The command show hsrp 1 is not valid due to incorrect syntax.

Objective:

Infrastructure Services

Sub-Objective:

Configure, verify, and troubleshoot basic HSRP

References:

[Cisco > Cisco IOS IP Application Services Command Reference > show ip sockets through standby name > show standby](#)

[Cisco > Cisco IOS IP Application Services Configuration Guide, Release 12.4 > Part 1: First Hop Redundancy Protocols > Configuring HSRP](#)

## QUESTION 16

Which of the following statements is NOT true regarding flow control?

- A. It determines the rate at which the data is transmitted between the sender and receiver.
- B. It can help avoid network congestion.

- C. It manages the data transmission between devices.
- D. It uses a cyclic redundancy check (CRC) to identify and remove corrupted data.

**Correct Answer: D**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

It is NOT true that flow control uses a cyclic redundancy check (CRC) to identify and remove corrupted data. CRC is an error-checking schema that checks and removes corrupted data. It is a calculation that is performed at the source. Flow control uses CRC to identify corrupted data for the purpose of requesting re-transmission, but it does not use CRC to remove the corrupted data from the packet. If corruption is detected, the entire packet will be dropped.

Flow control is a function that ensures that a sending device does not overwhelm a receiving device. The following statements are TRUE regarding flow control:

- Flow control controls the amount of data that the sender can send to the receiver.
- Flow control determines the rate at which the data is transmitted between the sender and receiver.
- Flow control of certain types can aid in routing data around network congestion

Types of flow control include windowing, buffering, and congestion avoidance:

- Windowing- a process whereby the sender and receiver agree to increase or decrease the number of packets received before an acknowledgment is required based on network conditions. This packet number is called a window. When conditions are favorable, the window size will be increased. During unfavorable network conditions, it will be decreased.
- Buffering- the ability of a network card to store data received but not yet processed in a buffer (memory). This enhances its ability to handle spikes in traffic without dropping any data.
- Congestion avoidance - a process that some routing protocols can perform by adding information in each frame that indicates the existence of congestion on the network, allowing the router to choose a different routing path based on this information.

Objective:

Network Fundamentals

Sub-Objective:

Compare and contrast OSI and TCP/IP models

References:

[Cisco Documentation > Internetworking Technology Handbook > Routing Basics > Internet Protocols > TCP Packet Format](#)

#### **QUESTION 17**

Which command would be used to establish static translation between an inside local address and an inside global address?

- A. Router(config)# ip nat inside source static local-ip global-ip
- B. Router(config)# ip source nat inside static local-ip global-ip
- C. Router(config)# ip nat inside static source local-ip global-ip
- D. Router(config)# ip nat static inside source local-ip global-ip

**Correct Answer: A**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

You should use the following command:



## Router(config)# ip nat inside source static local-ip global-ip

You can translate your own IP addresses into globally unique IP addresses when communicating outside of your network. You can configure static or dynamic inside source translation.

To establish static translation between an inside local address and an inside global address, you should use the ip nat inside source static local-ip global-ip command. This static configuration can be removed by entering the no ip nat inside source static global command.

The other options are incorrect as they are not valid Cisco IOS configuration commands.

Objective:

Infrastructure Services

Sub-Objective:

Configure, verify, and troubleshoot inside source NAT

References:

### QUESTION 18

You wish to configure Secure Shell (SSH) support on your router so that incoming VTY connections are secure.

Which of the following commands must be configured? (Choose all that apply.)

- A. ip domain-name
- B. transport input ssh
- C. ip access-group
- D. crypto key generate rsa
- E. service config

**Correct Answer:** ABD

**Section:** (none)

**Explanation**

#### Explanation/Reference:

Explanation:

Secure Shell (SSH) provides a secure alternative to Telnet for remote management of a Cisco device.

Configuring Secure Shell (SSH) support on a Cisco router involves a minimum of three commands:

- ip domain-name [domain-name]: configures the DNS of the router (global configuration mode)
- crypto key generate rsa: generates a cryptographic key to be used with SSH (global configuration mode)
- transport input ssh: allows SSH connections on the router's VTY lines (VTY line configuration mode)

The transport input ssh command allows only SSH connectivity to the router, and prevents clear-text Telnet connections. To enable both SSH and Telnet, you would use the transport input ssh telnet command.

The ip access-group command is incorrect because this command is used to activate an access control list (ACL) on an interface, and does not pertain to SSH.

The service config command is incorrect because this command is used to automatically configure routers from a network server, and does not pertain to SSH.

Objective:

Infrastructure Security

Sub-Objective:

Configure, verify, and troubleshoot basic device hardening

References:

[Cisco > Support > Technology Support > Security and VPN > Secure Shell \(SSH\) > Design > Configuring Secure Shell on Routers and Switches Running Cisco IOS > Document ID: 4145](#)

**QUESTION 19**

Which Cisco IOS command is used on a Catalyst 2950 series switch to verify the port security configuration of a switch port?

- A. show interfaces port-security
- B. show port-security interface
- C. show ip interface
- D. show interfaces switchport

**Correct Answer:** B

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The show port-security interface command displays the current port security and status of a switch port, as in this sample output:

```
Switch# show port-security interface fastethernet0/1
Port Security: Enabled
Port status: SecureUp
Violation mode: Shutdown
Maximum MAC Addresses: 2
Total MAC Addresses: 2
Configured MAC Addresses: 2
Aging Time: 30 mins
Aging Type: Inactivity
SecureStatic address aging: Enabled
Security Violation count: 0
```

The sample output indicates that port security has been enabled on interface FastEthernet0/1, and that a maximum of two MAC addresses has been configured. A violation policy of Shutdown indicates that if a third MAC address attempts to make a connection, the switch port will be disabled.

The violation mode setting has three possible values that take the following actions when a violation occurs:

- protect Drops packets with unknown source addresses until you remove a sufficient number of secure MAC addresses to drop below the maximum value.
- restrict Drops packets with unknown source addresses until you remove a sufficient number of secure MAC addresses to drop below the maximum value and causes the SecurityViolation counter to increment. It will send a Syslog message and an SNMP trap as well.
- shutdown Puts the interface into the error-disabled state immediately and sends an SNMP trap notification

The show ip interface command is incorrect because it displays protocol-related information about an interface, and nothing pertaining to switch port security.

The show interfaces switchport command is incorrect because it displays non-security related switch port information, such as administrative and operational status and trunking.

The show interfaces port-security command is incorrect because this is not a valid Cisco command.

Objective:

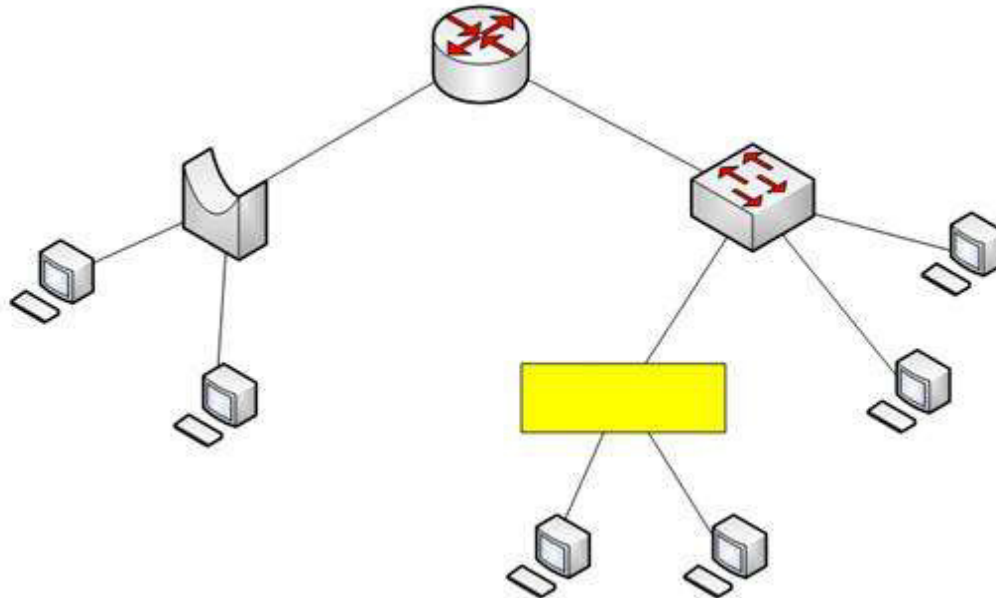
Infrastructure Security

Sub-Objective:  
Configure, verify, and troubleshoot port security

References:

### QUESTION 20

Assume that all ports on Layer 2 devices are in the same Virtual LAN (VLAN). View the given network topology. (Click the Exhibit(s) button.)



Which network device should be placed at the highlighted box to produce a total of two broadcast domains and seven collision domains in the network?

- A. Hub
- B. Bridge
- C. Switch
- D. Router

**Correct Answer:** A

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

A hub should be placed at the highlighted box to produce a total of two broadcast domains and seven collision domains in the network. Network devices segment collision domains and broadcast domains in the following manner:

- Hub: A Layer 1 device with all ports in same collision domain and broadcast domain.
- Bridge/Switch: Layer 2 devices on which all ports are in different collision domains, but in the same broadcast domain (assuming that all ports are in the same VLAN or no VLAN is configured).
- Routers: A Layer 3 device on which every port is a separate collision as well as broadcast domain.

The bridge shown in the graphic has three ports populated by active links, resulting in three collision domains.

The switch shown in the exhibit has four ports populated with the links, resulting in four collision domains.

Together these two devices create seven collision domains.

Because the scenario requires that there be no more than seven collision domains, the device in the highlighted box must not create any further collision domains. A hub is a device that has all its ports in the same collision

domain and will not create any further collision domains in the topology.

A bridge or switch cannot be the correct option because these will also add collision domains.

In the exhibit, the router has two ports with active links, which will result into two broadcast domains. Because the scenario states there are no more than two broadcast domains, the device in the highlighted box must not be a router. Routers are used to segment broadcast domains.

Objective:

Network Fundamentals

Sub-Objective:

Describe the impact of infrastructure components in an enterprise network

References:

### QUESTION 21

You are purchasing a device to upgrade your network. You need to determine the type of device required, as well as the number and type of required interfaces. The device will host three LAN subnets and a T1 Internet connection.

Which of the following device and interface combinations will support this requirement without providing any unnecessary interfaces or using subinterfaces?

- A. a switch with one Ethernet interface and three serial interfaces
- B. a router with one serial interface and three Ethernet interfaces
- C. a router with one serial interface and one Ethernet interface
- D. a switch with one modem and three serial interfaces

**Correct Answer:** B

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

This deployment will require a router with one serial interface and three Ethernet interfaces. When LAN subnets and the Internet must be connected, you must deploy a device that can make decisions based on IP addresses. This is the function of a router. Each LAN subnet will require a separate Ethernet interface, and the T1 connection requires a serial interface, so the router must have one serial interface and three Ethernet interfaces.

A switch cannot be used to connect separate subnets and the Internet. This requires a router. Switches make forwarding decisions based on MAC addresses. In this deployment, decisions must be made on the basis of IP addresses. Moreover, switches only have Ethernet interfaces, so a switch could not handle the T1 connection.

A router with one serial and one Ethernet interface will not be sufficient. Each LAN subnet will require a separate Ethernet interface.

Objective:

Network Fundamentals

Sub-Objective:

Describe the impact of infrastructure components in an enterprise network

References:

[Cisco > Home > Internetworking Technology Handbook > Internetworking Basics > Bridging and Switching Basics](#)

### QUESTION 22

Which of the following statements are TRUE regarding the following output? (Choose all that apply.)

```
Router# show ip route
```

```
Gateway of last resort is 192.168.15.1 to network 0.0.0.0
```

```
<<output omitted>>
```

```
D 192.168.10.0 [90/2172416] via 192.168.15.254, 0:01:42, Serial0/1/0
C 192.168.14.0 is directly connected, Serial0/0/0
D 192.168.52.0 [90/2172416] via 192.168.15.254, 0:00:35, Serial0/1/0
[90/2172416] via 192.168.15.5, 0:02:05, Serial0/0/0
C 192.168.15.0 is directly connected, Serial0/1/0
C 192.168.20.0 is directly connected, Serial0/0/1
S 192.168.50.0 [1/0] via 192.168.53.1
C 192.168.33.0 is directly connected, Loopback1
D 192.168.25.0 [90/2196545] via 192.168.20.254, 0:01:20, Serial0/0/1
```

- A. There are four default routes on this router.
- B. There are four physically connected interfaces on this router.
- C. This router is running EIGRP.
- D. The metric for the routes learned via a routing protocol is 90.
- E. A packet for the 192.168.52.0 network will be load-balanced across two paths.

**Correct Answer:** CE

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

This router is running EIGRP and a packet for the 192.168.52.0 network will be load-balanced across two paths.

EIGRP routes display with a D code in the leftmost column of the show ip route command. The D stands for Diffusing Update Algorithm (DUAL), which is the algorithm used by EIGRP to determine the best and potential backup paths to each remote network. There are four EIGRP-learned routes in this exhibit.

When two routes with equal metrics exist in the routing table, EIGRP will send packets using both paths. In the output there are two routes listed for the 192.168.52.0 network. Both have the same metric value (2172416). Therefore, packets will be sent to that network via the Serial 0/1/0 interface to the neighbor at 192.168.15.254 and via the Serial 0/0/0 interface to the neighbor at 192.168.15.5. Both paths, either directly or indirectly, lead to the 192.168.52.0 network, and both paths have the same cost.

There are not four default routes on this router. The D represents EIGRP-learned routes, not default routes. There is one default route, as indicated by the line of output that says Gateway of last resort is 192.168.15.1 to network 0.0.0.0. Because Serial0/1/0 is directly connected to the 192.168.15.0 network, packets that are destined for networks not found in the routing table will be sent out on that interface.

The C in the leftmost column of the show ip route command represents directly connected networks, of which there are four in the exhibit. Closer examination, however, reveals that one of these entries (for network 192.168.33.0) is connected to a loopback interface (Loopback1), as opposed to a physical interface:

```
C 192.168.33.0 is directly connected, Loopback1
```

Loopback interfaces are virtual, software interfaces that appear in the routing table, but do not represent a physical interface on the router. Therefore, there are three physically connected interfaces on this router, not four.

The metric for the routes learned via a routing protocol is not 90. The 90 in the scenario output is the administrative distance (AD) of the route, and the 2196545 is the metric value (see below):

D 192.168.25.0 [90/2196545] via 192.168.20.254, 0:01:20, Serial0/0/1

Objective:

Routing Fundamentals

Sub-Objective:

Interpret the components of routing table

References:

### QUESTION 23

You are the network administrator for your company. The Chief Technical Officer of the company is looking for a routing solution that satisfies the following requirements:

- No routing protocol advertisements
- Increased network security
- No routing protocol overhead
- Not concerned about fault tolerance

Which of the following routing techniques matches the criteria?

- A. Dynamic routing
- B. Hybrid routing
- C. Static routing
- D. Public routing

**Correct Answer: C**

**Section: (none)**

**Explanation**

#### **Explanation/Reference:**

Explanation:

The static routing technique matches the criteria given in this scenario. Static routing is a process of manually entering routes into a routing table. Static routes are not recommended for large networks because static routes are manually configured on the router. However, if a single link is used to connect an enterprise to an Internet Service Provider (ISP), then static routing is the best option.

The following are characteristics of static routing:

- Configuring static routes does not create any network traffic.
- Manually configured static routes do not generate routing updates and therefore do not consume any network bandwidth.
- Router resources are used more efficiently.
- Static routes are not recommended for large networks because they are manually configured on the router and maintaining the routes can become problematic.
- Static route configuration is not fault tolerant, because static routes do not automatically adapt to changes in the network.

The dynamic routing option is incorrect because route updates consume bandwidth and overhead. While the scenario is not concerned with routing protocol overhead, it states that there should be no bandwidth consumption by route advertisements.

Hybrid routing and public routing are not valid routing techniques in Cisco terminology.

Objective:

Routing Fundamentals

Sub-Objective:

Compare and contrast static routing and dynamic routing

References:

[Cisco Documentation > Internetworking Technology Handbook > Routing Basics > Algorithm Types](#)

## QUESTION 24

Which Cisco Internetwork Operating System (IOS) command is used to view the VLAN Trunking Protocol (VTP) statistics information?

- A. show vtp status
- B. show vtp domain
- C. show vtp statistics
- D. show vtp counters

**Correct Answer:** D

**Section:** (none)

**Explanation**

### Explanation/Reference:

Explanation:

The show vtp counters command is used to view VTP statistics information. The syntax of the command is as follows:

**show vtp {counters | status}**

The parameters used in the command are counters, which specifies VTP statistics information, and status, which specifies VTP domain status information.

The following is the output of the show vtp counters command:

```
Router#show vtp counters

VTP statistics:
Summary advertisements received: 7
Subset advertisements received: 6
Request advertisements received: 0
Summary advertisements transmitted: 894
Subset advertisements transmitted: 13
Request advertisements transmitted: 3
Number of config revision errors: 0
Number of config digest errors: 0
Number of V1 summary errors: 0
VTP pruning statistics:

Trunk Join Transmitted Join Received Summary advts received
from on-pruning-capable device
-----
Fa0/2 43450 42691 6
```

The show vtp status command option is incorrect because this command is used to view VTP domain status information.

The show vtp domain and show vtp statistics commands are invalid options because they are not valid Cisco IOS commands.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot inter-VLAN routing

References:



**QUESTION 25**

With which type of service is bandwidth and latency the biggest consideration?

- A. streaming video
- B. telnet sessions
- C. FTP transfers
- D. authentication traffic

**Correct Answer:** A

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

Streaming video places the largest demand on both bandwidth and latency. Video traffic is real-time and benefits from dedicated bandwidth with QoS implementation to ensure quality. Moreover, this service can tolerate very little latency.

Telnet and FTP sessions are both low bandwidth users and can tolerate a high degree of latency since the data can be reassembled when all pieces arrive, which is not possible when data is coming in real-time, and waiting for retransmissions and reassembly is not feasible.

Authentication traffic is not sensitive to latency and does not require much bandwidth either.

Objective:

WAN Technologies

Sub-Objective:

Describe basic QoS concepts

References:

[Cisco Documentation > Internetworking Technology Handbook > Voice/Data Integration Technologies](#)

**QUESTION 26**

Which of the following is a Point-to-Point Protocol (PPP) authentication protocol that supports sending of hashed values instead of sending passwords in clear text?

- A. LCP
- B. NCP
- C. PAP
- D. CHAP

**Correct Answer:** D

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

There are two authentication methods available when implementing a PPP connection: Password Authentication Protocol (PAP) and Challenge Handshake Authentication Protocol (CHAP).

Challenge Handshake Authentication Protocol (CHAP) uses a one-way hash function based on the Message Digest 5 (MD5) hashing algorithm to hash the password. This hashed value is then sent across the wire. In this situation, the actual password is never sent. No one tapping the wire will be able to reverse the hash to come up with the original password. This is why MD5 is referred to as a one-way function. It cannot be reverse engineered. CHAP uses a three-way handshake process to perform the authentication. Moreover, CHAP periodically repeats the authentication process after link establishment.



When configuring PPP with CHAP authentication, both routers must be configured with a username that will be presented by the other router with a password. Therefore, the username to configure on Router A will be the username of Router B. The password should be the same on both machines. If these settings are not correct, then authentication will fail. The authentication process can be displayed as it happens with the debug PPP authentication command.

Link Control protocol (LCP) is defined in Request for Comments (RFCs) 1548 and 1570 and has primary responsibility to establish, configure, authenticate, and test a PPP connection. LCP negotiates the following when setting up a PPP connection:

- Authentication method used (PAP or CHAP), if any
- Compression algorithm used (Stacker or Predictor), if any
- Callback phone number to use, if defined
- Multilink; other physical connections to use, if configured

Network Control Protocol (NCP) defines the process for how the two PPP peers negotiate which network layer protocols, such as IP and IPX, will be used across the PPP connection. LCP is responsible for negotiating and maintaining a PPP connection whereas NCP is responsible for negotiating upper-layer protocols that will be carried across the PPP connection.

Password authentication Protocol (PAP) is simpler than CHAP, but less secure. During the authentication phase, PAP goes through a two-way handshake process. In this process, the source sends its user name (or hostname) and password in clear text, to the destination. The destination compares this information with a list of locally stored user names and passwords. If it finds a match, the destination returns an accept message. If it does not find a match, it returns a reject message.

Objective:

WAN Technologies

Sub-Objective:

Configure, verify, and troubleshoot PPPoE client-side interfaces using local authentication

References:

[Cisco > Internetworking Technology Handbook > Point-to-Point Protocol](#)

[Cisco > Support > Technology Support > WAN > Point-to-Point Protocol \(PPP\) > Design > Design TechNotes > Understanding and Configuring PPP CHAP Authentication > Document ID: 25647](#)

## QUESTION 27

You are configuring the link between a Cisco 2950 series switch and a Cisco 2611 router. You have physically connected the router's Ethernet port to the switch using a straight-through cable. The switch has not been configured, except for a hostname. The router's hostname has also been configured, and the Ethernet port has been enabled. However, you forgot to assign an IP address to the Ethernet port.

You issue the show cdp neighbors command and get the following output:

```
RouterA#show cdp neighbors
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
                  S - Switch, H - Host, I - IGMP, r - Repeater
Device ID        Local Interface    Holdtime    Capability Platform  Port ID
SwitchA          Eth 0/0             157         S           2950          Fas 0/0
```

If you did not configure IP addresses, how is this information being passed between the two devices?

- A. The devices established a connection using default IP addresses.
- B. The ip unnumbered command has been issued, which means the interface does not require an IP address to be configured.
- C. CDP is a Layer 2 protocol and does not require IP addresses to be configured.
- D. CDP uses its own IP addressing system.

**Correct Answer:** C

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

CDP is a Layer 2 protocol and does not require IP addresses to be configured. The structure of the OSI model requires that the upper-layer protocols rely on the lower-layer protocols for operation. Protocols at Layer 3 cannot be operational unless Layers 1 and 2 are operational. Conversely, lower-layer protocols do not rely on upper-layer protocols for their operation. Because CDP operates at Layer 2 of the OSI model, it does not require an IP address to be active, since IP addresses are a function of Layer 3.

The ip unnumbered command has not been issued in this scenario. This command can only be used on serial interfaces, not Ethernet interfaces. It allows a serial interface to use an address that is already applied to an Ethernet interface.

Information is not being passed between the devices through default IP addresses. There is no such thing as default IP addresses on Ethernet interfaces for Cisco routers.

Information is not being passed between the devices through CDP's IP addressing system. CDP does not have its own IP addressing system because it does not use IP addresses for its operation.

Objective:

Infrastructure Management

Sub-Objective:

Use Cisco IOS tools to troubleshoot and resolve problems

References:

[Cisco > Cisco IOS Network Management Command Reference > schema through show event manager session cli username > show cdp neighbors](#)

**QUESTION 28**

Which Wide Area Network (WAN) switching technology is used by Asynchronous Transfer Mode (ATM)?

- A. packet switching
- B. virtual switching
- C. circuit switching
- D. cell switching

**Correct Answer:** D

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

Cell switching is a WAN switching technology that is used by ATM. ATM is an International Telecommunication Union-Telecommunications (ITU-T) standard for transmission of data, voice, or video traffic using a fixed size frame of 53 bytes, known as cells. Out of these 53 bytes, the initial five bytes are header information and the rest 48 bytes is the payload.

Packet switching is incorrect because packet switching is popularly used for data transfer, as data is not delay sensitive and it does not require real time transfer from a sender to a receiver. With packet switching, the data is broken into labeled packets and transmitted using packet-switching networks.

Virtual switching is incorrect because no such WAN switching technology exists.

Circuit switching is incorrect because circuit switching dynamically establishes a virtual connection between a source and destination. The virtual connection cannot be used by other callers unless the circuit is released. Circuit switching is the most common technique used by the Public Switched Telephone Network (PSTN) to

make phone calls. A dedicated circuit is temporarily established for the duration of call between caller and receiver. Once the caller or receiver hangs up the phone, the circuit is released and is available for other users.

Objective:

WAN Technologies

Sub-Objective:

Describe WAN access connectivity options

References:

[Cisco Documentation > Internetworking Technology Handbook > Introduction to WAN Technologies > Circuit Switching](#)

### QUESTION 29

You instructed your assistant to add a new router to the network. The routers in your network run OSPF. The existing router, OldRouter, is configured as follows:

```
router ospf 1
network 192.168.5.0 0.0.0.255 area 0
network 192.168.10.0 0.0.0.255 area 0
```

The OldRouter interface that connects to NewRouter is 192.168.5.3/24. Your assistant shows you the configuration that will be implemented:

```
newrouter(config)# router ospf 1
newrouter(config-router)# network 192.168.5.0 255.255.255.0 area 0
```

What is wrong with this configuration?

- A. The area ID is incorrectly configured.
- B. The wildcard mask is incorrectly configured.
- C. The network statement is incorrectly configured.
- D. The process ID number is incorrectly configured.

**Correct Answer: B**

**Section: (none)**

**Explanation**

#### **Explanation/Reference:**

Explanation:

When entering network statements for OSPF, a wildcard mask is used instead of a regular mask. Since the network connecting the two routers is a class C network, as shown by the address 192.168.5.0/24, the wildcard mask should be 0.0.0.255 rather than 255.255.255.0. With wildcard masks, the 0s octets must match, and the 255s octets do not have to match.

The area ID is correct. OldRouter is in area 0, so NewRouter should be as well. There must be an area 0 in an OSPF network. There can be multiple areas as well, but they must all connect to area 0. If non-0 areas cannot be directly connected to area 0, they must be configured with a virtual link across an area that does connect to the backbone (area 0).

The network statement is correct. The network between the routers is 192.168.5.0.

The process ID number is correct. The number is stated as OSPF 1 on OldRouter and OSPF 1 on NewRouter. They match in this case but that is not required. Process IDs are only locally significant.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot single area and multi-area OSPFv2 for IPv4 (excluding authentication, filtering, manual summarization, redistribution, stub, virtual-link, and LSAs)

References:

[Internetworking Technology Handbook > Open Shortest Path First \(OSPF\)](#)

### QUESTION 30

You are the network administrator for your company and have configured Cisco Discovery Protocol (CDP) in your network. You recently noticed that when devices send large numbers of CDP neighbor announcements, some devices are crashing. You decide to disable CDP on the router.

Which command should you use to achieve the objective?

- A. no cdp run
- B. set cdp disable
- C. no cdp enable
- D. no cdp advertise-v2

**Correct Answer:** A

**Section:** (none)

**Explanation**

#### Explanation/Reference:

Explanation:

You should use the no cdp run command to disable CDP on the router. Due to a known vulnerability regarding the handling of CDP by Cisco routers and switches when devices send large numbers of CDP neighbor announcements, some devices can crash or cause abnormal system behavior. To overcome this problem, you can disable CDP for the entire router by using the no cdp run command.

You cannot use the set cdp disable command to disable CDP on the router. This command disables CDP on an entire Catalyst switch.

You cannot use the no cdp enable command to disable CDP on the router. This command disables CDP on a specific interface.

You cannot use the no cdp advertise-v2 command to disable CDP on the router. This command disables CDPv2 advertisements.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Configure and verify Layer 2 protocols

References:

[Cisco > Support > Using Cisco Discovery Protocol](#)

[Cisco > Support > Technology Support > Network Management > Cisco's Response to the CDP Issue > Document ID: 13621](#)

### QUESTION 31

Which command is used to disable Cisco Discovery Protocol (CDP) on a Cisco router?

- A. disable cdp
- B. no cdp run
- C. no cdp enable
- D. no cdp advertise-v2

**Correct Answer:** B

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The no cdp run command is used to disable CDP on a Cisco router globally. CDP is a Layer 2 (Data Link layer) protocol that discovers information about neighboring network devices. CDP does not use network layer protocols to transmit information because it operates at the Data Link layer. Therefore, it is useful to determine information about directly connected Cisco network devices, because it can operate when network protocols have not been configured or are misconfigured. The show cdp neighbors detail command is used to view the IP addresses of the directly connected Cisco devices.

The no cdp advertise-v2 command disables CDPv2 advertisements. It will not disable the protocol globally.

The no cdp enable command is used to disable CDP on an interface. In a situation where CDP needs to be disabled on a single interface only, such as the interface leading to the Internet, this command would be executed from interface configuration mode for that specific interface. It will not disable the protocol globally. For example, to disable CDP for only the serial0 interface, the command sequence would be:

**Router#configure terminal**

**Router(config)#interface serial 0**

**Router(config-if)#no cdp enable**

The disable cdp command is not a valid Cisco command.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Configure and verify Layer 2 protocols

References:

[Cisco > Cisco IOS Network Management Command Reference > show cdp neighbors](#)

**QUESTION 32**

Which Cisco Internetwork Operating System (IOS) command is used to assign a router a name for identification?

- A. description
- B. banner motd
- C. hostname
- D. banner exec

**Correct Answer: C**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

The hostname command is used to assign the router a name for identification. This command is a global configuration mode command. The syntax of the command is as follows:

**Router(config)# hostname [name]**

The name parameter of the command specifies the new host name for the router.

The description command is incorrect because this command is used to set a description for an interface. The description command is an interface configuration mode command.

The banner motd command is used to specify a message of the day (MOTD) banner to users logging into the router. This is a global configuration mode command, but it does not assign a name to the router for identification.

The banner exec command enables a banner message to be displayed when an EXEC process is created; for example, if a line is activated or an incoming connection is made to a telnet line.

Objective:

Network Fundamentals

Sub-Objective:

Select the appropriate cabling type based on implementation requirements

References:

[Cisco > Cisco IOS Configuration Fundamentals Command Reference > F through K > hostname](#)

### QUESTION 33

Given the following output, which statements can be determined to be true? (Choose three.)

```
RouterA2# show ip ospf neighbor
```

```
Neighbor ID Pri State Dead Time Address Interface
192.168.23.2 1 FULL/BDR 00:00:29 10.24.4.2 FastEthernet1/0
192.168.45.2 2 FULL/BDR 00:00:24 10.1.0.5 FastEthernet0/0
192.168.85.1 1 FULL/- 00:00:33 10.6.4.10 Serial0/1
192.168.90.3 1 FULL/DR 00:00:32 10.5.5.2 FastEthernet0/1
192.168.67.3 1 FULL/DR 00:00:20 10.4.9.20 FastEthernet0/2
192.168.90.1 1 FULL/BDR 00:00:23 10.5.5.4 FastEthernet0/1
<<output omitted>>
```

- A. This router is the DR for subnet 10.1.0.0.
- B. The DR for the network connected to Fa0/0 has an interface priority greater than 2.
- C. The DR for the network connected to Fa0/1 has a router ID of 10.5.5.2.
- D. The DR for the serial subnet is 192.168.85.1.
- E. This router is neither the DR nor the BDR for the Fa0/1 subnet.
- F. RouterA2 is connected to more than one multi-access network.

**Correct Answer:** BEF

**Section:** (none)

**Explanation**

#### Explanation/Reference:

Explanation:

The show ip ospf neighbor command displays a list of all OSPF routers with which you have established a neighbor relationship. The following describes the command output:

- Neighbor ID: the Router ID (RID) of the neighboring router
- Pri: the interface priority of the neighboring router, which is used to determine which router should serve the function of a Designated Router (DR)
- State: the functional state of the neighboring router
- Dead Time: the period that the router will wait to hear a Hello packet from this neighbor before declaring the neighbor down
- Address: the IP address of the neighboring router on this subnet
- Interface: the local interface over which the neighbor relationship (adjacency) was formed

The output for neighbor 192.168.45.2 is as follows:

```
192.168.45.2 2 FULL/BDR 00:00:24 10.1.0.5 FastEthernet0/0
```

This indicates that the interface priority of neighbor 192.168.45.2 is 2. The default OSPF interface priority is 1, and the highest interface priority determines the designated router (DR) for a subnet. This same line reveals that this neighbor is currently the backup designated router (BDR) for this segment, which indicates that another router became the DR. It can be then be assumed that the DR router has an interface priority higher than 2. (The router serving the DR function is not present in the truncated sample output.)

The output for the two neighbors discovered on F0/1 is as follows:

```
192.168.90.3 1 FULL/DR 00:00:32 10.5.5.2 FastEthernet0/1
192.168.90.1 1 FULL/BDR 00:00:23 10.5.5.4 FastEthernet0/1
```

This output indicates that router 192.168.90.3 is the DR, and router 192.168.90.1 is the BDR for this network. Since there can only be one DR and BDR per segment, this indicates that the local router is neither the DR nor the BDR. (OSPF considers these DROther routers.)

The fact that multiple DRs are listed in this output indicates that RouterA2 is connected to more than one multi-access segment, since each segment will elect a DR.

It cannot be determined if this router is the DR for subnet 10.1.0.0. The output indicates that router 192.168.45.2 is the BDR for this network, but with the truncated output, it cannot be determined if this router is the DR.

The DR for the network connected to Fa0/1 does not have a router ID of 10.5.5.2. The Address field of the show ip ospf neighbor command indicates the IP address of the neighbor's interface, not the router ID of the neighbor.

The DR for the serial subnet is not 192.168.85.1, since point-to-point serial interfaces do not elect DRs and BDRs. This is indicated by the output below:

```
192.168.85.1 1 FULL/- 00:00:33 10.6.4.10 Serial0/1
```

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot single area and multi-area OSPFv2 for IPv4 (excluding authentication, filtering, manual summarization, redistribution, stub, virtual-link, and LSAs)

References:

[Cisco > Support > IP > IP Routing > Technology Information > Technology White Paper > OSPF Design Guide > Document ID: 7039 > DR Election](#)

### QUESTION 34

The conference room has a switch port available for use by the presenter during classes. You would like to prevent that port from hosting a hub or switch.

Which of the following commands could be used to prevent that port from hosting a hub or switch?

- A. switchport port-security maximum
- B. switchport port-security mac address sticky
- C. switchport port-security mac address
- D. switchport port-security

**Correct Answer:** D

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

The switchport port-security command would prevent the port from hosting a hub or switch. This command enables port security on an interface. It does not specify a maximum number of MAC addresses, but in the default is 1, therefore it would accomplish the goal.

The switchport port-security maximum command alone could not be used to limit the number of MAC addresses allowed on the interface to 1. This command has no effect unless the switchport port-security command has been executed.



The switchport port-security mac address sticky command would not prevent that port from hosting a hub or switch. This command is used to allow a port to dynamically learn the first MAC address it sees in the port, add it to the MAC address table and save it to the running configuration of the switch.

The switchport port-security mac address command would not prevent that port from hosting a hub or switch. This command is used to manually assign a MAC address to a port as a secure address. When used in combination with the switchport port-security maximum command, the use of the port can not only be limited to one address at a time, but also limited to only a specific address. For example, the following set of commands would assure that only the device with the MAC address of 0018.cd33.46b3 will be able to connect to the port:

```
Switch(config-if)#switchport port-security maximum 1
Switch(config-if)#switchport port-security mac-address 0018.cd33.46b3
```

Objective:

Infrastructure Security

Sub-Objective:

Configure, verify, and troubleshoot port security

References:

[Catalyst 4500 Series Switch Cisco IOS Software Configuration Guide, 12.2\(20\)EWA>Configuring Port Security](#)

### QUESTION 35

Which of the following are NOT valid IPv6 addresses? (Choose all that apply.)

- A. 225.1.4.2
- B. ::FFFF:10.2.4.1
- C. ::
- D. 2001:0:42:3:ff::1
- E. fe80:2030:31:24
- F. 2001:42:4:0:0:1:34:0
- G. 2003:dead:beef:4dad:ab33:46:abab:62

**Correct Answer:** AE

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The addresses 255.1.4.2 and fe80:2030:31:24 are not valid IPv6 addresses.

225.1.4.2 is incorrect because it is an IPv4 multicast address. The address fe80:2030:31:24 is incorrect because it does not represent a 16-byte IPv6 address, with colons separating each 2-byte segment.

IPv6 addresses are 16 bytes, or 128 bits in length. The following are valid IPv6 addresses.

- ::FFFF:10.2.4.1 is an example of an IPv4-compatible IPv6 address, where the first 10 bytes (80 bits) of the address are set to 0 the next 2 bytes (16 bits) are set to FFFF and the last 32 bits are the IPv4 address
- :: is the IPv6 "unspecified address." It is a unicast address not assigned to any interface, and is used by a DHCP-dependent host prior to allocating a real IPv6 address.
- 2001:0:42:3:ff::1 is a valid IP address, with the :: representing two segments (4 bytes) of compressed zeros.
- 2001:42:4:0:0:1:34:0 is a valid IP address, with only the leading zeros of each segment truncated.
- 2003:dead:beef:4dad:ab33:46:abab:62 has 16 bytes, is divided correctly by colons into eight sections, utilizes the dropping of leading zeros in each section correctly, and uses the letters a-f in the three section that spell out dead beef 4 dad.

Objective:

Network Fundamentals

Sub-Objective:



Compare and contrast IPv6 address types

References:

[Cisco > Technology Support > IP > IPv6 > Technology Information > Technology White Paper > IPv6 Addressing At A Glance \(PDF\)](#)  
[Cisco > Internetworking Technology Handbook > IPv6](#)

### QUESTION 36

Which WAN switching technology is used with ISDN?

- A. packet switching
- B. virtual switching
- C. circuit switching
- D. cell switching

**Correct Answer:** C

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

Circuit switching dynamically establishes a connection between a source and a destination. The connection cannot be used by other callers until the circuit is released. Circuit switching is the most common technique used with the public switched telephone network (PSTN) to make phone calls. During a call, a dedicated virtual circuit is temporarily established between the caller and receiver for the duration of the call. Once the caller or receiver hangs up the phone, the circuit is released and is made available for other users.

Packet switching is a technique popularly used for transfer of data that is not delay sensitive and does not require real-time transfer rates from a sender to a receiver. Also unlike circuit switching which makes a fixed amount of bandwidth available for the connection (which may not be fully utilized) packet switching uses bandwidth more efficiently. With packet switching, the data is broken into labeled packets and is transmitted using packet-switching networks.

Cell switching is used by Asynchronous Transfer Mode (ATM). ATM is an International Telecommunication Union-Telecommunications (ITU-T) standard for transmission of data, voice, or video traffic using a fixed size frame of 53 bytes, known as cells. Of these 53 bytes, the initial five bytes are header information and the remaining 48 bytes are the payload. These cells are transmitted over a path that may vary with each cell. It does not maintain a dedicated virtual circuit.

The term "virtual switching" is incorrect because it is not a valid WAN switching technology.

Objective:

WAN Technologies

Sub-Objective:

Describe WAN access connectivity options

References:

[Cisco Documentation > Internetworking Technology Handbook > Introduction to WAN Technologies > Circuit Switching](#)

### QUESTION 37

What Cisco IOS command produced the following as a part of its output?

```
Port Security: Enabled
Port status: SecureUp
Violation mode: Shutdown
Maximum MAC Addresses: 2
Total MAC Addresses: 2
Configured MAC Addresses: 2
```

Aging Time: 30 mins  
Aging Type: Inactivity  
SecureStatic address aging: Enabled  
Security Violation count: 0

- A. show interfaces port-security
- B. show port-security interface
- C. show ip interface
- D. show interfaces switchport

**Correct Answer:** B

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The output is the result of executing the show port-security interface command. The sample output indicates that port security has been enabled on the interface, and that a maximum of two MAC addresses has been configured. A violation mode of Shutdown indicates that if a third MAC address attempts to make a connection, the switch port will be disabled. It is useful to note that you must specify a port number when you execute the command. In this case, the command was Switch# show port-security interface fastethernet0/1.

The output was not produced by the show interfaces port-security command. This is not a valid Cisco command.

The output was not produced by the show ip interface command. It displays protocol-related information about an interface, and nothing pertaining to switch port security. An example of its output follows:

```
Router# show ip interface fastethernet0/1
fastethernet0/1 is up, line protocol is up
Internet address is 10.1.1.1/16
Broadcast address is 255.255.255.255
Address determined by setup command
MTU is 1500 bytes
Helper address is not set
Directed broadcast forwarding is disabled
Outgoing access list is not set
Inbound access list is not set
Proxy ARP is enabled
Local Proxy ARP is disabled
Security level is default
Split horizon is enabled
ICMP redirects are always sent
ICMP unreachable are always sent
ICMP mask replies are never sent
IP fast switching is enabled
IP fast switching on the same interface is disabled
IP Flow switching is disabled
IP CEF switching is enabled
IP Feature Fast switching turbo vector
IP VPN Flow CEF switching turbo vector
IP multicast fast switching is enabled
IP multicast distributed fast switching is disabled
IP route-cache flags are Fast, CEF
Router Discovery is disabled
IP output packet accounting is disabled
IP access violation accounting is disabled
TCP/IP header compression is disabled
RTP/IP header compression is disabled
Policy routing is enabled, using route map PBR
Network address translation is disabled
BGP Policy Mapping is disabled
IP Multi-Processor Forwarding is enabled <===== MPF information
IP Input features, "PBR",
are not supported by MPF and are IGNORED
IP Output features, "NetFlow",
are not supported by MPF and are IGNORED
```

The output was not produced by the show interfaces switchport command. This command displays non-security related switch port information, such as administrative and operational status and trunking:

```
Cat2950# show interfaces fastethernet0/1 switchport
Name: Po1
Switchport: Enabled
Administrative Mode: trunk
Operational Mode: trunk
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: dot1q
Negotiation of Trunking: On
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 10 (VLAN0010)
Trunking VLANs Enabled: ALL
Pruning VLANs Enabled: 2-1001

Protected: false
Voice VLAN: none (Inactive)
Appliance trust: none
```

Objective:  
Infrastructure Security  
Sub-Objective:  
Configure, verify, and troubleshoot port security

References:  
[Cisco > Support > Cisco IOS Security Command Reference: Commands S to Z > show port-security](#)

### QUESTION 38

You are configuring a serial link between a Cisco router and a router produced by another vendor. What would be the advantages of using Point to Point Protocol (PPP) over High Level Data Link Control (HDLC) in this scenario?

- A. HDLC has a proprietary "type" field that may be incompatible with equipment from other vendors.
- B. HDLC is not available on non-Cisco routers.
- C. PPP is faster.
- D. PPP performs error checking.

**Correct Answer: A**

**Section: (none)**

**Explanation**

#### **Explanation/Reference:**

Explanation:

High Level Data Link Control (HDLC) has a proprietary "type" field that may be incompatible with equipment from other vendors. It is recommended that PPP always be used when combining equipment from multiple vendors because this Data Link layer WAN protocol is an industry standard. PPP is implemented in the same manner on all PPP-capable equipment.

HDLC is available on non-Cisco routers. However, the Cisco implementation has a "type" field that may prevent the connection from working.

PPP is not faster than HDLC.

PPP performs error checking, but so does HDLC.

Objective:  
WAN Technologies  
Sub-Objective:

Describe WAN access connectivity options

References:

[Cisco > Internetworking Technology Handbook > Point to Point Protocol \(PPP\)](#)

### QUESTION 39

Which of the following are classless routing protocols? (Choose four.)

- A. Open Shortest Path First (OSPF)
- B. Enhanced Interior Gateway Routing Protocol (EIGRP)
- C. Interior Gateway Routing Protocol (IGRP)
- D. Routing Information Protocol version 1 (RIPv1)
- E. Border Gateway Protocol (BGP)
- F. Routing Information Protocol version 2 (RIPv2)

**Correct Answer:** ABEF

**Section:** (none)

**Explanation**

#### Explanation/Reference:

Explanation:

Open Shortest Path First (OSPF), Enhanced Interior Gateway Routing Protocol (EIGRP), Border Gateway Protocol (BGP), and Routing Information Protocol version 2 (RIPv2) are classless routing protocols.

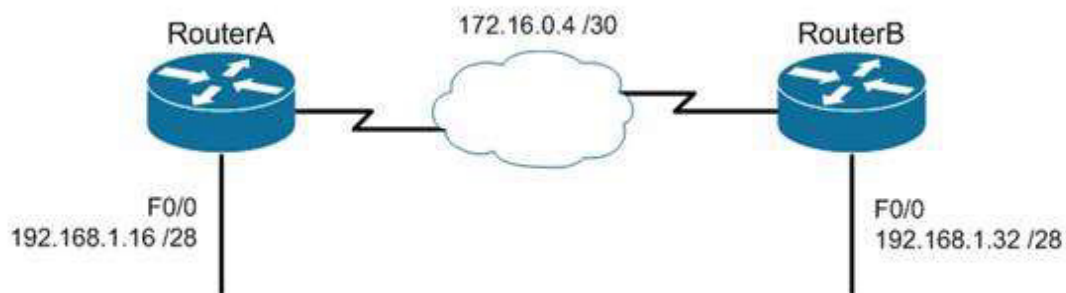
Intermediate-System-to-Intermediate System (IS-IS) is also a classless routing protocol.

The options IGRP and RIPv1 are incorrect because these are classful routing protocols.

The following are characteristics of classless routing protocols:

- The subnet mask is advertised with each route by using classless routing protocols.
- Flexible route summarization and supernetting (CIDR) are allowed in classless routing protocols.
- Classless routing protocols support variable length subnet masks (VLSM), which allow different subnets of a given IP network to be configured with different subnet masks.

One of the main advantages of using a classless routing protocol is its ability to minimize the effects of discontinuous networks. When subnets of the same classful network are separated by another classful network, the networks are called discontinuous. Examine the diagram below:



The LAN networks extending from Router A and Router B are derived from the same Class C network, 192.168.1.0/24. A classful routing protocol such as RIP v1 would not be able to determine the direction to send the packets, but since classless protocols include the subnet mask in advertisements, they would not suffer the same problem. Whenever networks with non-default subnet masks are used, a classless routing protocol will be required.

Below are some examples of networks that do not have default masks. You can recognize them by the fact that they are not /8, /16, or /24.

192.168.10.0/27  
10.5.6.0/22  
172.68.0.0/18

All of the classless protocols discussed here are interior routing protocols with the exception of Border Gateway Protocol (BGP), which is an external routing protocol used to connect different autonomous systems. For example, BGP would be used to connect two OSPF autonomous systems (AS).

Objective:

Routing Fundamentals

Sub-Objective:

Interpret the components of routing table

References:

[Cisco > Support > IP > IP Routing](#)

#### **QUESTION 40**

Which of the following commands helps you determine the Layer 1 and Layer 2 up/down status of a Cisco interface?

- A. show controllers
- B. show running-config
- C. show interfaces trunk
- D. show interfaces

**Correct Answer: D**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

The show interfaces command displays the Layer 1 and Layer 2 operational status of an interface, along with other information.

```

Router# show interfaces
Ethernet 1 is up, line protocol is up
Hardware is MCI Ethernet, address is 0000.0c00.750c (via 0000.0c00.750c)
Internet address is 205.108.28.8, subnet mask is 255.255.0.0
MTU 1500 bytes, BW 10000 Kbit, DLY 100000 usec, rely 255/255, load 1/255
Encapsulation ARPA, loopback not set, keepalive set (10 sec)
ARP type: ARPA, ARP Timeout 4:00:00
Last input 10:09*:00, output 0:00:00, output hang never
Last clearing of "show interface" counters 0:00:00
Output queue 0/40, 0 drops; input queue 0/75, 0 drops
Five minute input rate 0 bits/sec, 0 packets/sec
Five minute output rate 2000 bits/sec, 4 packets/sec
1127576 packets input, 447251251 bytes, 0 no buffer
Received 354125 broadcasts, 586 runts, 705 giants
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
5332142 packets output, 496316039 bytes, 0 underruns
0 output errors, 432 collisions, 0 interface resets, 0 restarts
Input queue: 0/75/0 (size/max/drops); Total output drops: 0
Output queue: 7/64/0 (size/threshold/drops)
Conversations 2/9 (active/max active)

```

Of interest in this output is the information contained on line 14 (also shown below). The figures for Runts and Giants (packets that are either too large or too small) indicate that collisions are occurring or that the NIC is malfunctioning:

```
Received 354125 broadcasts, 586 runts, 705 giants
```

As a part of troubleshooting this increase in collisions, you can also identify the speed of the interface by reading line 4, which says the bandwidth is 10000 Kbit, indicating a FastEthernet interface.

```
MTU 1500 bytes, BW 10000 Kbit, DLY 100000 usec, rely 255/255, load 1/255
```

You can also specify a particular interface for which information should be displayed, as shown below:

```

Router# show interfaces ethernet 0/0
Ethernet0/0 is administratively down, line protocol is down
Hardware is AmdP2, address is 0003.e39b.9220 (via 0003.e39b.9220)
Internet address is 10.1.0.254/16
MTU 1500 bytes, BW 10000 Kbit, DLY 1000 usec,
reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ARPA, loopback not set
Keepalive set (10 sec)
ARP type: ARPA, ARP Timeout 04:00:00
<<output omitted>>

```

The sample output indicates that interface Ethernet 0/0 is in an administratively down, line protocol is down state. The first statement indicates the Layer 1 (Physical) status, while the second statement indicates the Layer 2 (Data Link) status of the interface. A status of administratively down always indicates that the interface is in a shutdown state; the interface can be activated by executing the command `no shutdown`. This command also indicates the configured bandwidth of the interface (10000 Kbit in this case).

The following lines of information concern the Physical layer:

```
Hardware is AmdP2, address is 0003.e39b.9220 (via 0003.e39b.9220)
Ethernet0/0 is administratively down, line protocol is down
```

This output indicates that the link has not been enabled. There are other combinations of up and down states that can indicate other conditions. For example, the following indicates the link is functioning:



```
Ethernet0/0 is up, line protocol is up
```

The output below indicates a problem at the other end of the link, perhaps meaning that the interface on the other end has not been enabled or that the port to which it is connected has been disabled.

```
Ethernet0/0 is up, line protocol is down (not connect)
```

The following lines of information concern the Data Link layer:

```
Encapsulation ARPA  
line protocol is down
```

The show controllers command provides Layer 1 information only, including the type of cable detected (DTE/DCE) on a serial interface.

The show running-config command displays the current active configuration of the router, but does not indicate the operational status of its interfaces.

The show interfaces trunk command will not show the Layer 1 and Layer 2 up/down status of a Cisco interface. It will show all interfaces configured to be trunks. This command is very useful when you need to locate trunk interfaces on a switch with which you are not familiar. In the output of the command below, the three trunking interfaces are the Fa0/3, Fa0/9, and Fa0/12 interfaces.

```
Switch# show int trunk  
Port Mode          Encapsulation  native vlan  
Fa0/3             on             802.1q        1  
Fa0/9             desirable     802.1q        1  
Fa0/12            desirable     802.1q        1
```

Objective:

LAN Switching Fundamentals

Sub-Objective:

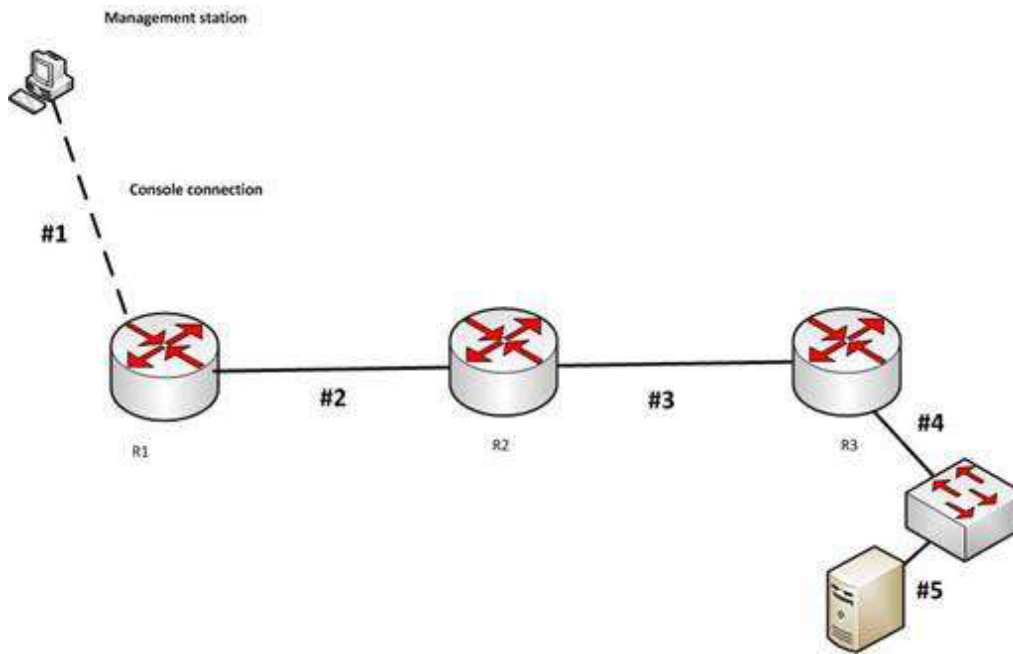
Troubleshoot interface and cable issues (collisions, errors, duplex, speed)

References:

[Cisco > Catalyst 6500 Series Cisco IOS Command Reference, 12.1 E > show bootvar to show ip cache > show interfaces](#)

## QUESTION 41

You need to cable the network shown below.



Which of the following is the correct cable for each numbered link?

- A. 1-crossover, 2-straight-through, 3-rollover, 4- crossover, 5-crossover
- B. 1-straight-through, 2-straight-through, 3-rollover, 4- crossover, 5-crossover
- C. 1-crossover, 2-crossover, 3-rollover, 4- crossover, 5-crossover
- D. 1-rollover, 2-crossover, 3-crossover, 4- straight-through, 5-straight through

**Correct Answer: D**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

The correct cabling pattern is 1-rollover, 2-crossover, 3-crossover, 4- straight-through, 5-straight through. When selecting cables, the following rules apply:

- Router to router- crossover
- Router to switch- straight- through
- Management station (PC) to router for console session- rolled cable
- Switch to switch - crossover
- PC to switch- straight through

Objective:

Network Fundamentals

Sub-Objective:

Select the appropriate cabling type based on implementation requirements

References:

[Cisco > Product Support > End-of-Sale and End-of-Life Products > Cisco 7000 Series Routers > Troubleshooting TechNotes > Cabling Guide for Console and AUX Ports > Document ID: 12223](#)

## QUESTION 42

DRAG DROP

Click and drag the Open Systems Interconnection (OSI) layers to their corresponding functions on the right.

**Select and Place:**

### OSI Layer:

Network
Application
Physical
Transport

### Descriptions:

	Responsible for error-free delivery of data
	Consists of hardware for sending and receiving data on a
	Is responsible for making path and forwarding decis
	Provides services such as e-mail and File Transfer Pro (FTP)

Correct Answer:

### OSI Layer:


### Descriptions:

Transport	Responsible for error-free delivery of data
Physical	Consists of hardware for sending and receiving data on a
Network	Is responsible for making path and forwarding decis
Application	Provides services such as e-mail and File Transfer Pro (FTP)

Section: (none)

Explanation

#### Explanation/Reference:

Explanation:

The following are the OSI layers along with their descriptions:

- Application: Responsible for interacting directly with the application. It provides application services such as e-mail and File Transfer Protocol (FTP).
- Physical: Consists of hardware for sending and receiving data on a carrier. The protocols which work at the Physical layer include Fast Ethernet, RS232, and Asynchronous Transfer Mode (ATM).
- Transport: Responsible for error-free and sequential delivery of data. This layer is used to manage data transmission between devices, a process known as flow control. The Transport layer protocols are Transmission Control Protocol (TCP) and User Datagram Protocol (UDP).
- Network: Used to define the network address or the Internet Protocol (IP) address, which is then used by the routers to make routing decisions.
- The following are also OSI layers:
- Presentation: Enables coding and conversion functions for application layer data. The formatting and encryption of data is done at this layer. The Presentation layer converts data into a format which is acceptable by the application layer.
- Session: Used to create, manage, and terminate sessions between communicating nodes. The session layer handles the service requests and service responses, which take place between different applications.
- Data Link: Ensures the reliable transmission of data across a network on the basis of Layer 2 addresses such as MAC addresses (Ethernet) or DLCIs (Frame Relay).

Objective:

Network Fundamentals

Sub-Objective:

Compare and contrast OSI and TCP/IP models

References:

[Internetworking Technology Handbook > Internetworking Basics > OSI Model and Communication Between Systems](#)

#### QUESTION 43

Which type of Dynamic Host Configuration Protocol (DHCP) transmission is used by a host to forward a DHCPDISCOVER packet to locate a DHCP server on the network?

- A. unicast
- B. broadcast
- C. multicast
- D. anycast

**Correct Answer:** B

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

Hosts broadcast DHCPDISCOVER messages to locate a DHCP server. The following steps are followed during the allocation of the IP address dynamically using a DHCP server:

- The client device broadcasts a DHCPDISCOVER message to locate a DHCP server.
- The DHCP server replies with a DHCPOFFER unicast message with configuration parameters, such as an IP address, a MAC address, a domain name, and a lease for the IP address for the client device.
- The client returns a DHCPREQUEST broadcast, which is a formal request for the offered IP address to the DHCP server.
- The DHCP server replies to client device with DHCPACK unicast message, acknowledging the allocation of the IP address to this client device.

Dynamic Host Configuration Protocol (DHCP) is an enhancement over Bootstrap Protocol (BOOTP) and is used to automate the distribution of IP address to clients from a central server. BOOTP protocol was also used to distribute IP addresses, but was inflexible to changes in the network.

DHCP offers the following three advantages that also addressed the inflexibility of the BOOTP protocol:

- Automatic allocation of permanent IP addresses
- Automatic allocation of time bound (leased) IP addresses
- Provision of assigning static IP address or defining a pool of reserved IP address

DHCP does not use multicast messages.

Anycast is a concept of IPv6 protocol and is not valid type used by DHCP.

Objective:

Infrastructure Services

Sub-Objective:

Configure and verify DHCP on a router (excluding static reservations)

References:

[Cisco > Cisco IOS IP Addressing Services Configuration Guide, Release 12.4 > Part 3: DHCP > DHCP Server, Relay Agent, and Client Operation](#)

#### QUESTION 44

Which type of switching process requires a switch to wait for the entire frame to be received before forwarding it to a destination port?

- A. store and forward

- B. cut-through
- C. fragment free
- D. frame-forward

**Correct Answer:** A

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The store and forward switching process requires a switch to wait until the entire frame is received before forwarding it to a destination port. The store and forward method increases latency as it buffers the entire frame and runs a Frame Check Sequence (FCS) before forwarding it to destination port. However, it ensures error-free frame forwarding because it filters all frame errors.

The cut-through switching process does NOT require a switch to verify the FCS in a frame before forwarding it to the destination port. This type of internal switching method is faster than the store and forward process, but may forward error frames.

The fragment-free switching process only waits to receive the first 64 bytes of the frame before forwarding it the destination port. Fragment-free internal switching assumes that if there is no error in the first 64 bytes of the data, the frame is error free. The assumption is based on the fact that if a frame suffers a collision, it occurs within the first 64 bytes of data. Fragment-free forwarding speed lies between that of store and forward and cut-through.

The term frame-forward is not a valid internal switching process for Cisco switches.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Describe and verify switching concepts

References:

[Cisco Documentation > Internetworking Case Studies > LAN Switching](#)

**QUESTION 45**

You have two routers in your OSPF area 0. Router 1 is connected to Router 2 via its Serial 1 interface, and to your ISP via the Serial 0 interface. Router 1 is an ASBR.

After your assistant configures a default route on Router 1, you discover that whenever either router receives packets destined for networks that are not in the routing tables, it causes traffic loops between the two routers.

To troubleshoot, you execute the show run command on Router 1. Part of the output is shown below:

```
<output omitted>
IP route 0.0.0.0 0.0.0.0 serial 1
Router ospf 1
Network 192.168.5.0 0.0.0.255 area 0
Default-information originate
```

Which command or set of commands should you execute on Router 1 to stop the looping traffic while maintaining Router 2's ability to send traffic to the Internet?

- A. Execute the no default-information originate command.
- B. Execute the no ip route 0.0.0.0 0.0.0.0 serial 1 command and then execute the ip route 0.0.0.0 0.0.0.0 serial 0 command.
- C. Execute the default-information originate always command.
- D. Execute the no network 192.168.5.0 area 0 command and then execute the network 192.168.5.0

255.255.255.0 area 0 command.

**Correct Answer:** B

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

You should execute the `no ip route 0.0.0.0 0.0.0.0 serial 1` command followed by the `ip route 0.0.0.0 0.0.0.0 serial 0` command. The original configuration command was executed on the wrong interface on Router 1 by your assistant. It should be executed on Serial 0, which is the connection to the ISP. The `show run` command indicates that with the current configuration, if Router 2 receives a packet not in its table, it sends it to Router 1, and then Router 1 sends it back out on Serial 1. This redirects the packet back to Router 2, and the loop begins. By changing the configuration to Serial 0, Router 1 will start forwarding all traffic not in the routing table to the ISP.

You should not execute the `no default-information originate` command. This command instructs Router 1 to NOT inject the default route into area 0, which is the desired behavior. Running this command would stop the loop, but would leave Router2 with no default route to send packets to the Internet.

You should not execute the `default-information originate always` command. It will not change the existing looping behavior. The addition of the `always` parameter instructs Router 1 to inject a default route into area 0, even if one does not exist on Router 1. This is unnecessary, since Router 1 does have a default route configured, and will not change the existing looping behavior. To advertise a default route to other OSPF routers, you should run this command:

```
Router1(config-router)#default information originate
```

You should not execute the `no network 192.168.5.0 area 0` command followed by the `network 192.168.5.0 255.255.255.0 area 0` command. There is nothing wrong with the original network command. Also, the `network 192.168.5.0 255.255.255.0 area 0` command uses an incorrect mask type. The mask must be in the wildcard format. Moreover, since it is incorrect, this will have the effect of disabling OSPF on the network connecting the two routers.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot single area and multi-area OSPFv2 for IPv4 (excluding authentication, filtering, manual summarization, redistribution, stub, virtual-link, and LSAs)

References:

[Cisco > Home > Support > Technology Support > IP > IP Routing > Configure > Configurations Examples and Technotes > How OSPF Injects a Default Route into a Normal Area](#)

**QUESTION 46**

```

Routing Protocol is "igrp 120"
Sending updates every 90 seconds, next due in 44 seconds
Invalid after 270 seconds, hold down 280, flushed after 630
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Default networks flagged in outgoing updates
Default networks accepted from incoming updates
IGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0
IGRP maximum hopcount 100
IGRP maximum metric variance 1
Redistributing: igrp 109
Routing for Networks:
172.160.74.0
Routing Information Sources:
Gateway Distance Last Update
172.160.74.18 100 0:56:41
172.160.74.19 100 6d19
172.160.74.22 100 0:25:41
172.160.74.20 100 0:01:04
172.160.74.30 100 0:02:29
Distance: (default is 100)
Routing Protocol is "bgp 18"
Sending updates every 60 seconds, next due in 0 seconds
Outgoing update filter list for all interfaces is 1
Incoming update filter list for all interfaces is not set
Redistributing: igrp 109
IGP synchronization is disabled
Automatic route summarization is enabled
Neighbor(s):
Address FiltIn FiltOut DistIn DistOut Weight RouteMap
192.109.211.17 1
192.109.213.89 1
198.6.255.13 1
172.161.72.18 1
172.161.72.19
172.161.84.17 1
Routing for Networks:
192.108.209.0
192.108.211.0
198.6.254.0
Routing Information Sources:
Gateway Distance Last Update
172.161.72.19 20 0:05:28
Distance: external 20 internal 200 local 200

```

What command produced the preceding output?

- A. show ip process
- B. show ip route
- C. show ip protocols
- D. show ip routing process

**Correct Answer: C**

**Section: (none)**

**Explanation**



**Explanation/Reference:**

Explanation:

The show ip protocols command is used to view the current state of active routing protocols. This command is issued from Privileged EXEC mode. It has the following syntax:

```
Router# show ip protocols
```

This command does not have any parameters.

The output was not produced by the command show ip process or the show ip routing process. The show ip routing process and show ip process commands are incorrect because these are not valid Cisco IOS commands.

The output was not produced by the command show ip route. The show ip route command is used to view the current state of the routing table. An example of the output is shown below.

```
router>show ip route

Codes: C - connected O - OSPF i - IS-IS
S - static IA - inter area L1 - level-1
B - BGP E1 - external type 1 L2 - level-2
E2 - external type 2
* - candidate default
m - route's metric
w - route's weight

S 0.0.0.0/0 directly connected to null 0
C 6.1.1.64/28 directly connected to ethernet 1
C 6.1.1.80/28 directly connected to ethernet 2
C 6.1.1.96/28 directly connected to ethernet 3
C 6.1.1.112/28 directly connected to ethernet 4
S 11.1.0.0/16 via 10.5.0.1 [w:0 m:0]
C 11.5.0.0/16 directly connected to ethernet 0
S 127.0.0.0/8 directly connected to null 0
```

Objective:

Routing Fundamentals

Sub-Objective:

Interpret the components of routing table

References:

[Cisco > Support > Cisco IOS IP Routing: Protocol-Independent Command Reference > show ip protocols](#)

### QUESTION 47

Which statement is supported by the following output?

```
router# show ip protocols
Routing Protocol is "eigrp 3"
Sending updates every 90 seconds, next due in 24 seconds
<<some output omitted>>
EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0
EIGRP maximum hopcount 100
EIGRP maximum metric variance 1
Redistributing: eigrp 3
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
172.160.72.0
192.168.14.0
<<output omitted>>
```

- A. EIGRP supports load-balancing over three equal-cost paths
- B. EIGRP supports load-balancing over three unequal-cost paths
- C. EIGRP supports load-balancing over four equal-cost paths
- D. EIGRP supports load-balancing over four unequal-cost paths

**Correct Answer:** C

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

The Maximum path: 4 output indicates that Enhanced Interior Gateway Routing Protocol (EIGRP) will support round-robin load-balancing over four equal-cost paths. This is a default setting, and is a true statement for most routing protocols (including RIP, OSPF and IS-IS). Equal-cost paths are different routes to the same destination network with identical metrics, as determined by the routing protocol. Most routing protocols allow this maximum to be raised up to 16 with the maximum-paths command.

EIGRP has the additional benefit of allowing unequal cost load-balancing. With unequal cost load-balancing, the router can be configured to include less desirable (higher-metric) paths in the routing table. The router will then send a balanced percentage of traffic over both the best route and the less desirable paths, such as sending two packets over the best path plus one over a less desirable path. EIGRP will never perform unequal-cost load-balancing by default; it must be configured with a variance command. Therefore, you cannot state that EIGRP supports load-balancing over unequal-cost paths in this example.

You cannot state that EIGRP will support load-balancing over three paths because the output displays the Maximum path: 4 value.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot EIGRP for IPv4 (excluding authentication, filtering, manual summarization, redistribution, stub)

References:

[Cisco > Support > IP > IP Routing > Design > Design TechNotes > How Does Load Balancing Work? > Document ID: 5212](#)

[Cisco > Support > IP > IP Routing > Design > Design TechNotes > How Does Unequal Cost Path Load Balancing \(Variance\) Work in IGRP and EIGRP? > Document ID: 13677](#)

### QUESTION 48

Which of the following are Wide Area Network (WAN) protocols? (Choose three.)

- A. PPP
- B. AAA
- C. WEP
- D. STP
- E. HDLC
- F. Frame Relay

**Correct Answer:** AEF

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

Point-to-Point Protocol (PPP), High-Level Data Link Control (HDLC), and Frame Relay are WAN protocols.

PPP is a WAN protocol is defined in Request for Comments (RFCs) 1332, 1661, and 2153. PPP works with asynchronous and synchronous serial interfaces as well as High-Speed Serial Interfaces (HSSI) and Integrated Services Digital Network (ISDN) interfaces (BRI and PRI). Some of the characteristics of PPP are:

- Can be used over analog circuits
- Can encapsulate several routed protocols, such as TCP/IP
- Provides error correction
- Should be used rather than HDLC when non-Cisco routers are involved, as it is implemented consistently among vendors
- PPP authentication can be used between the routers to prevent unauthorized callers from establishing an ISDN circuit

To change the encapsulation from the default of HDLC to PPP when connecting to a non-Cisco router, such as a Juniper, you would use the following command:

```
router(config)#interface serial S0
router(config-if)#encapsulation ppp
```

HDLC is a WAN protocol used with synchronous and asynchronous connections. It defines the frame type and interaction between two devices at the Data Link layer.

Frame Relay is a group of WAN protocols, including those from International Telecommunication Union (ITU-T) and American National Standards Institute (ANSI). Frame Relay defines interaction between the Frame Relay customer premises equipment (CPE) and the Frame Relay carrier switch. The connection across the carrier's network is not defined by the Frame Relay standards. Most carriers, however, use Asynchronous Transfer Mode (ATM) as a transport to move Frame Relay frames between different sites.

Authentication, Authorization, and Accounting (AAA) is incorrect because this is a scheme to monitor access control and activities on networked devices.

Wired Equivalent Privacy (WEP) is a security scheme for wireless networks and therefore it is incorrect.

Spanning Tree Protocol (STP) is for loop avoidance in redundant topologies. This option is incorrect because this protocol is used on Local Area Network (LAN).

Objective:

WAN Technologies

Sub-Objective:

Describe WAN access connectivity options

References:

[Cisco > Internetworking Technology Handbook > Point-to-Point Protocol](#)

[Cisco > Internetworking Technology Handbook > Frame Relay](#)

#### QUESTION 49

Which of the following are characteristics of Enhanced Interior Gateway Routing Protocol (EIGRP)? (Choose all that apply.)

- A. Requires a hierarchical physical topology
- B. Does not require a hierarchical physical topology
- C. Uses Diffusing Update Algorithm (DUAL) to provide loop prevention
- D. Uses Bellman-Ford algorithm to provide loop prevention
- E. Supports Message-Digest Algorithm 5 (MD5) authentication
- F. Does not support Message-Digest Algorithm 5 (MD5) authentication
- G. Can differentiate between internal and external routes
- H. Uses a 32-bit metric

**Correct Answer:** BCEGH

**Section:** (none)

**Explanation**

#### Explanation/Reference:

Explanation:

EIGRP does not require a hierarchical physical topology. It uses Diffusing Update Algorithm (DUAL) to provide loop prevention, and it supports Message-Digest Algorithm 5 (MD5) authentication. It can differentiate between internal and external routes, and uses a 32-bit metric.

EIGRP is a classless protocol that allows the use of variable length subnet masks (VLSM) and supports classless interdomain routing (CIDR) for allocation of IP addresses. The following are characteristics of EIGRP:

- Supports large networks due to high scalability
- Provides fast convergence using the Diffusing Update Algorithm (DUAL)
- Performs equal and unequal load balancing by default
- Supports variable length subnet masks (VLSM) and classless interdomain routing (CIDR)
- Is a hybrid routing protocol (distance-vector protocol) that also provides link-state protocol characteristics
- Is a classless protocol
- Sends partial route updates only when there are changes, reducing bandwidth usage for routing updates
- Has an administrative distance of 90 for EIGRP internal routes, 170 for EIGRP external routes, and 5 for EIGRP summary routes
- Is used only with Cisco platforms
- Provides support for IP, IPX and AppleTalk protocols
- Can differentiate between internal and external routes
- Uses a 32-bit metric

EIGRP can load-balance up to four unequal cost paths. To do so, use the variance n command to instruct the router to include routes with a metric of less than n times the minimum metric route for that destination. The variable n can take a value between 1 and 128. The default is 1, which means equal cost load balancing.

The option stating that EIGRP requires a hierarchical physical topology is incorrect because EIGRP does not require or support a hierarchical routing topology.

The option stating that EIGRP uses Bellman-Ford algorithm to provide loop prevention is incorrect. EIGRP uses DUAL to provide loop prevention.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot EIGRP for IPv4 (excluding authentication, filtering, manual summarization, redistribution, stub)

References:

[Cisco > Internetworking Technology Handbook > Enhanced Interior Gateway Routing Protocol \(EIGRP\)](#)

#### QUESTION 50

Refer to the following configuration on a Cisco router to allow Telnet access to remote users:

```
Router(config)#line vty 0 2
Router(config-line)#login
Router(config-line)#password guest
```

How many users can Telnet into this router at the same time?

- A. 0
- B. 1
- C. 2
- D. 3
- E. 5

**Correct Answer:** D

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

The given configuration will allow three users to Telnet into the router at the same time. The line vty 0 2 command specifies a range from 0 to 2; therefore, three simultaneous Telnet sessions are allowed on this Cisco router. The commands in the exhibit can be explained as follows:

Router(config)#line vty 0 2 (determines which of the five possible terminal lines are being configured. In this case, they are lines 0 through 2. It also determines the number of lines available, in that any line with no password configured will be unusable.)

Router(config-line)#login (specifies that a password will be required)

Router(config-line)#password guest (specifies the password)

The default configuration allows five simultaneous Telnet sessions on the Cisco router. For the default configuration, you would issue the vty 0 4 command in global configuration mode.

You must configure a password when enabling a router for Telnet access. Without a password, the login access to the router will be disabled and you will receive the following error message if you try to Telnet to the router:

```
router# telnet 10.10.10.1
Trying 10.10.10.1 ... Open
Password required, but none set
[Connection to 10.10.10.1 closed by foreign host]
```

**Objective:**

Infrastructure Management

**Sub-Objective:**

Configure and verify device management

References:

#### QUESTION 51

Which Cisco Internetwork Operating System (IOS) command can be used to configure the location of the configuration file?

- A. boot buffersize

- B. configure
- C. boot config
- D. service config

**Correct Answer:** C

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The boot config command will configure the location of the configuration file. It must be followed by the copy run start command to be effective at next reboot. The syntax of the command is as follows:

**boot config device:filename**

The parameters of the command are as follows:

- Device : Specifies the device that contains the configuration file.
- Filename : Specifies the name of the configuration file.

The boot buffersize command is incorrect because this command is used to modify the buffer size used to load the IOS image. Moreover, this command no longer functions in IOS 12.4.

The configure command is incorrect because this command is used to enter the global configuration mode.

The service config command is incorrect because this command is used to enable autoloading of configuration files from a network server.

Objective:

Infrastructure Management

Sub-Objective:

Perform device maintenance

References:

[Cisco > Cisco IOS Configuration Fundamentals Command Reference > A through B > boot config](#)

## QUESTION 52

Which prompt indicates the configuration mode at which Cisco IOS debug commands can be issued?

- A. router>
- B. router#
- C. router(config)#
- D. router(config-if)#

**Correct Answer:** B

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

You would use privileged EXEC mode, as indicated by the router# prompt, to issue Cisco IOS show and debug commands. All debug commands are entered in privileged EXEC mode. A brief description of all the debugging commands can be displayed by entering the following command in privileged EXEC mode at the command line:

**debug?**

Debugging output consumes high CPU processing power and can leave the system unusable. The debug commands should be reserved to troubleshoot specific problems, preferably with the help of Cisco technical support staff.

The prompt `router>` indicates user exec mode, which provides limited access to the router.

The prompt `router(config)#` indicates global configuration mode, which allows configuration settings affecting the entire router. Passing through this mode is also required to access configuration mode for specific interfaces as well.

The prompt `router(config-if)#` indicates interface configuration mode, which allows configuration of the interface specified when entering this mode.

Objective:

Infrastructure Management

Sub-Objective:

Configure and verify device management

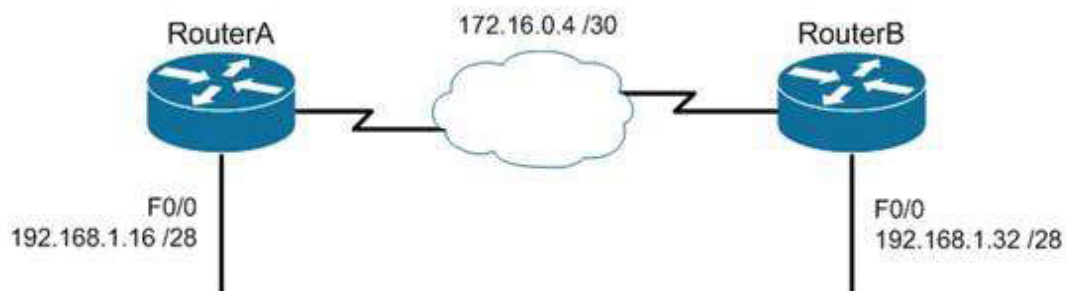
References:

[Cisco > Support > Cisco IOS Software > Using the Command-Line Interface in Cisco IOS Software](#)

### QUESTION 53

You are the Cisco administrator for Metroil. One of your assistants has submitted the given diagram as a potential addressing plan for two offices. Both offices use EIGRP as the routing protocol. You immediately see a problem with the proposal.

Which of the following actions could be a solution? (Choose two. Each correct option is a complete solution.)



- A. Execute the `no auto-summary` command on both routers.
- B. Change the network on F0/0 of Router A to 192.168.3.0/24 and change the network on F0/0 of Router B to 192.168.2.0/24.
- C. Change the network on F0/0 of Router B to 192.168.1.48/28.
- D. Execute the `auto-summary` command on both routers.

**Correct Answer:** AB

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

You should either execute the `no auto-summary` command on both routers, or change the network on F0/0 of Router A to 192.168.3.10/24 and the network on F0/0 of Router B to 192.168.2.0/24. The exhibit is an example



of discontinuous subnets, in which two subnets (192.168.1.16 and 192.168.1.32) of the same major network (192.168.1.0) are separated by a completely different network (172.16.0.4/30). The no auto-summary command instructs EIGRP to stop automatically summarizing advertised networks to their classful boundaries. Without the no auto-summary command, EIGRP will automatically summarize these two subnets to 192.168.1.0, and advertise the summary route across the WAN link, losing the subnet-specific information and causing routing problems. The no auto-summary command stops this behavior, and allows EIGRP to advertise specific subnets.

An alternate solution would be to change the network on F0/0 of Router A to 192.168.3.0/24 and the network on F0/0 of Router B to 192.168.2.0/24. If that were done, the two networks would be in separate class C networks and auto summarization would not be a problem.

It would not help to change the network on F0/0 of Router B to 192.168.1.48/28. The two networks would still be in the same class C network and the summarization process would confuse routing.

It would not help to execute the auto-summary command. The command is already in effect by default.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot EIGRP for IPv4 (excluding authentication, filtering, manual summarization, redistribution, stub)

References:

[Cisco > Home > Support > Technology Support > IP > IP Routing > Technology Information > Technology White Paper > Enhanced Interior Gateway Routing Protocol > Auto-Summarization](#)

#### QUESTION 54

You are planning the configuration of an IPsec-protected connection between two routers. You are concerned only with the integrity of the data that passes between the routers. You are less concerned with the confidentiality of the data, and you would like to minimize the effect of IPsec on the data throughput.

Which protocol option should you choose?

- A. Authentication Header (AH) in tunnel mode
- B. Authentication Header (AH) in transport mode
- C. Encapsulating Security Payload (ESP) in tunnel mode
- D. Encapsulating Security Payload (ESP) in transport mode

**Correct Answer: A**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

You should choose Authentication Header (AH) in tunnel mode to meet the scenario requirements. Two protocols can be used to build tunnels and protect data traveling across the tunnel:

- Authentication Header (AH) uses protocol 51.
- ESP uses protocol 50.

AH is defined in Request for Comments (RFC) 1826 and 2402. AH does not perform data encryption, and therefore information is passed as clear text. The purpose of AH is to provide data integrity and authentication, and optionally to provide anti-reply service. It ensures that a packet that crosses the tunnel is the same packet that left the peer device and no changes have been made. It uses a keyed hash to accomplish this.

ESP is defined in RFC 2406. ESP can provide data integrity and authentication, but its primary purpose is to encrypt data crossing the tunnel. On Cisco devices, ESP supports encryption using Advanced Encryption Standard (AES), Data Encryption Standard (DES), or Triple DES (3DES). Tunnel mode is used between Virtual Private Network (VPN) gateways such as routers, firewalls, and VPN concentrators.

You would not choose Authentication Header (AH) in transport mode. Transport mode is used between end stations or between an end station and a VPN gateway.

You would not choose Encapsulating Security Payload (ESP) in tunnel mode or transport mode. Using ESP will slow the connection because of the encryption and decryption process that will occur with each packet.

Objective:

WAN Technologies

Sub-Objective:

Describe WAN access connectivity options

References:

[Cisco > Articles > Network Technology > General Networking > IPsec Overview Part Two: Modes and Transforms](#)

[Cisco > The Internet Protocol Journal > The Internet Protocol Journal - Volume 3, No. 1, March 2000 > IP Security](#)

CCNA ICND2 Official Exam Certification Guide (Cisco Press, ISBN 1-58720-181-X), Chapter 15: Virtual Private Networks, pp. 536-537.

### QUESTION 55

Which Cisco IOS command allows you to change the setting of the configuration register?

- A. boot config
- B. configuration-register edit
- C. config-register
- D. edit configuration-register

**Correct Answer: C**

**Section: (none)**

**Explanation**

#### **Explanation/Reference:**

Explanation:

The config-register command is used to change the setting of the configuration register. The configuration register has the boot field setting, which specifies the order in which the router should look for bootstrap information. The router contains a 16-bit software register, which is stored in the non-volatile random access memory (NVRAM). The config-register command is used to modify the default configuration register. The most common use of changing this register is to instruct the router to ignore the stored configuration file and boot as a new router with no configuration. This process is normally used when a router has a password that is not known and must be reset. For security purposes, this procedure can only be performed from the console connection, which means it requires physical access to the router.

Normally the setting of this register is 0x2102, which tells the router to look for a configuration file. If the file exists, it will use it. If none exists, the router will boot into ROM and present the user with a menu-based setup. This would be the default behavior for a new router as well.

To view the value of the configuration register, use the show version command as displayed below. The register setting can be seen at the bottom of the output in bold.

```
Cisco IOS Software, 3600 Software (C3660-I-M), Version 12.3(4)T
TAC Support: http://www.cisco.com/tac
Copyright (c) 1986-2003 by Cisco Systems, Inc.
Compiled Thu 18-Sep-03 15:37 by ccai
ROM: System Bootstrap, Version 12.0(6r)T, RELEASE SOFTWARE (fc1)
ROM:
C3660-1 uptime is 1 week, 3 days, 6 hours, 41 minutes
System returned to ROM by power-on
System image file is "slot0:tftpboot/c3660-i-mz.123-4.T"
```

```
Cisco 3660 (R527x) processor (revision 1.0) with 57344K/8192K bytes of memory.
Processor board ID JAB055180FF
R527x CPU at 225Mhz, Implementation 40, Rev 10.0, 2048KB L2 Cache
```

```
3660 Chassis type: ENTERPRISE
2 FastEthernet interfaces
4 Serial interfaces
DRAM configuration is 64 bits wide with parity disabled.
125K bytes of NVRAM.
16384K bytes of processor board System flash (Read/Write)
```

```
Flash card inserted. Reading filesystem...done.
20480K bytes of processor board PCMCIA Slot0 flash (Read/Write)
```

Configuration register is 0x2102

To change this setting would require issuing these commands, followed by a restart:

```
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#config
Router(config)#config-register 0x2142
```

By setting register to 0x2142, the router will ignore a configuration file at reboot if it exists. The router will then enter setup mode and prompt for you to enter initial system configuration information, as would happen with a new router. This enables the user to bypass an unknown password, since the password is contained in the file.

The boot config command is incorrect because this command is used to set the device where the configuration file is located (flash, slot, etc.) and file name for the configuration file, which helps the router to configure itself during startup.

The configuration-register edit command and the edit configuration-register commands are incorrect because they are not valid Cisco IOS commands.

Objective:  
Infrastructure Management  
Sub-Objective:  
Perform device maintenance

References:  
[Cisco > Support > Routers > Cisco 10000 Series Routers > Troubleshoot and Alerts > Troubleshooting TechNotes > Use of the Configuration Register on All Cisco Routers > Document ID: 50421](#)

## QUESTION 56

You have a router that is not syncing with its configured time source.

Which of the following is NOT a potential reason for this problem?

- A. The reported stratum of the time source is 12
- B. The IP address configured for the time source is incorrect
- C. NTP authentication is failing
- D. There is an access list that blocks port 123

**Correct Answer:** A

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

A reported stratum of 12 will not cause a router's inability to synchronize with its configured time source. The stratum value describes the device's distance from the clock source, measured in NTP server hops. When a router reports a stratum value over 15, it is considered unsynchronized. Therefore, a report of 12 could be normal.

The other options describe potential reasons for a lack of synchronization.

When you are configuring the local router with a time source, if the IP address configured for the time source is incorrect, then no synchronization will occur.

If NTP authentication is configured between the local router and its time source, and that process is failing (for example, due to a non-matching key or hashing algorithm), then synchronization will not occur.

If there were an access list applied to any interface in the path between the local router and its time source that blocks port 123 (the port used for NTP), then synchronization will not occur.

Objective:

Infrastructure Services

Sub-Objective:

Configure and verify NTP operating in a client/server mode

References:

[Cisco > Support > Product Support > Switches > Cisco Nexus 6000 Series Switches > Configure > Configuration Guides > Cisco Nexus 6000 Series NX-OS System Management Configuration Guide, Release 7.x > Chapter: Configuring NTP](#)

**QUESTION 57**

DRAG DROP

Click and drag the network components and functions to their corresponding descriptions on the right.

**Select and Place:**

**Components:**

TCP/IP
Router
Layer 2 switching
Hierarchical model

**Descriptions:**

	Performed using a destination MAC address within a frame
	Provides a framework for designing internetworks in large organizations
	A suite of protocols used to transmit data
	Separates broadcast domains and connects different networks

**Correct Answer:**

## Components:


## Descriptions:

Layer 2 switching	Performed using a destination MAC address within a frame
Hierarchical model	Provides a framework for designing internetworks in layers
TCP/IP	A suite of protocols used to transmit data
Router	Separates broadcast domains and connects different networks

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

The following network components and functions should be matched to these corresponding descriptions:

- Transmission Control Protocol (TCP)/Internet Protocol (IP): TCP/IP is a suite of data communication protocols.
- Router: Separates broadcast domains while connecting different networks. Routers also provide a medium for connecting Local Area Network (LAN) and Wide Area Network segments.
- Layer 2 switching: Performed using a destination MAC address within a frame. In Layer 2 switching, switching is based on Media Access Control (MAC) addresses.
- Hierarchical model: Enables the designing of internetworks into layers. There are three layers in the hierarchical network design:
  - Core layer: Provides high-speed data transfer between sites.
  - Distribution layer: Includes LAN-based routers and Layer 3 switches and enables routing between Virtual Local Area Networks (VLANs).
  - Access layer: Provides workgroup and end-user access, and is also referred to as the desktop layer.

Objective:

Network Fundamentals

Sub-Objective:

Describe the impact of infrastructure components in an enterprise network

References:

[Cisco wiki > Main Page > Internet Protocols](#)

[Cisco wiki > Internetwork Design Guide -- Designing Switched LAN Internetworks > General Network Design Principles > 5.6.1 Figure: Hierarchical network design model](#)

## QUESTION 58

Examine the output shown below:

```
R1#show ipv6 eigrp neighbors
IPv6-EIGRP neighbors for process 1
H   Address                Interface Hold Uptime      SRTT      RTO   Q   Seq
                               (sec)      (ms)                Cnt  Num
0   Link-local add         Se0/0      13 15:17:58    44       264   0   12
    FE80::2
```

```
R2#show ipv6 eigrp neighbors
IPv6-EIGRP neighbors for process 1
H   Address                Interface Hold Uptime      SRTT      RTO   Q   Seq
                               (sec)      (ms)                Cnt  Num
0   Link-local add         Se0/0      14 16:32:05    30       300   0   12
    FE80::1
```

What is true of this configuration?

- A. The link-local address of R1 is FE80::2
- B. The link-local address of R1 is FE80::1
- C. The area ID is 1
- D. No adjacency has formed

**Correct Answer:** B

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The output shows that the link-local address of R1 is FE80::1. R1's link-local address appears in the output of R2 because the show ipv6 eigrp neighbors command displays information about the neighbor, not the local router.

The link-local address of R1 is not FE80::2. That is the link-local address of R2.

Because the area ID is not displayed in the output, we do not know its value. The only 1 in the output is the value representing the process ID of both routers, IPv6-EIGRP neighbors for process 1.

It is not true that no adjacency has formed. There is an adjacency present; if there were not, the two routers would not appear in each other's output of the show ipv6 eigrp neighbors command.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot EIGRP for IPv6 (excluding authentication, filtering, manual summarization, redistribution, stub)

References:

[Home > Support > Cisco IOS IPv6 Command Reference > show ipv6 eigrp neighbors](#)

## QUESTION 59

What is the possible IP range that can be assigned to hosts on a subnet that includes the address 192.168.144.34/29?

- A. 192.168.144.32 - 192.168.144.63
- B. 192.168.144.33 - 192.168.144.38



- C. 192.168.144.33 - 192.168.144.48
- D. 192.168.144.28 - 192.168.144.40

**Correct Answer:** B

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

Range 192.168.144.33 - 192.168.144.38 is the correct answer. To determine the range of addresses that can be assigned in a subnet, you must first determine the network ID of the subnetwork and the broadcast address of the subnetwork. All addresses that can be assigned to hosts will lie between these endpoints. The network ID can be obtained by determining the interval between subnet IDs. With a 29-bit mask, the decimal equivalent of the mask will be 255.255.255.248. The interval between subnets can be derived by subtracting the value of the last octet of the mask from 256. In this case, that operation would be  $256 - 248 = 8$ . Therefore, the interval is 8.

The first network ID will always be the classful network you started with (in this case 192.168.144.0). Each subnetwork ID will fall at 8-bit intervals as follows:

192.168.144.0  
192.168.144.8  
192.168.144.16  
192.168.144.24  
192.168.144.32  
192.168.144.40

We can stop at the 192.168.144.40 address because the address given in the scenario, 192.168.144.34, is in the network with a subnet ID of 192.168.144.32. Therefore, since the broadcast address for this network will be 1 less than the next subnet ID (192.168.144.39), the valid range of IP addresses is 192.168.144.33 - 192.168.144.38. 192.168.144.39 will be the broadcast address for the next subnet, and 192.168.144.40 will be the first valid address in the next subnet.

None of the other answers is the correct range.

Objective:

Network Fundamentals

Sub-Objective:

Apply troubleshooting methodologies to resolve problems

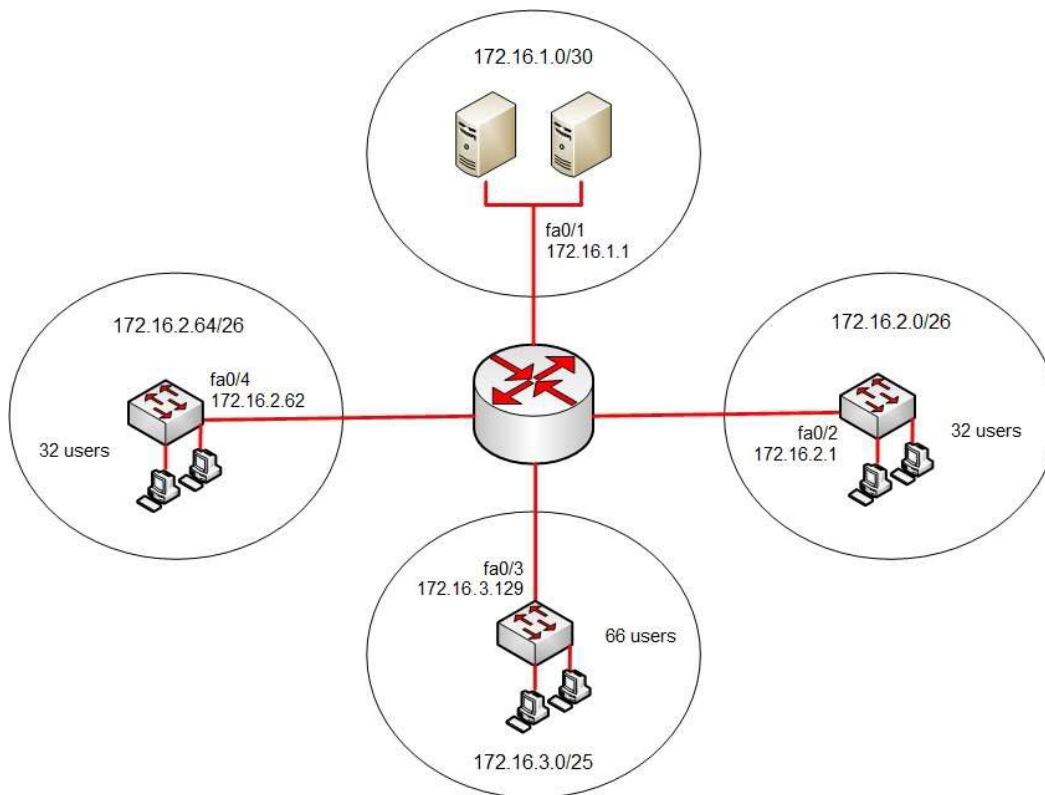
References:

[Cisco > Technology Support > IP > IP Routing > Design TechNotes > IP Addressing and Subnetting for New Users > Document ID: 13788 > Understanding IP Addresses](#)

**QUESTION 60**

Your company's network must make the most efficient use of the IP address space. In the following diagram, the circles define separate network segments. The requirements of each network segment are given in the diagram. (Click the Exhibit(s) button.)





Users complain of connectivity issues. You need to discover the problems with the network configuration.

What are the three problems with the network diagram? (Choose three.)

- A. The 172.16.1.0/30 segment requires more user address space.
- B. The 172.16.2.0/26 segment requires more user address space.
- C. The 172.16.3.0/25 segment requires more user address space.
- D. The 172.16.2.64/26 segment requires more user address space.
- E. Interface fa0/2 has an IP address that belongs to the 172.16.2.64/26 segment.
- F. Interface fa0/4 has an IP address that belongs to the 172.16.2.0/26 segment.
- G. Interface fa0/3 has an IP address outside the 172.16.3.0/25 segment.

**Correct Answer:** AFG

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The given exhibit has three problems:

- The 172.16.1.0/30 segment requires more user address space.
- Interface Fa0/4 has an IP address that belongs to the 172.16.2.0/26 segment.
- Interface Fa0/3 has an IP address outside the 172.16.3.0/25 segment.

The 172.16.1.0/30 segment, as configured, will only support two hosts. This segment needs to support three hosts, the two servers, and the Fa0/1 interface. The number of hosts that a subnet is capable of supporting is a function of the number of host bits in the subnet mask. When that has been determined, the following formula can be used to determine the number of hosts yielded by the mask:

$$2^n - 2 = X$$

(where n = the number of host bits in the mask and X = the number of hosts supported)

In this example with a 30-bit mask, 2 host bits are left in the mask. When that is plugged into the formula, it yields only two usable addresses. The -2 in the formula represents the two addresses in each subnet that cannot be assigned to hosts, the network ID and the broadcast address. Therefore, the segment should be configured with the 172.16.1.0/29 address range, which supports up to six hosts.

Interface fa0/4, as configured, has an IP address that belongs to the 172.16.2.0/26 segment. With a 26-bit mask and the chosen class B address, the following network IDs are created:

```
172.16.0.0
172.16.0.64
172.16.1.128
172.16.1.192
172.16.2.0
172.16.2.64
172.16.2.128
172.16.2.192
172.16.2.0
172.16.2.64
172.16.2.128
172.16.2.192
...and so on, incrementing each time by 64 in the last octet
```

The 172.16.2.0/26 segment is allocated host addresses in the 172.16.2.1 through 172.16.2.62 range (the last address, 172.16.2.63, is the broadcast address and cannot be assigned). Interface fa0/4 should be assigned an IP address in the 172.16.2.64/26 range, which includes host addresses in the 172.16.2.65 through 172.16.2.126 range.

Interface Fa0/3, as configured, has an IP address outside the 172.16.3.0/25 segment. With a 25-bit mask and the chosen class B address, the following network IDs are created:

```
172.16.0.0
172.16.0.128
172.16.1.0
172.16.1.128
172.16.2.0
172.16.2.128
172.16.3.0
172.16.3.128
...and so on, incrementing each time by 128 in the last octet
```

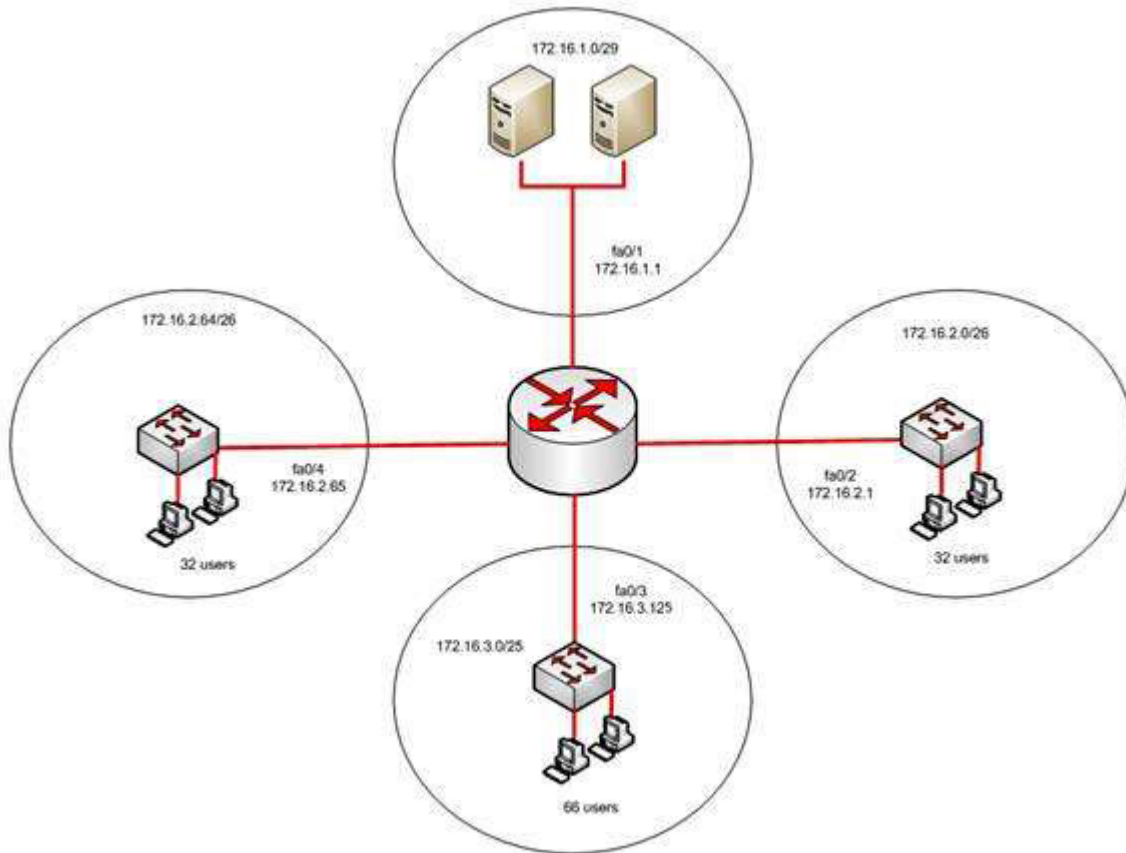
Interface Fa0/3 should be allocated an IP address in the 172.16.3.1 through 172.16.3.126 range.

The 172.16.2.0/26 segment does not require more user address space. With a 26-bit mask, 6 bits are left for hosts, and by using the above formula it can be determined that it will yield 62 hosts. It requires 32.

The 172.16.2.64/26 segment does not require more user address space. With a 26-bit mask, 6 bits are left for hosts, and by using the above formula it can be determined that it will yield 62 hosts. It requires 32.

Interface Fa0/2 does not have an IP address that belongs to the 172.16.2.64/26 segment. The 172.16.2.64/26 segment includes addresses 172.16.2.65-172.16.2.126. Because its address is 172.16.2.1, it belongs in the 172.16.2.0/26 network (from 172.16.2.1-172.16.2.62), so it is correctly configured.

The network should be configured as shown in the following image:



Objective:  
Network Fundamentals  
Sub-Objective:  
Configure, verify, and troubleshoot IPv4 addressing and subnetting

References:  
[IP Addressing and Subnetting for New Users](#)

### QUESTION 61

Based on the command output below, which of the interfaces on Router1 are trunk ports?

```
Router1# show mac-address-table

Dynamic Addresses Count: 14
Secure Addresses (User-defined) Count: 0
Static Addresses (User-defined) Count: 0
System Self Addresses Count: 23
Total MAC addresses: 33
Non-static Address Table:
Destination Address Address Type VLAN Destination Port
```

```
-----
0010.0de0.e289 Dynamic 1 FastEthernet0/1
0010.7b00.1540 Dynamic 1 FastEthernet0/5
0010.7b00.1545 Dynamic 1 FastEthernet0/5
0060.5cf4.0076 Dynamic 3 FastEthernet0/1
0060.5cf4.0077 Dynamic 3 FastEthernet0/1
0060.5cf4.1315 Dynamic 2 FastEthernet0/1
0060.70cb.f301 Dynamic 1 FastEthernet0/2
00e0.1e42.9978 Dynamic 1 FastEthernet0/3
```

<output omitted>

- A. Fa0/1
- B. Fa0/2
- C. Fa0/3
- D. Fa0/5

**Correct Answer: A**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

Interface Fa0/1 is a trunk port. The output shows that it has MAC addresses that belong to VLANs 1, 2 and 3. Only trunk ports can carry traffic from multiple VLANs.

Fa0/2 is not a trunk port. It only carries traffic from VLAN 1.

Fa0/3 is not a trunk port. It only carries traffic from VLAN 1.

Fa0/5 is not a trunk port. It only carries traffic from VLAN 1.

Objective:

Infrastructure Management

Sub-Objective:

Use Cisco IOS tools to troubleshoot and resolve problems

References:

## QUESTION 62

You have implemented SNMP v3 in your network. After making the configuration changes, you find that technicians in the TECHS group cannot access the MIB. You execute the show run command and receive the following output that relates to SNMP:

<output omitted>

```
snmp-server group NORMAL v3 priv read NORMAL write NORMAL
snmp-server group TECHS v3 priv read TECHS access 99
snmp-server group TRAP v3 priv

!!
snmp-server user NORMAL NORMAL v3 auth sha CISCO priv des56 CISCO
snmp-server user TECHS TECHS v3 auth sha CISCO priv des56 CISCO
snmp-server user TRAP TRAP v3 auth sha CISCO priv des56 CISCO

snmp-server enable traps snmp linkup linkdown
snmp-server host 155.1.146.100 traps version 3 priv TRAP
```

What is preventing the TECHS group from viewing the MIB?

- A. The presence of the keyword priv in the command creating the RESTRICTED group
- B. A mismatch between the authentication mechanism and the encryption type in the command creating the TECHS user
- C. The absence of an access list defining the stations that can be used by the TECHS group
- D. The presence of the keyword auth in the command creating the TECHS user

**Correct Answer: C**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

The command that creates the TECHS group ends with the parameter access 99:

```
snmp-server group TECHS v3 priv read TECHS access 99
```

This indicates that the access list number 99 is specifying the IP addresses of the stations allowed to connect to the MIB for the group. Since the access list is missing from the configuration, no IP addresses will be allowed, and no connections can be made by the group.

The presence of the keyword priv in the command creating the TECHS group is not causing the issue. This keyword indicates that encryption (privacy) and authentication should both be used on all transmissions by the group.

In SNMPv3, there are three combinations of security that can be used:

- noAuthNoPriv- no authentication and no encryption; includes the noauth keyword in the configuration
- AuthNoPriv - messages are authenticated but not encrypted; includes the auth keyword in the configuration
- AuthPriv - messages are authenticated and encrypted; includes the priv keyword in the configuration

There is no mismatch between the authentication mechanism and the encryption type in the command creating the TECHS user.

```
snmp-server user TECHS TECHS v3 auth sha CISCO priv des56 CISCO
```

In the preceding command, the section auth sha CISCO specified that messages are authenticated using SHA with a key of CISCO. It does not need to match the section priv des56 CISCO, which indicates that encryption (priv) will be provided using DES56 with a key of CISCO.

The presence of the keyword auth in the command creating the TECHS user is not causing the issue. This line indicates that messages are authenticated using SHA with a key of CISCO.

Objective:

Infrastructure Management  
Sub-Objective:  
Configure and verify device-monitoring protocols

References:  
[SNMP Configuration Guide, Cisco IOS XE Release 3SE \(Catalyst 3850 Switches\) > SNMPv3](#)

### QUESTION 63

You are the network administrator for your company. Your company has opened a new site in London. The Chief Technical Officer (CTO) of the company wants to implement a routing protocol that can provide the following features:

- Supports multiple large networks
- Does not require a hierarchical physical topology
- Supports VLSM
- Provides loop prevention and fast convergence
- Provides load balancing over un-equal cost links

Which routing protocol should be implemented in the new site?

- A. Enhanced Interior Gateway Routing Protocol (EIGRP)
- B. Open Shortest Path First (OSPF)
- C. Interior Gateway Routing Protocol (IGRP)
- D. Routing Information Protocol version 2 (RIPv2)

**Correct Answer:** A

**Section:** (none)

**Explanation**

#### Explanation/Reference:

Explanation:

Enhanced Interior Gateway Routing Protocol (EIGRP) is the routing protocol that should be implemented for this scenario. EIGRP is a classless protocol that allows the use of variable length subnet masks (VLSM) and classless interdomain routing (CIDR) for the allocation of IP addresses. The following are characteristics of EIGRP:

- Supports large networks due to high scalability.
- Does not require a hierarchical physical topology.
- Provides loop prevention and fast convergence by using Diffusing Update Algorithm (DUAL).
- Performs equal cost load balancing by default.
- Can be configured to perform unequal-cost load balancing.
- Supports VLSM and CIDR.
- Is a hybrid routing protocol (a distance-vector protocol that also provides link-state protocol characteristics).
- Is a classless protocol.
- Sends partial route updates only when there are changes.
- Supports Message-Digest algorithm 5 (MD5) authentication.
- Has an administrative distance is 90 for EIGRP internal routes, 170 for EIGRP external routes, and 5 for EIGRP summary routes.
- Is only used with Cisco platforms.

All the other options are incorrect because they would not provide the features required in this scenario.

OSPF requires a hierarchical physical topology.

IGRP does not support VLSM.

RIPv2 is not designed for multiple large networks.

Objective:  
Routing Fundamentals  
Sub-Objective:

Compare and contrast distance vector and link-state routing protocols

References:

[Cisco > Articles > Cisco Certification > CCNP > Shooting Trouble with IP](#)  
[Cisco > Support > IP > IP Routing > Design > Design TechNotes > Introduction to EIGRP > Document ID: 13669](#)

#### QUESTION 64

You receive the following error message after addressing and enabling an interface:

```
%192.168.16.0 overlaps with FastEthernet0/0
```

Which two are NOT the causes of the error message? (Choose two.)

- A. incorrect subnet mask in the new interface
- B. incorrect IP address on the new interface
- C. incorrect encapsulation configured
- D. failure to issue the no shutdown command

**Correct Answer:** CD

**Section:** (none)

**Explanation**

#### Explanation/Reference:

Explanation:

The error message %192.168.16.0 overlaps with FastEthernet0/0 indicates that the newly configured interface is in the same subnet as an existing interface. This can occur if there is an incorrect subnet mask or an address that inadvertently places the new interface in that subnet. Each router interface must be in a different subnet to function. For example, when the series of commands below is executed on a router, it will elicit the error message because the two IP addresses used are in the same subnet given the subnet mask in use.

```
Router#config t
Router(config)#interface S0
Router(config-if)#ip address 192.168.1.17 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#interface S1
Router(config-if)#ip address 192.168.1.65 255.255.255.0
Router(config-if)#no shutdown
0%192.168.1.0 overlaps with Serial 0
```

It's also a valuable skill to be able to recognize these problems before the router tells you about them. In the diagram below, you should be able to spot the problem with the two planned addresses on the router as being in the same subnet before you receive the error message.

An incorrect encapsulation would prevent the interface from working, but would not generate this message.

If the no shutdown command had not been issued, we would not be receiving this error. It is only generated when an attempt is made to enable an incorrectly configured interface.

Objective:

Routing Fundamentals

Sub-Objective:

Troubleshoot basic Layer 3 end-to-end connectivity issues

References:

[Cisco Documentation > Configuring IP Addressing](#)

#### QUESTION 65

In which of the following IPv6 address assignment methods will the interface receive its IPv6 address from a



process native to IPv6, and receive additional parameters from DHCP?

- A. Stateless DHCPv6
- B. Stateful DHCPv6
- C. DHCPv6-PD
- D. Stateless autoconfiguration

**Correct Answer:** A

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

Stateless DHCPv6 uses a combination of processes to assign a configuration to an IPv6 interface. It uses Stateless Address Autoconfiguration (SAAC), a process native to IPv6, to assign an IPv6 address to the interface. It uses DHCPv6 to assign other parameters, such as the DNS server and NTP server.

In stateful DHCPv6, the interface will receive the IPv6 address and all other parameters from the DHCP server.

In DHCPv6 Prefix Designation (DHCPv6-PD), the device is assigned a set of IPv6 "subnets." This assignment will consist of a set of IPv6 addresses in the same subnet (such as the address 2001:db8::/60) that the device can dynamically allocate to its interfaces.

Objective:

Network Fundamentals

Sub-Objective:

Configure and verify IPv6 Stateless Address Auto Configuration

References:

[Cisco > Support > IP Addressing: DHCP Configuration Guide, Cisco IOS XE Release 3S > Chapter: IPv6 Access Services: Stateless DHCPv6](#)

#### QUESTION 66

Your assistant has been assigned the task of configuring one end of a WAN link between two offices. The link is a serial connection and the router on the other end is a non-Cisco router. The router in the other office has an IP address of 192.168.8.6/24. The connection will not come up, so you ask your assistant to show you the commands he configured on the Cisco router. The commands he executed are shown below.

```
Cisrouter(config)# interface serial0/0
```

```
Cisrouter(config-if)# ip address 192.168.8.5 255.255.255.0
```

```
Cisrouter(config-if)# no shut
```

What command(s) should he run to correct the configuration?

- A. Cisrouter(config-if)# no ip address 192.168.8.5  
Cisrouter(config-if)# ip address 192.168.8.10
- B. Cisrouter(config-if)# encapsulation ppp
- C. Cisrouter(config-if)# encapsulation ansi
- D. Cisrouter(config-if)# authentication chap

**Correct Answer:** B

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

There are three encapsulation types available for a serial connection: High-Level Data Link Control (HDLC),

Point-To-Point (PPP), and Frame Relay. HDLC is the default on Cisco routers and the form of HDLC used on a Cisco router is incompatible with routers from other vendors. Since the encapsulation command was not run, the router is set for HDLC. To correct this, you should execute the encapsulation ppp command. Frame Relay could also be used if the other router were running Frame Relay, since it also is an industry standard.

The IP address does not need to be changed. It is currently set for 192.168.8.5/24. This is correct since it is in the same subnet as the IP address of the other end, 192.168.8.6/24.

The command authentication chap should not be run because the scenario does not indicate that authentication is configured on the other end. If it is set on one end, it must be set on the other as well.

The command encapsulation ansi should not be run because ANSI is not an encapsulation type. It is an LMI type used in Frame Relay. The three LMI options available are Cisco, ANSI, and ITU.

Objective:

WAN Technologies

Sub-Objective:

Configure and verify PPP and MLPPP on WAN interfaces using local authentication

References:

### QUESTION 67

You are the network administrator for your company. You want to use both IPv6 and IPv4 applications in the network. You also want to ensure that routers can route both IPv6 and IPv4 packets.

Which deployment model should be implemented to accomplish the task?

- A. IPv6 over IPv4 tunnels
- B. IPv6 over dedicated Wide Area Network (WAN) links
- C. Dual-Stack Backbones
- D. Protocol translation

**Correct Answer: C**

**Section: (none)**

**Explanation**

#### **Explanation/Reference:**

Explanation:

A dual-stack backbone deployment model should be used to accomplish the task in this scenario. When routers route both IPv6 and IPv4 packets, it is called dual stack routing or a dual-stack backbone.

The following deployment models are available for IPv4 to IPv6 migration:

- IPv6 over IPv4 tunnels: IPv6 traffic is encapsulated into IPv4 packets. Then these packets are transferred over an IPv4 WAN. This model eliminates the need to create separate circuits to connect to the IPv6 networks. This model increases protocol overhead because of the IPv6 headers and requires one end to be capable of both protocols
- Protocol translation: A translation method of allowing an IPv6 host to communicate with an IPv4 host. This is accomplished with the help of Network Address Translation - Protocol Translation (NAT-PT) used to configure translation between IPv6 and IPv4 hosts. NAT-PT allows communication between IPv6 hosts and applications, and native IPv4 hosts and applications.
- IPv6 over dedicated WAN links: A new deployment of IPv6 is created. In this model, IPv6 hierarchy, addressing, and protocols are used by all nodes. However, this model involves cost for creating IPv6 WAN circuits. This solution is not designed for LAN translation but rather translation over WAN links.
- Dual-Stack Backbones: A hybrid model in which backbone routers have dual-stack functionality, which enables them to route both IPv4 and IPv6 packets. It is suitable for an enterprise that uses both IPv4 and IPv6 applications. Running IPv6 and IPv4 together in a network is known as dual-stack routing.

Objective:

Network Fundamentals

Sub-Objective:

Identify the appropriate IPv6 addressing scheme to satisfy addressing requirements in a LAN/WAN environment

References:

[Cisco > Dual Stack Network](#)

[Cisco > Technology Support > IP > IPv6 > Configure > Configuration Examples and TechNotes > Tunneling IPv6 through an IPv4 Network > Document ID: 25156](#)

### QUESTION 68

Which of the following statements is NOT true of Cisco ACI?

- A. It is a comprehensive SDN architecture.
- B. It uses Cisco APIC as the central management system.
- C. It provides policy driven automation support.
- D. It decreases network visibility.

**Correct Answer: D**

**Section: (none)**

**Explanation**

#### **Explanation/Reference:**

Explanation:

The Cisco ACI does not decrease network visibility. On the contrary, the Cisco Application Centric Infrastructure (ACI) increases network visibility. It is a policy-driven automation solution that can keep the network inventory up-to-date automatically whenever a new device is added and provide a graphic representation at all times.

ACI is a comprehensive SDN architecture that integrates physical and virtual environments under one policy model. It uses the Cisco Application Policy Infrastructure Controller (APIC) as the central management system.

It provides policy driven automation support through a business-relevant application policy language.

Objective:

Infrastructure Management

Sub-Objective:

Describe network programmability in enterprise network architecture

References:

[Home > Support > Product Support > Cloud and Systems Management > Cisco Application Policy Infrastructure Controller \(APIC\) > Reference Guides > Technical References Cisco Application Centric Infrastructure Fundamentals](#)

### QUESTION 69

Which of the following methods of tunneling Internet Protocol version 6 (IPv6) traffic through an IPv4 network increases protocol overhead because of IPv6 headers?

- A. Protocol translation
- B. IPv6 over dedicated WAN links
- C. Dual-Stack Backbones
- D. IPv6 over IPv4 tunnels

**Correct Answer: D**

**Section: (none)**

**Explanation**

#### **Explanation/Reference:**

Explanation:

IPv6 over IPv4 tunnels is a method of tunneling IPv6 traffic through an IPv4 network that eliminates the need to create separate circuits to connect to the IPv6 networks. This model increases protocol overhead because of IPv6 headers.

The following deployment models are available for IPv4 to IPv6 migration:

- IPv6 over IPv4 tunnels: IPv6 traffic is encapsulated into IPv4 packets. Then these packets are transferred over IPv4 WAN. This model eliminates the need to create separate circuits to connect to the IPv6 networks. This model increases protocol overhead because of the IPv6 headers and requires both ends to be capable of both protocols.
- Protocol translation: A method allowing an IPv6 host to communicate with an IPv4 host. This is accomplished with the help of Network Address Translation - Protocol Translation (NAT-PT) used to configure translation between IPv6 and IPv4 hosts. NAT-PT allows communication between IPv6 hosts and applications, and native IPv4 hosts and applications.
- IPv6 over dedicated WAN links: A new deployment of IPv6 is created. In this model, IPv6 hierarchy, addressing, and protocols are used by all nodes. However, this model involves cost for creating IPv6 WAN circuits. This solution is not designed for LAN translation but rather translation over WAN links.
- Dual-Stack Backbones: A hybrid model in which backbone routers have dual-stack functionality, which enables them to route both IPv4 and IPv6 packets. It is suitable for an enterprise that uses both IPv4 and IPv6 applications. Running IPv6 and IPv4 together in a network is known as dual-stack routing.

Objective:

Network Fundamentals

Sub-Objective:

Identify the appropriate IPv6 addressing scheme to satisfy addressing requirements in a LAN/WAN environment

References:

[Cisco > Technology Support > IP > IPv6 > Configure > Configuration Examples and TechNotes > Tunneling IPv6 through an IPv4 Network > Document ID: 25156](#)

### QUESTION 70

You are the senior network administrator for a large corporation. Some new trainees have recently joined the network security team. You are educating them about denial-of-service (DoS) attacks and the risks posed to a network by such attacks.

Which three are risks that a DoS attack poses to a network? (Choose three.)

- A. Downtime and productivity loss
- B. Spread of viruses
- C. Revenue loss
- D. Information theft
- E. Spread of spyware

**Correct Answer:** ACD

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

A DoS attack can result in network downtime and loss of productivity, revenue loss, and information theft.

A DoS attack is an attack in which legitimate users are denied access to networks, systems, or resources. The potential risks posed by a DoS attack are as follows:

- Downtime and productivity loss: A DoS attack causes downtime in the network, which ultimately results in loss of productivity for the organization.
- Revenue loss: Organizations that use their Web sites for commerce or vital support services, such as search engines, can incur large revenue losses.
- Information theft: DoS attacks can also be aimed at stealing important and confidential information from a network.

- Malicious competition: An organization might launch DoS attacks against their competitors to damage their reputation.

A few methods that can help minimize potential risks from DoS attacks are:

- Using a firewall, which allows you to block or permit traffic entering into the network, can help to mitigate DoS attacks.
- Computers vulnerable to attacks can be shifted to another location or a more secure LAN.
- Intrusion Detection Systems (IDS), such as Network Intrusion Detection Systems (NIDS) and Host Intrusion Detection Systems (HIDS), can be implemented to detect intrusive network or host activity, such as a DoS attack, and raise alerts when any such activity is detected.

A DoS attack does not result in the spread of viruses because viruses are not spread by DoS attacks. Viruses are spread when the network is attacked by a virus or a Trojan horse.

A DoS attack does not result in the spread of spyware. DoS attacks are mainly aimed at exhausting system resources so that legitimate users are denied access to networks, systems, or resources. Spyware is software installed on a computer without the knowledge of the user, and it gathers information about a person or organization. Spyware is generally downloaded through Web sites and e-mail messages.

Objective:

Infrastructure Security

Sub-Objective:

Configure, verify, and troubleshoot basic device hardening

References:

[Cisco > Cisco IOS Security Configuration Guide, Release 12.4 > Traffic Filtering, Firewalls, and Virus Detection > Configuring TCP Intercept \(Preventing Denial-of-Service Attacks\)](#)

#### QUESTION 71

Which Cisco command will display the version and configuration data for Secure Shell (SSH)?

- A. show ssh
- B. show ip ssh
- C. debug ssh
- D. debug ip ssh

**Correct Answer: B**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

The show ip ssh command is used to display the version and configuration data for SSH on a Cisco router. The following is sample output of the show ip ssh command:

```
router#show ip ssh
SSH Enabled - version 1.5
Authentication timeout: 120 secs; Authentication retries: 2
```

This show ip ssh command output displays the enabled status of the SSH protocol, the retries parameter (configured at two attempts), and the timeout of 120 seconds.

The following message will appear when the show ip ssh command is issued and SSH has been disabled:

```
router# show ip ssh
%SSH has not been enabled
```

To enable SSH include the transport input SSH command when configuring authentication on a line. For example, the configuration of a Cisco network device to use SSH on incoming communications via the virtual

terminal ports, with a specified password as shown from the partial output of the show run command is shown below:

```
line vty 0 4
password 7 030752180500
login
transport input ssh
```

It is important to note the login command on the third line of the above output is critical for security. This command instructs the device to prompt for a username and password using SSH. If this line reads no login, SSH might be otherwise be correctly configured, but the device will never prompt for the username and password.

The show ssh command will display the status of the SSH connections on the router. The following is the sample output of the show ssh command:

```
router# show ssh
Connection Version Encryption State Username
0 1.5 3DES Session Started tim
```

The debug ip ssh command is used to display debug messages for SSH.

The debug ssh command is not a valid Cisco command.

Objective:

Infrastructure Management

Sub-Objective:

Use Cisco IOS tools to troubleshoot and resolve problems

References:

[Cisco > Cisco IOS Security Command Reference > show ip ssh](#)

## QUESTION 72

Examine the partial output of the show ip interface command below.

```
Router# show ip interface
```

```
Serial0 is up, line protocol is up
Internet address is 1.1.1.2/24
Broadcast address is 255.255.255.255
Address determined by setup command
MTU is 1500 bytes
Helper address is not set
Directed broadcast forwarding is disabled
Outgoing access list is not set
Inbound access list is not set

GigabitEthernet0/3 is up, line protocol is up
Internet address is 192.168.93.1/28
Broadcast address is 255.255.255.255
Address determined by setup command
MTU is 1500 bytes
Helper address is not set
Directed broadcast forwarding is disabled
Outgoing access list is not set
Inbound access list is not set
```

What is the subnet broadcast address of the LAN connected to the router from which the command was executed?

- A. 192.168.93.15
- B. 192.168.93.255
- C. 1.1.1.255
- D. 1.1.1.127

**Correct Answer:** A

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

In the output we can see there are two interfaces, a serial interface (which goes to another router) and a GigabitEthernet interface (the LAN interface). The LAN interface has an address of 192.168.93.1/28, which is a mask of 255.255.255.240. When this mask is used against the 192.168.93.0 classful network, it yields the following subnets:

```
192.168.93.0
192.168.93.16
192.168.93.32
192.168.93.48
```

and so on, incrementing in intervals of 16 in the last octet.

Since the LAN interface has an address of 192.168.93.1, the interface is in the 192.168.93.0/28 network. That network's broadcast address is the last address before the next subnet address of 192.168.93.16. Therefore, the broadcast address of the LAN connected to the router from which the command was executed is 192.168.93.15.

The address 192.168.93.255 is not the broadcast address. If a standard 24-bit mask were used instead of the /28, this would be the broadcast address.



The address 1.1.1.255 is the broadcast address of the network in which the Serial interface resides. The question asked for the LAN interface.

The address 1.1.1.127 would be the broadcast address of the network in which the Serial interface resides if the mask used on the interface were 255.255.255.128. However, that is not the mask, and the question asked for the LAN interface.

Objective:

Network Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot IPv4 addressing and subnetting

References:

### QUESTION 73

Which two features do Cisco routers offer to mitigate distributed denial-of-service (DDoS) attacks? (Choose two.)

- A. Anti-DDoS guard
- B. Scatter tracing
- C. Access control lists (ACLs)
- D. Flow control
- E. Rate limiting

**Correct Answer:** CE

**Section:** (none)

**Explanation**

#### Explanation/Reference:

Explanation:

Cisco routers use access control lists (ACLs) and blackholing features to help mitigate distributed denial-of-service (DDoS) attacks. A DoS attack is an attack in which legitimate users are denied access to networks, systems, or resources. One of the most common DoS attacks is the DDoS attack, which is executed by using multiple hosts to flood the network or send requests to a resource. The difference between DoS and DDoS is that in a DoS attack, an attacker uses a single host to send multiple requests, whereas in DDoS attacks, multiple hosts are used to perform the same task.

Cisco routers offer the following features to mitigate DDoS attacks:

- ACLs: Filter unwanted traffic, such as traffic that spoofs company addresses or is aimed at Windows control ports. However, an ACL is not effective when network address translation (NAT) is implemented in the network.
- Rate limiting: Minimizes and controls the rate of bandwidth used by incoming traffic.
- Traffic-flow reporting: Creates a baseline for the network that is compared with the network traffic flow, helping you detect any intrusive network or host activity.
- Apart from these features offered by Cisco routers, the following methods can also be used to mitigate DDoS attacks:
  - Using a firewall, you can block or permit traffic entering a network.
  - The systems vulnerable to attacks can be shifted to another location or a more secure LAN.
  - Intrusion Detection Systems (IDS), such as Network Intrusion Detection Systems (NIDS) and Host Intrusion Detection Systems (HIDS), can be implemented to detect intrusive network or host activity such as a DoS attack, and raise alerts when any such activity is detected.

Anti-DDoS guard and scatter tracing are incorrect because these features are not offered by Cisco routers to mitigate DDoS attacks.

Flow control is incorrect because flow control is used to prevent the loss of traffic between two devices.

Objective:

## Infrastructure Security

### Sub-Objective:

Configure, verify, and troubleshoot basic device hardening

### References:

[Cisco > Support > Technology Support > Security and VPN > Authentication Protocols > Technology Information > Technology White Paper > Strategies to Protect Against Distributed Denial of Service \(DDoS\) Attacks > Document ID: 13634](#)

### QUESTION 74

You are working with an Internet Service Provider (ISP) as network manager. A corporate client approaches you to lease a public IP subnet that can accommodate 250 users. You have assigned him the 192.25.27.0 subnet.

What subnet mask should be assigned to this IP address so that it can accommodate the number of users required by the corporate client?

- A. 255.255.255.0
- B. 255.255.255.128
- C. 255.255.255.224
- D. 255.255.255.252

**Correct Answer:** A

**Section:** (none)

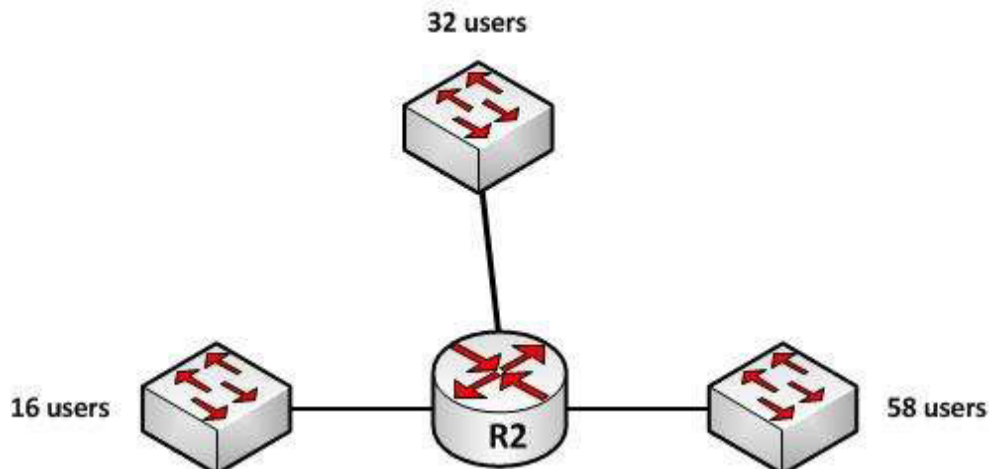
**Explanation**

### Explanation/Reference:

Explanation:

The 192.25.27.0 subnet should be assigned the subnet mask of 255.255.255.0 to accommodate 250 users. This subnet mask can accommodate a maximum of 254 hosts. The number of hosts that can reside on a subnet can be calculated using the formula  $2^n - 2 = x$ , where  $n$  is equal to the number of hosts bits in the mask and  $x$  is the resulting number of hosts. 2 is subtracted from the results to represent the two addresses, the network ID and the broadcast address, that cannot be assigned to computers in the subnet. Since the 255.255.255.0 mask leaves 8 bits at the end of the mask, the formula will be  $2^8 - 2$ , which is  $256 - 2$ , which equals 254.

In situations where the same subnet mask must be used for multiple interfaces on a router, the subnet mask that is chosen must provide capacity sufficient for the largest number of hosts on any single interface while also providing the required number of subnets. For example, in the diagram below, the three interfaces on the router R2 have 16, 32 and 58 users respectively on each interface:



If each interface must have the same subnet mask, the subnet mask would need to be one that yields at least 58 addresses to support the interface with the highest host count and yields at least 3 subnets as well.

If the chosen classful networks were 128.107.4.0/24, the correct mask would be 255.255.255.192. Since the mask is currently 255.255.255.0 (/24), by borrowing 2 bits to /26 or 255.255.255.192, we will get 4 subnets ( $2^2 = 4$ ) and each subnet will yield 62 hosts ( $2^6 - 2 = 62$ ).

With a subnet mask of 255.255.255.128, the 192.25.27.0 subnet can accommodate only 126 hosts. The mask 255.255.255.128 leaves 7 host bits in the mask and when we plug that into the formula we get  $2^7 - 2$ , which equals 126.

With a subnet mask of 255.255.255.224, the 192.25.27.0 subnet can accommodate only 30 hosts. The mask 255.255.255.224 leaves 5 host bits in the mask and when we plug that into the formula we get  $2^5 - 2$ , which equals 30.

With a subnet mask of 255.255.255.252, the IP address 192.25.27.24 can accommodate only two hosts. The mask 255.255.255.252 leaves 2 host bits in the mask and when we plug that into the formula we get  $2^2 - 2$ , which equals 2.

Objective:

Network Fundamentals

Sub-Objective:

Apply troubleshooting methodologies to resolve problems

References:

[Cisco > Design Tech Notes > IP Routing > IP Addressing and Subnetting for New Users > Understanding IP Addresses > Document ID: 13788](#)

#### QUESTION 75

You are the network administrator for your company and have configured Cisco Discovery Protocol (CDP) in your network. You recently noticed that when devices send large numbers of CDP neighbor announcements, some devices are crashing. You decide to disable CDP on the router.

Which command should you use to achieve the objective?

- A. no cdp run
- B. set cdp disable
- C. no cdp enable
- D. no cdp advertise-v2

**Correct Answer: A**

**Section: (none)**

**Explanation**

#### **Explanation/Reference:**

Explanation:

You should use the no cdp run command to disable CDP on the router. Due to a known vulnerability regarding the handling of CDP by Cisco routers and switches when devices send large numbers of CDP neighbor announcements, some devices can crash or cause abnormal system behavior. To overcome this problem, you can disable CDP for the entire router by using the no cdp run command.

You cannot use the set cdp disable command to disable CDP on the router. This command disables CDP on an entire Catalyst switch.

You cannot use the no cdp enable command to disable CDP on the router. This command disables CDP on a specific interface.

You cannot use the no cdp advertise-v2 command to disable CDP on the router. This command disables CDPv2 advertisements.

Objective:  
LAN Switching Fundamentals  
Sub-Objective:  
Configure and verify Layer 2 protocols

References:  
[Cisco > Support > Using Cisco Discovery Protocol](#)  
[Cisco > Support > Technology Support > Network Management > Cisco's Response to the CDP Issue > Document ID: 13621](#)

#### QUESTION 76

Which is the valid IP address range that can be assigned to hosts on the subnet that includes the address 172.16.4.6/23?

- A. 172.16.2.1 - 172.16.4.254
- B. 172.16.3.1 - 172.16.5.254
- C. 172.16.4.1 - 172.16.5.254
- D. 172.16.4.1 - 172.16.4.254

**Correct Answer: C**

**Section: (none)**

**Explanation**

#### Explanation/Reference:

Explanation:  
172.16.4.1 - 172.16.5.254 is the valid IP address range that can be assigned to hosts on the subnet that includes the address 172.16.4.6/23.

To determine the range of addresses that can be assigned in a subnet, you must first determine the network ID and broadcast address of the subnetwork. All addresses that can be assigned to hosts will lie between these two endpoints. The network ID can be obtained by determining the interval between subnet IDs. With a 23-bit mask, the decimal equivalent of the mask will be 255.255.254.0. The interval between subnets can be derived by subtracting the value of the last octet of the mask from 256. In this case that operation would be 256 - 254. Therefore, the interval is 2, and it is applied in the third octet where the subnet mask ends.

The first network ID will always be the classful network you started with (in this case 172.16.0.0). Then each subnetwork ID will fall at 16-bit intervals as follows:

172.16.0.0  
172.16.2.0  
172.16.4.0  
172.16.6.0

At 172.16.6.0 we can stop because the address that we are given in the scenario, 172.16.4.6, is in the network with a subnet ID of 172.16.4.0. Therefore, since the broadcast address for this network will be 1 less than the next subnet ID, or 172.16.5.255, the valid range is 172.16.4.1 - 172.16.5.254.

All the other options are incorrect because these are not valid IP address ranges for this scenario.

Objective:  
Network Fundamentals  
Sub-Objective:  
Apply troubleshooting methodologies to resolve problems

References:  
[Cisco > Technology Support > IP > IP Routing > Design TechNotes > IP Addressing and Subnetting for New Users > Document ID: 13788 > Understanding IP Addresses](#)

**QUESTION 77**

What command produced the following as a part of its output?

```
1 14.0.0.2 4 msec 4 msec 4 msec
2 63.0.0.3 20 msec 16 msec 16 msec
3 33.0.0.4 16 msec * 16 msec
```

- A. Ping
- B. Traceroute
- C. Tracert
- D. Extended ping

**Correct Answer: B**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

The output displayed is a part of the output from executing the traceroute command. The traceroute command finds the path a packet takes while being transmitted to a remote destination. It is also used to track down routing loops or errors in a network. Each of the following numbered sections represents a router being traversed and the time the packet took to go through the router:

```
1 14.0.0.2 4 msec 4 msec 4 msec
2 63.0.0.3 20 msec 16 msec 16 msec
3 33.0.0.4 16 msec * 16 msec
```

The output would not be displayed by the ping command. This command is used to test connectivity to a remote ip address. The output from the ping command is as follows:

```
router1# ping 10.201.1.11
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 10.201.1.11, timeout is 2 seconds:
```

```
.....
```

```
Success rate is 0 percent (0/5)
```

The ping in this output was unsuccessful, as indicated by the Success rate is 0 percent output.

The output would not be displayed by the tracert command. The tracert command is used by Microsoft Windows operating systems, not the Cisco IOS command line interface. However, the purpose of the tracert command is similar to the Cisco traceroute utility, which is to test the connectivity or "reachability" of a network device or host. The tracert command uses Internet Control Message Protocol (ICMP).

The output would not be displayed by the extended version of the ping command. This command can be issued on the router to test connectivity between two remote routers. A remote execution means that you are not executing the command from either of the two routers you are interested in testing, but from a third router.

To execute an extended ping, enter the ping command from the privileged EXEC command line without specifying the target IP address. The command takes the router into configuration mode, where you can define various parameters, including the destination and target IP addresses. An example is below:

```
Protocol [ip]:
Target IP address: 10.10.10.1
Repeat count [5]:
Datagram size [100]:
Timeout in seconds [2]:
Extended commands [n]: y
Source address or interface: 12.1.10.2
Type of service [0]:
```

```
Set DF bit in IP header? [no]:
Validate reply data? [no]:
Data pattern [0xABCD]:
Loose, Strict, Record, Timestamp, Verbose[none]:
Sweep range of sizes [n]:
Type escape sequence to abort.
```

Each line is a menu question allowing you to either accept the default setting (in parenthesis) of the ping or apply a different setting. The real value of this command is that you can test connectivity between two remote routers without being physically present at those routers, as would be required with the standard version of the ping command.

Objective:  
Routing Fundamentals  
Sub-Objective:  
Troubleshoot basic Layer 3 end-to-end connectivity issues

References:  
[Cisco > Cisco IOS Command Fundamentals Reference, Release 12.4 > ping](#)  
[Cisco > Tech Notes > Using the Extended ping and Extended traceroute Commands > Document ID: 13730 > The Extended ping Command](#)

### QUESTION 78

Which of the following is NOT managed by the cloud provider in an IaaS deployment?

- A. virtualization
- B. servers
- C. storage
- D. operating system

**Correct Answer: D**  
**Section: (none)**  
**Explanation**

#### Explanation/Reference:

Explanation:

Operating systems are not managed by the cloud provider in an Infrastructure as a service (IaaS) deployment. Only storage, virtualization, servers, and networking are the responsibility of the provider. The customer is responsible for the following with IaaS:

- Operating systems
- Data
- Applications
- Middleware
- Runtime

In a Platform as a Service (PaaS) deployment, the provider is responsible for all except the following, which is the responsibility of the customer:

- Applications
- Data

In Software as a Service (SaaS) deployment, the provider is responsible for everything.

Objective:  
Network Fundamentals  
Sub-Objective:  
Describe the effects of cloud resources on enterprise network architecture

References:  
[IaaS, PaaS, SaaS \(Explained and Compared\)](#)

### QUESTION 79

Which Cisco Internetwork Operating System (IOS) command would be used to set the privileged mode password to "cisco"?

- A. router(config)# enable password cisco
- B. router# enable secret cisco
- C. router(config)# line password cisco
- D. router(config-router)# enable password cisco

**Correct Answer: A**

**Section: (none)**

**Explanation**

#### **Explanation/Reference:**

Explanation:

The enable password command is used to set the local password to control access to privileged levels. This command is executed on the global configuration mode, as in router(config)# enable password cisco. The syntax of the command is:

**router(config)# enable password [level level] {password | [encryption-type] encrypted-password}**

The parameters of the command are as follows:

- level level: An optional parameter to set the privilege level at which the password applies. The default value is 15.
- password: Specifies the password that is used to enter enable mode.
- encryption-type: An optional parameter to specify the algorithm used to encrypt the password.
- encrypted-password: Specifies the encrypted password that is copied from another router configuration.

The router# enable secret cisco command is incorrect because the enable secret command must be executed from global configuration mode, not privileged EXEC mode. In fact, this is the password for which you will be prompted when you attempt to enter privilege exec mode.

The line password command is incorrect because this command is not a valid Cisco IOS command.

The router(config-router)# enable password cisco command is incorrect because the enable password command must be entered in global configuration mode.

Objective:

Infrastructure Security

Sub-Objective:

Configure, verify, and troubleshoot basic device hardening

References:

[Cisco > Cisco IOS Security Command Reference > E > enable password](#)

[Cisco > Cisco IOS Security Configuration Guide, Release 12.4 > Part 7: Secure Infrastructure > Configuring Security with Passwords, Privilege Levels and, Login Usernames for CLI Sessions on Networking Devices](#)

### QUESTION 80

Which command can be issued at the following prompt?

**Router(config-router)#**

- A. show interface
- B. network
- C. interface
- D. ip default-gateway



**Correct Answer:** B

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The network command can be issued at the Router(config-router)# prompt, which also indicates that the router is in router configuration mode. The network command is used to configure the network upon which a routing protocol is functioning.

The router configuration mode is accessed by issuing the router command in the global configuration mode along with a parameter indicating the routing protocol to be configured. For example:

```
R4(config)#router eigrp 1
```

changes the prompt to:

```
R4(config-router)#
```

which then allows you to specify the network as follows:

```
R4(config-router)#network 192.18.5.0
```

All other options are incorrect as these commands can be issued only in the global configuration command mode (which would be indicated by the R4(config)# prompt.

Objective:

Infrastructure Management

Sub-Objective:

Configure and verify initial device configuration

References:

[Cisco > Support > Cisco IOS Software > Using the Command-Line Interface in Cisco IOS Software](#)

**QUESTION 81**

You run the following command:

```
switch# show ip interface brief
```

What information is displayed?

- A. A summary of the IP addresses and subnet mask on the interface
- B. A summary of the IP addresses on the interface and the interface's status
- C. The IP packet statistics for the interfaces
- D. The IP addresses for the interface and the routing protocol advertising the network

**Correct Answer:** B

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The command show ip interface brief displays a summary of the IP address on the interface and the interface's status. The status shows whether the interface is up. This command is useful when you are connected to a router or switch with which you are not familiar, because it allows you to obtain the state of all interfaces or switch ports.

Sample output of this command is shown below:

```
Switch88# show ip interface brief
```

Interface	IP-Address	OK?	Method	Status	Protocol
FastEthernet0/1	unassigned	YES	manual	down	down
FastEthernet0/2	unassigned	YES	manual	down	down
FastEthernet0/3	unassigned	YES	manual	down	down
FastEthernet0/4	unassigned	YES	manual	down	down
FastEthernet0/5	unassigned	YES	manual	down	down
FastEthernet0/6	unassigned	YES	manual	down	down
FastEthernet0/7	unassigned	YES	manual	down	down
FastEthernet0/8	unassigned	YES	manual	up	up
FastEthernet0/9	unassigned	YES	manual	down	down
FastEthernet0/10	unassigned	YES	manual	down	down

This command does not display subnet mask information. You should use other commands, such as `show ip interface` or `show run interface`, to verify the subnet mask.

IP statistics about the interface are displayed with the command `show ip interface`. Adding the `brief` keyword tells the switch to leave out everything but the state of the interface and its IP address.

To view the routing protocol advertising an interfaces network, you would use the command `show ip protocol`.

Objective:

LAN Switching Fundamentals

Sub-Objective:

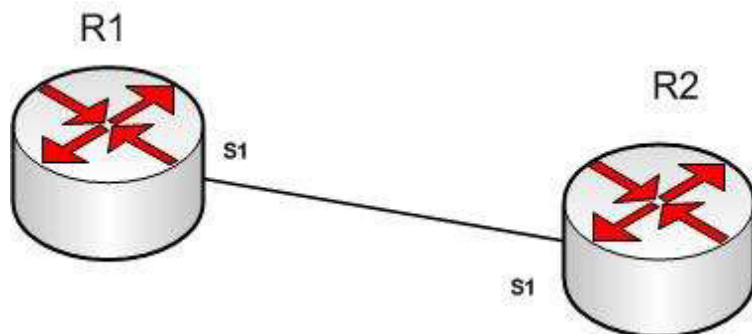
Configure, verify, and troubleshoot interswitch connectivity

References:

[Cisco > Support > Cisco IOS IP Addressing Services Command Reference > show ip interface](#)

## QUESTION 82

R1 and R2 are connected as shown in the diagram and are configured as shown in output in the partial output of the `show run` command.



```

R1#show run

version 12.0
hostname R1

interface s1
ip address 192.168.5.5 255.255.255.252

ip host R1 192.168.5.6

R2#show run

version 12.0
hostname R2
interface s1
ip address 192.168.5.6 255.255.255.252
ip host R1 192.168.5.5

```

The command ping R2 fails when executed from R1. What command(s) would allow R1 to ping R2 by name?

- A. R1(config)#int S1  
R1(config-if)#no ip address 192.168.5.5  
R1(config-if)# ip address 192.168.5.9 255.255.255.252
- B. R1(config)#no ip host R1  
R1(config)# ip host R2 192.168.5.6 255.255.255.252
- C. R1(config)#no hostname R2  
R1(config)# hostname R1
- D. R2(config)#int S1  
R1(config-if)#no ip address 192.168.5.5  
R1(config-if)# ip address 192.168.5.9 255.255.255.0

**Correct Answer: B**

**Section: (none)**

**Explanation**

#### **Explanation/Reference:**

Explanation:

Both routers have been configured with the ip host command. This command creates a name to IP address mapping, thereby enabling the pinging of the device by address. On R1, the mapping is incorrect and needs to be corrected. Currently it is configured as ip host R1 192.168.5.6. It is currently mapping its own name to the IP address of R2.

To fix the problem, you should remove the incorrect IP address mapping and create the correct mapping for R2, as follows:

```

R1(config)#no ip host R1
R1(config)# ip host R2 192.168.5.6 255.255.255.252

```

Once this is done, the ping on R2 will succeed.

The IP address of the S1 interface on R1 does not need to be changed to 192.168.5.9 /30. In fact, if that is done the S1 interface on R1 and the S1 interface in R2 will no longer be in the same network. With a 30-bit mask configured, the network they are currently in extends from 192.168.5.4 - 192.168.5.7. They are currently set to the two usable addresses in that network, 192.168.5.5 and 192.168.5.6.

The hostnames of the two routers do need to be set correctly using the hostname command for the ping to function, but they are correct now and do not need to be changed.

The subnet mask of the S1 interface on R2 does not need to be changed to 255.255.255.0. The mask needs to match that of R1, which is 255.255.255.252.

Objective:

Infrastructure Services

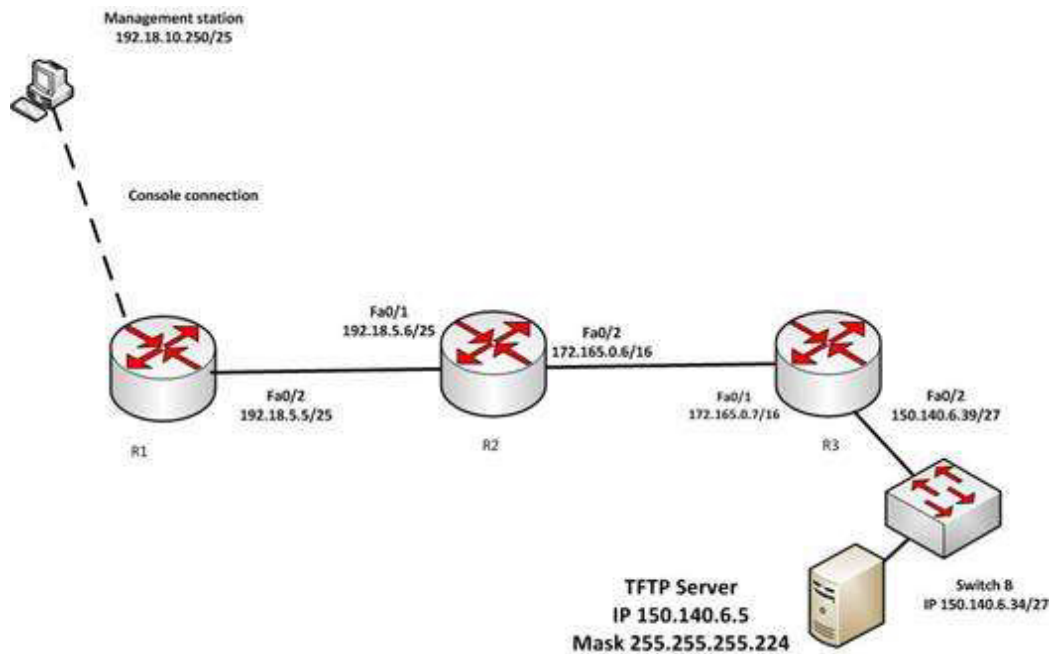
Sub-Objective:

Troubleshoot client connectivity issues involving DNS

References:

### QUESTION 83

You have established a console session with R1 and you are attempting to download an IOS image from the TFTP server in the diagram below.



However, you are unable to make the connection to 150.140.6.5. What is the problem?

- A. The IP address of the management station is incorrect
- B. The IP address of the TFTP server is incorrect
- C. The interfaces between R1 and R2 are not in the same subnet
- D. The IP address of Switch B is incorrect

**Correct Answer: B**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

The IP address of the TFTP server is incorrect. The TFTP server, Switch B and the Fa0/2 interface on R3 should all be in the same subnet. With a 27-bit mask (255.255.255.224) against the 150.140.0.0 classful network the resulting subnets are:

150.140.0.0  
150.140.0.32  
150.140.0.64

and so on, incrementing in intervals of 32 in the last octet until it reaches the 150.140.6.0 subnet.

150.140.6.0  
150.140.6.32  
150.140.6.64

At this point, we can see that Switch B and the router interface are in the 150.140.6.32 subnet, while the TFTP server is in the 150.140.6.0 subnet. The IP address of the TFTP server needs to be in the 150.140.6.33-150.140.6.62 range, while avoiding the addresses already used on R1 and the switch.

The IP address of the management station does not appear to be in any of the networks listed in the diagram, but that doesn't matter since the connection to the router is through the console cable which does not require a correct IP address.

The Fa0/2 and Fa0/1 interfaces on R1 and R2 are in the same subnet. Using a 25-bit mask against the 192.18.5.0/24 classful network yields the following subnets:

192.18.5.0  
192.168.5.128

Both router interfaces in question are in the 192.18.5.0 subnet.

As we have already determined, the IP address of Switch B is correct. Even if it were incorrect or missing altogether, it would have no impact on connecting to the TFTP server. Switches merely switch frames based on MAC addresses and only need an IP address for management purposes.

Objective:

Routing Fundamentals

Sub-Objective:

Troubleshoot basic Layer 3 end-to-end connectivity issues

References:

[Cisco > Support > IP Routing > Design TechNotes > Document ID: 13788 > IP Addressing and Subnetting for New Users](#)

### QUESTION 84

You and your team are evaluating the use of OSPFv3 in your IPv6 network.

Which of the following statements is true of OSPFv3?

- A. There will be a higher demand on the processor to run the link-state routing algorithm
- B. Router IDs must match for adjacency formation
- C. Area IDs do not need to match for adjacency formation
- D. Area types do not need to match for adjacency formation

**Correct Answer: A**

**Section: (none)**

**Explanation**

#### **Explanation/Reference:**

Explanation:

There will be a higher demand on the processor to run the link-state routing algorithm. As with OSPFv2, OSPFv3 uses the Shortest Path first (SPF) algorithm, which is processor intensive. It is one of the only downsides of using the algorithm.

OSPFv3 also shares a number of other characteristics with its v2 counterpart with respect to adjacency formation. For example:

- Router IDs should not match.
- Router IDs should reflect the correct router ID for each device.

- Area IDs must match.
- Area types must match.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot single area and multi-area OSPFv3 for IPv6 (excluding authentication, filtering, manual summarization, redistribution, stub, virtual-link, and LSAs)

References:

[Home > Network Infrastructure > IPv6 Integration and Transition > Troubleshooting OSPFv3 Neighbor Adjacencies](#)

### QUESTION 85

Which of the following topologies is used in Wide Area Networks (WANs)?

- A. FDDI
- B. CDDI
- C. SONET
- D. Token Ring

**Correct Answer: C**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

Synchronous Optical NETwork (SONET) is the standard topology for fiber optic networks. Developed in 1980s, SONET can transmit data at rates of up to 2.5 gigabits per second (Gbps).

All other options are incorrect because they are LAN topologies, not WAN topologies.

Fiber Distributed Data Interface (FDDI) specifies a 100-Mbps dual-ring fiber optics-based token-passing LAN. FDDI is typically implemented for high-speed LAN backbones because of its support for high bandwidth.

Copper Distributed Data Interface (CDDI) is copper version of FDDI. They differ only in that FDDI can span longer distances than CDDI due to the attenuation characteristics of copper wiring.

Token Ring/IEEE 802.5 LAN technology was developed by IBM in 1970. Token-ring LAN technology is based on token-passing, in which a small frame, called a token, is passed around the network. Possession of the token grants the node the right to transmit data. Once the data is transmitted, the station passes the token to the next end station.

Objective:

Network Fundamentals

Sub-Objective:

Compare and contrast network topologies

References:

[Cisco>Home>Cisco Documentation > Internetworking Technology Handbook>WAN Technologies](#)

### QUESTION 86

Which show interfaces command output indicates that the link may not be functional due to a Data Link layer issue, while the Physical layer is operational?

- A. Ethernet 0/0 is up, line protocol is up
- B. Ethernet 0/0 is up, line protocol is down
- C. Ethernet 0/0 is down, line protocol is up

D. Ethernet 0/0 is down, line protocol is down

**Correct Answer:** B

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The first or left-hand column (Ethernet 0/0 is up) indicates the Physical layer state of the interface, while the second or right-hand column (line protocol is down) indicates the Data Link layer state of the interface. The following command output excerpt indicates that the link is not functional due to a Data Link layer (or "line protocol") issue, while the Physical layer is operational:

Ethernet 0/0 is up, line protocol is down

If the problem were at the Data Link layer while the Physical layer is operational, the show interfaces command output will indicate that the interface is up, but the line protocol is down.

In the normal operation mode, when both Physical layer and Data Link layer are up, the show interfaces output will display the following message:

Ethernet0/0 is up, line protocol is up

The message Ethernet 0/0 is down, line protocol is up is not a valid output.

The message Ethernet 0/0 is down, line protocol is down indicates that both the Physical layer and the Data Link layer are down. Therefore, this is an incorrect option.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Troubleshoot interface and cable issues (collisions, errors, duplex, speed)

References:

#### **QUESTION 87**

Which of the following is NOT a possible component of Enhanced Interior Gateway Routing Protocol's (EIGRP) composite metric?

- A. Cost
- B. Load
- C. Delay
- D. Bandwidth

**Correct Answer:** A

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

Cost is not a component of EIGRP's composite metric. The cost, or efficiency, of a path is used as a metric by the Open Shortest Path First (OSPF) routing protocol.

Enhanced IGRP (EIGRP) is Cisco Systems' proprietary routing protocol. It can use bandwidth, delay, load, reliability, and maximum transmission unit (MTU) to calculate the metric. Of these five metrics, by default, only minimum bandwidth and delay are used to compute the best path.

The metric for EIGRP can be calculated with this formula:



$$\text{Metric} = [K1 * \text{Bandwidth} + (K2 * \text{Bandwidth}) / (256 - \text{load}) + K3 * \text{Delay}] * [K5 / (\text{reliability} + K4)]$$

The default constant values for Cisco routers are K1 = 1, K3 = 1, and K2 = 0, K4 = 0, K5 = 0. In the default setting, K1 and K3 have non-zero values, and therefore, by default, the metric is dependent on bandwidth and delay.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot EIGRP for IPv4 (excluding authentication, filtering, manual summarization, redistribution, stub)

References:

[Cisco > Support > IP > IP Routing > Design > Design TechNotes > Introduction to EIGRP > Document ID: 13669](#)

### QUESTION 88

You are the network administrator for your company. You have implemented VLAN Trunking Protocol (VTP) in your network. However, you have found that VTP is not synchronizing VLAN information.

Which of the following items should be verified to resolve the problem? (Choose three.)

- A. Ensure that switches in the VTP domain are configured with VTP version 1 and version 2.
- B. Ensure that VLANs are active on at least one switch on the VTP domain.
- C. Ensure that all of the ports that interconnect switches are configured as trunks and are trunking properly.
- D. Ensure that the VTP domain name is the same on all switches in the domain.
- E. Ensure that identical passwords are configured on all VTP switches.

**Correct Answer:** CDE

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

The following is a list of the steps to take if VTP fails to exchange VLAN information:

- Ensure that all of the ports that interconnect switches are configured as trunks and are trunking properly.
- Ensure that VLANs are active in all the devices.
- Ensure that at least one switch is acting as a VTP server in the VTP domain.
- Ensure that the VTP domain name is the same for all switches in the domain. The VTP domain name is case-sensitive.
- Ensure that the VTP password is the same for all switches in the domain.
- Ensure that the same VTP version is used by every switch in the domain. VTP version 1 and version 2 are not compatible on switches in the same VTP domain.

You should not ensure that switches are configured with VTP version 1 and version 2 in the domain, because VTP version 1 and version 2 are incompatible. VTP version 1 is the default on all Cisco switches.

You should not ensure that VLANs are active on at least one switch in the VTP domain, because VLANs should be active in all of the devices in a VTP domain.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot VLANs (normal/extended range) spanning multiple switches

References:

### QUESTION 89

Which of the following is NOT a characteristic of private Internet Protocol (IP) addressing?

- A. These addresses are not routable through the public Internet.
- B. These addresses are publicly registered with the Internet Network Information Center (InterNIC).
- C. These addresses are reserved by the Internet Assigned Numbers Authority (IANA).
- D. The ranges of private IP addressing are 10.0.0.0 to 10.255.255.255, 172.16.0.0 to 172.31.255.255, and 192.168.0.0 to 192.168.255.255.

**Correct Answer:** B

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

It is NOT correct to state that private IP addresses are publicly registered with the Internet Network Information Center (InterNIC). Only public IP addresses are registered with the InterNIC.

The following characteristics are TRUE regarding private IP addressing:

- Private addresses are not routable through the public Internet.
- Private addresses are reserved by the Internet Assigned Numbers Authority (IANA).
- The ranges of private IP addressing are 10.0.0.0 to 10.255.255.255, 172.16.0.0 to 172.31.255.255 and 192.168.0.0 to 192.168.255.255.
- The use of private IP addressing conserves the use of the public IPv4 address space

Private addresses cannot be registered publicly.

Private IP addresses conserve public addressing space and can improve network security.

Objective:

Network Fundamentals

Sub-Objective:

Describe the need for private IPv4 addressing

References:

#### **QUESTION 90**

Which are among the valid steps in the process of recovering a password on a Cisco router? (Choose all that apply.)

- A. Restart the router.
- B. Configure the enable secret password.
- C. Enter the router diagnostic mode.
- D. Enter user mode.
- E. Answer the security question to recover the password.

**Correct Answer:** ABC

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

Three of the steps that should be performed while recovering a password on a Cisco router are to restart the router in ROMMON mode, enter ROMMON mode (router diagnostic mode) and reset the enable secret password. The complete password recovery process on a Cisco Router is as follows:

Configure the router so that it starts without reading the non-volatile random access memory (NVRAM). This is also referred to as the system test mode, which you enter by changing the configuration register. You must first

restart the router and within 60 seconds press Break on the terminal keyboard. Then the router will skip normal reading of the startup configuration file and will go to the ROMMON prompt (shown below this text section). At this command prompt, type confreg 0x2142 to instruct the router to boot to flash memory at the next reboot. When it does, it will ignore the startup configuration file again and will behave as if it had no configuration, as a new router would.

### **rommon 1> confreg 0x2142**

Type reset to reboot the router.

Enter enable mode through the test system mode.

View the existing password (if it can be viewed, it may be encrypted), configure a new password, or delete the configuration.

Configure the router to start by reading the NVRAM, which is done by resetting the configuration register to its normal value. Run these commands:

### **Router#configure terminal**

Enter configuration commands, one per line. End with CNTL/Z.

### **Router(config)#config**

### **Router(config)#config-register 0x2102**

Restart the router.

You will proceed through user mode but to make any changes you make must be at the global configuration prompt.

Finally, there is no way to recover a password by answering a security question.

Objective:

Infrastructure Management

Sub-Objective:

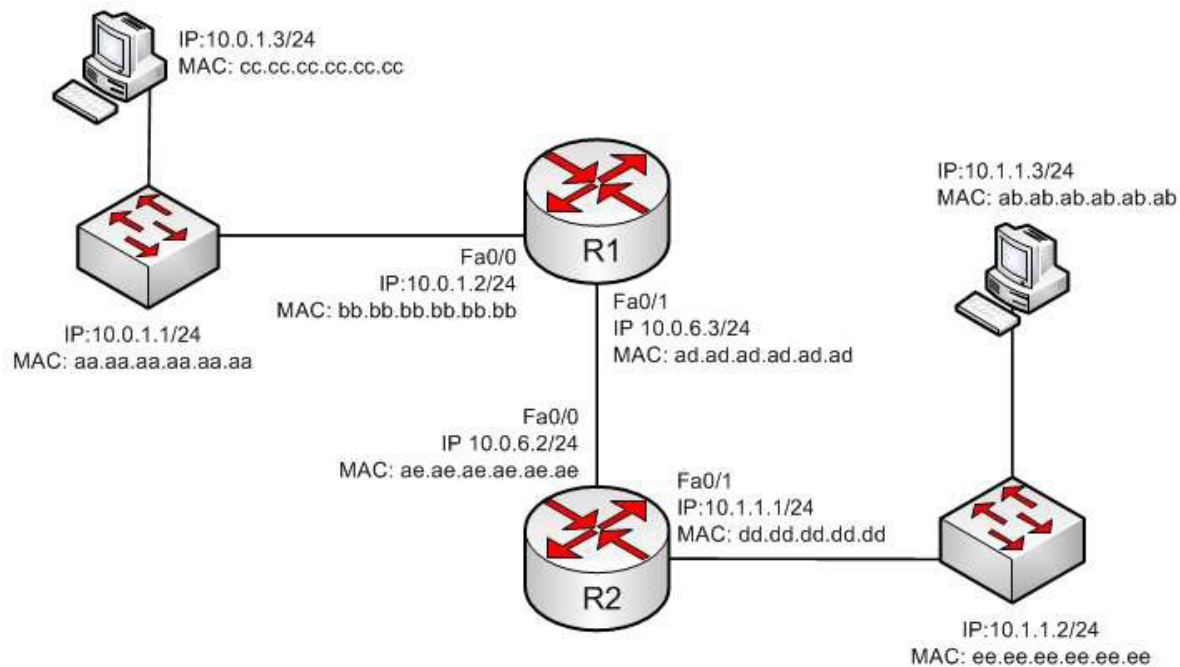
Use Cisco IOS tools to troubleshoot and resolve problems

References:

[Cisco > Home>Support>Product Support>End-of-Sale and End-of-Life Products>Cisco IOS Software Releases 12.1 Mainline>Troubleshoot and Alerts> Troubleshooting TechNotes> Password Recovery Procedures](#)

### **QUESTION 91**

In the diagram below, when a packet sent from the PC at 10.0.1.3 to the PC at 10.1.1.3 leaves the Fa0/1 interface of R1, what will be the source and destination IP and MAC addresses?



- A. source IP 10.1.1.2 destination IP 10.1.1.3  
Source MAC ad.ad.ad.ad.ad.ad destination MAC ab.ab.ab.ab.ab.ab
- B. source IP 10.1.1.1 destination IP 10.1.1.3  
Source MAC ad.dd.dd.dd.dd.dd destination MAC ab.ab.ab.ab.ab.ab
- C. source IP 10.0.1.3 destination IP 10.1.1.3  
Source MAC ad.ad.ad.ad.ad.ad destination MAC ae.ae.ae.ae.ae.ae
- D. source IP 10.0.6.3 destination IP 10.1.1.3  
Source MAC ad.ad.ad.ad.ad.ad destination MAC ae.ae.ae.ae.ae.ae

**Correct Answer: C**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

The source IP address will be 10.0.1.3 and the destination IP address will be 10.1.1.3. The source MAC address will be ad.ad.ad.ad.ad.ad and the destination MAC address will be ae.ae.ae.ae.ae.ae.

The source and destination IP addresses never change as the packet is routed across the network. The MAC address will change each time a router sends the packet to the next router or to the ultimate destination. The switches do not change either set of addresses in the header; they just switch the frame to the correct switch port according to the MAC address table. Therefore, when the packet leaves R1, the source MAC address will be that of R1 and the destination MAC address will be that of the Fa0/0 interface of R2. The IP addresses will be those of the two workstations, 10.0.1.3 and 10.1.1.3.

When the workstation at 10.0.1.3 starts the process, it will first determine that the destination address is in another subnet and will send to its default gateway (10.0.1.2). It will perform an ARP broadcast for the MAC address that goes with 10.0.1.2, and R1 will respond with its MAC address, bb.bb.bb.bb.bb.bb.

After R2 determines the next-hop address to send to 10.0.1.3 by parsing the routing table, it will send the packet to R1 at 10.0.6.2. When R2 receives the packet, R2 will determine that the network 10.0.1.0/24 is directly connected and will perform an ARP broadcast for the MAC address that goes with 10.0.1.3. The workstation at 10.0.1.3 will respond with its MAC address, ab.ab.ab.ab.ab.ab.

Objective:

Routing Fundamentals  
Sub-Objective:  
Describe the routing concepts

References:  
[Cisco > IOS Technology Handbook > Routing Basics](#)

### QUESTION 92

From which of the following attacks can Message Authentication Code (MAC) shield your network?

- A. DoS
- B. DDoS
- C. spoofing
- D. SYN floods

**Correct Answer:** C

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

Message Authentication Code (MAC) can shield your network from spoofing attacks. Spoofing, also known as masquerading, is a popular trick in which an attacker intercepts a network packet, replaces the source address of the packets header with the address of the authorized host, and reinserts fake information which is sent to the receiver. This type of attack involves modifying packet contents. MAC can prevent this type of attack and ensure data integrity by ensuring that no data has changed. MAC also protects against frequency analysis, sequence manipulation, and ciphertext-only attacks.

MAC is a secure message digest that requires a secret key shared by the sender and receiver, making it impossible for sniffers to change both the data and the MAC as the receiver can detect the changes.

A denial-of-service (DoS) attack floods the target system with unwanted requests, causing the loss of service to users. One form of this attack generates a flood of packets requesting a TCP connection with the target, tying up all resources and making the target unable to service other requests. MAC does not prevent DoS attacks. Stateful packet filtering is the most common defense against a DoS attack.

A Distributed Denial of Service attack (DDoS) occurs when multiple systems are used to flood the network and tax the resources of the target system. Various intrusion detection systems, utilizing stateful packet filtering, can protect against DDoS attacks.

In a SYN flood attack, the attacker floods the target with spoofed IP packets and causes it to either freeze or crash. A SYN flood attack is a type of denial of service attack that exploits the buffers of a device that accept incoming connections and therefore cannot be prevented by MAC. Common defenses against a SYN flood attack include filtering, reducing the SYN-RECEIVED timer, and implementing SYN cache or SYN cookies.

Objective:  
Infrastructure Security  
Sub-Objective:  
Configure, verify, and troubleshoot basic device hardening

References:  
[Cisco > The Internet Protocol Journal, Volume 10, No. 4 > IP Spoofing](#)

### QUESTION 93

Which of the following topologies is used in Wide Area Networks (WANs)?

- A. FDDI
- B. CDDI

- C. SONET
- D. Token Ring

**Correct Answer:** C

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

Synchronous Optical Network (SONET) is the standard topology for fiber optic networks. Developed in 1980s, SONET can transmit data at rates of up to 2.5 gigabits per second (Gbps).

All other options are incorrect because they are LAN topologies, not WAN topologies.

Fiber Distributed Data Interface (FDDI) specifies a 100-Mbps dual-ring fiber optics-based token-passing LAN. FDDI is typically implemented for high-speed LAN backbones because of its support for high bandwidth.

Copper Distributed Data Interface (CDDI) is copper version of FDDI. They differ only in that FDDI can span longer distances than CDDI due to the attenuation characteristics of copper wiring.

Token Ring/IEEE 802.5 LAN technology was developed by IBM in 1970. Token-ring LAN technology is based on token-passing, in which a small frame, called a token, is passed around the network. Possession of the token grants the node the right to transmit data. Once the data is transmitted, the station passes the token to the next end station.

Objective:

Network Fundamentals

Sub-Objective:

Compare and contrast network topologies

References:

[Cisco>Home>Cisco Documentation > Internetworking Technology Handbook>WAN Technologies](#)

#### **QUESTION 94**

You are the network administrator for your company and have configured Cisco Discovery Protocol (CDP) in your network. You recently noticed that when devices send large numbers of CDP neighbor announcements, some devices are crashing. You decide to disable CDP on the router.

Which command should you use to achieve the objective?

- A. no cdp run
- B. set cdp disable
- C. no cdp enable
- D. no cdp advertise-v2

**Correct Answer:** A

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

You should use the no cdp run command to disable CDP on the router. Due to a known vulnerability regarding the handling of CDP by Cisco routers and switches when devices send large numbers of CDP neighbor announcements, some devices can crash or cause abnormal system behavior. To overcome this problem, you can disable CDP for the entire router by using the no cdp run command.

You cannot use the set cdp disable command to disable CDP on the router. This command disables CDP on an entire Catalyst switch.

You cannot use the no cdp enable command to disable CDP on the router. This command disables CDP on a specific interface.

You cannot use the no cdp advertise-v2 command to disable CDP on the router. This command disables CDPv2 advertisements.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Configure and verify Layer 2 protocols

References:

[Cisco > Support > Using Cisco Discovery Protocol](#)

[Cisco > Support > Technology Support > Network Management > Cisco's Response to the CDP Issue > Document ID: 13621](#)

### QUESTION 95

Which of the following is NOT a feature offered by Enhanced Interior Gateway Routing Protocol (EIGRP)?

- A. variable length subnet masks (VLSM)
- B. partial updates
- C. neighbor discovery mechanism
- D. multiple vendor compatibility

**Correct Answer:** D

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

EIGRP is a Cisco-proprietary routing protocol, and does not support multiple vendor environments.

EIGRP is a classless routing protocol, and thus supports variable length subnet masks (VLSM).

EIGRP routers build a neighbor table in memory, and use a multicast-based neighbor discovery mechanism.

EIGRP routers send partial updates when there are network events.

The following are features offered by EIGRP:

- Fast convergence
- Partial updates
- Neighbor discovery mechanism
- VLSM
- Route summarization
- Scalability

Objective:

Routing Fundamentals

Sub-Objective:

Compare and contrast distance vector and link-state routing protocols

References:

[Cisco > Support > IP > IP Routing > Design > Design TechNotes > Introduction to EIGRP > Document ID: 13669](#)

### QUESTION 96

What is the primary benefit of the Virtual Local Area Network (VLAN) Trunking Protocol (VTP)?



- A. broadcast control
- B. frame tagging
- C. inter-VLAN routing
- D. consistent VLAN configuration across switches in a domain

**Correct Answer:** D

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

VTP manages configured VLANs across a switched network and maintains consistency of VLAN information throughout a VTP domain. When an administrator adds, deletes, or renames VLANs, VTP propagates this information to all other switches in the VTP domain. This makes the process of VLAN changes a plug-and-play activity. This protocol was developed by, and remains proprietary to Cisco Systems.

Broadcast control is not the primary benefit of VTP. Broadcast control is achieved by using VLANs. VLANs segment the network into logical broadcast domains. This helps in the reduction of unnecessary traffic over the network and optimizes the available bandwidth use. VTP pruning helps reduce broadcast and unknown unicast over VLAN trunk links. However, this is not the primary benefit of VTP.

Frame tagging is required for VLAN identification as frames traverse trunk links in a switch fabric. Inter-Switch Link (ISL) and IEEE 802.1q are the two methods of frame tagging available on Cisco devices. ISL is proprietary to Cisco, whereas IEEE 802.1q is a standard method. VTP is not a frame tagging method.

Inter-VLAN routing is achieved by an Open Systems Interconnect (OSI) Layer 3 device (Router). Inter-VLAN routing is not a benefit of VTP.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot VLANs (normal/extended range) spanning multiple switches

References:

[Cisco > Support > LAN Switching > Virtual LANS / VLAN Trunking Protocol \(VLANs/VTP\) > Configure > Configuration Examples and Technotes > Configuring VLAN Trunk Protocol \(VTP\) > Document ID: 98154](#)  
[Cisco > Catalyst 4500 Series Switch Cisco IOS Software Configuration Guide, 12.2\(25\) > Understanding and Configuring VLANs, VTP, and VMPS](#)

**QUESTION 97**

In which of the following networks does the address 192.168.54.23/27 reside?

- A. 192.168.54.0
- B. 192.168.54.8
- C. 192.168.54.4
- D. 192.168.54.16

**Correct Answer:** A

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

When a class C address such as 192.168.54.0 is subnetted with a /27 mask, the subnet mask in dotted decimal format is 255.255.255.224. This means that the interval between the network IDs of the resulting subnets is 32. The resulting network IDs are as follows:

192.168.54.0

192.168.54.32  
192.168.54.64  
192.168.54.92 and so on.

Therefore, the address 192.168.54.23 resides in the 192.168.54.0 subnet. The address 192.168.54.0 is called a network ID or, alternately, a subnet address. It represents the subnet as a group and will be used in the routing tables to represent and locate the subnet.

Neither the first address (192.168.54.0, the network ID) nor the last address (192.168.54.31, the broadcast address) in any resulting subnet can be used. Therefore, the addresses in this range are 192.168.54.1 through 192.168.54.30, which includes the 192.168.54.23 address.

192.168.54.8 would only be a network ID if the mask were /29, which would result in an interval of 8 between network IDs. However, even if a /29 mask were used, the 192.168.54.23 address would not fall in its range. The address range for a /29 mask would be 192.168.54.9 through 192.168.54.14.

Similarly, 192.168.54.4 would only be a network ID for a /30 mask, which would result in an interval of 4 between network IDs. But even if a /30 mask were used, the 192.168.54.23 address would not fall in its range. The address range for a /30 mask would be 192.168.54.5 through 192.168.54.6.

192.168.54.16 could be a network ID if the mask were /28, /29 or /30, but not with a /27 mask.

Objective:

Network Fundamentals

Sub-Objective:

Apply troubleshooting methodologies to resolve problems

References:

[Cisco > Support > IP Routing > Design TechNotes > Document ID: 13788 > IP Addressing and Subnetting for New Users](#)

### QUESTION 98

Which set of Cisco Internetwork Operating System (IOS) commands is used on Cisco routers to set a password for Telnet lines?

- A. `router(config-router)# line vty 0 4`  
`router(config-line)# login`  
`router(config-line)# password password`
- B. `router(config)# line telnet 0 4`  
`router(config-line)# login`  
`router(config-line)# password password`
- C. `router(config)# line aux 0`  
`router(config-line)# login`  
`router(config-line)# password password`
- D. `router(config)# line vty 0 4`  
`router(config-line)# login`  
`router(config-line)# password password`

**Correct Answer: D**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

The following commands are used on Cisco routers to set a password for Telnet lines:

**`router(config)# line vty 0 4`**

**`router(config-line)# login`**

**`router(config-line)# password password`**

An explanation of the commands is below:

router(config)# line vty 0 4: Enters line configuration mode for virtual terminal lines 0 to 4.

router(config-line)# login: Ensures that any remote access is prompted for a password.

router(config-line)# password password: Sets a password of "password" for VTY lines.

Assigning a password to the VTY lines is required for remote connections to the device to be possible. If a password has not been configured the following error message will be generated when the connection is attempted:

```
Password required but not set
```

```
[Connection to foreign host 106.5.5.1 closed by foreign host]
```

Configuring a VTY password and requiring the password (accomplished with the login command) is good first step in securing Telnet access to the device. Another step that can enhance the security of remote access to the device would be to apply an access list to the VTY lines with the access-class command.

The command sequence which begins with router(config-router)# line vty 0 4 is incorrect because the line vty 0 4 command should be executed in global configuration mode, not routing protocol configuration mode.

The line telnet 0 4 command is incorrect because this is not a valid Cisco IOS command.

The line aux 0 command is incorrect because this allows you to configure the properties of the Auxiliary port, as opposed to the incoming Telnet (VTY) lines.

Objective:

Infrastructure Management

Sub-Objective:

Configure and verify device management

References:

[Cisco > Support > Technology Support > IP > IP Addressing Services > Design > Design TechNotes > Cisco Guide to Harden Cisco IOS Devices > Document ID: 13608](#)

[Cisco > Support > End-of-sale and End-of-life Products > Cisco IOS Software Releases 11.0 > Configuration Examples and TechNotes > Telnet, Console and AUX Port Passwords on Cisco Routers Configuration Example](#)

### QUESTION 99

The output of the show ip route command is given:

```
Router# show ip route
```

```
Gateway of last resort is 10.119.254.240 to network 10.140.0.0
```

```
O 172.16.0.0 [110/5] via 10.19.24.6, 0:01:00, Ethernet2
```

```
B 172.17.12.0 [200/128] via 10.19.24.24, 0:02:22, Ethernet2
```

```
O 172.71.13.0 [110/5] via 10.19.24.6, 0:00:59, Ethernet2
```

```
O 10.13.0.0 [110/5] via 10.19.24.6, 0:00:59, Ethernet2
```

What does the value 110 in the output represent?

- A. The administrative distance of the information source
- B. The metric to the route
- C. The type of route
- D. The port number of the remote router

**Correct Answer: A**

**Section: (none)**

**Explanation**

### Explanation/Reference:

Explanation:

The value 110 in the output represents the administrative distance (AD) of the information source.

Administrative distance is used by Cisco routers to select the most trustworthy source of routing information for a particular route. Every routing protocol has a default administrative distance, and if more than one routing protocol is providing route information about a route, the protocol with the lowest AD will be selected to populate the routing table. The following table shows the AD values for different routing protocols:

IP Route	Default AD value
Connected interface	0
Static route directed to an connected interface	0
Static route directed to an IP address	1
Enhanced Interior Gateway Routing Protocol (EIGRP) summary route	5
External Border Gateway Protocol (BGP) route	20
Internal Enhanced Interior Gateway Routing Protocol (EIGRP) route	90
Interior Gateway Routing Protocol (IGRP) route	100
Open Shortest Path First (OSPF) route	110
Intermediate System-to-Intermediate System (IS-IS) route	115
Routing Information Protocol (RIP) route	120
Exterior Gateway Protocol (EGP) route	140
On Demand Routing (ODR)	160
External Enhanced Interior Gateway Routing Protocol (EIGRP) route	170
Internal Border Gateway Protocol (BGP) route	200
Unknown origin routes	255

The following is the sample output for the show ip route command:

```
Router# show ip route
```

```
Gateway of last resort is 10.119.254.240 to network 10.140.0.0
O 172.16.0.0 [110/5] via 10.19.24.6, 0:01:00, Ethernet2
B 172.17.12.0 [200/128] via 10.19.24.24, 0:02:22, Ethernet2
O 172.71.13.0 [110/5] via 10.19.24.6, 0:00:59, Ethernet2
O 10.13.0.0 [110/5] via 10.19.24.6, 0:00:59, Ethernet2
```

The following are the fields in the output:

- O: Indicates that the route was discovered using Open Shortest Path First (OSPF).
- B: Indicates that the route was discovered using Border Gateway Protocol (BGP).
- 172.16.0.0: Indicates the address of the remote network.
- 110: Indicates the administrative distance of the route.
- 128: Indicates the metric for the route.
- Via 10.19.24.6: Specifies the address of the next router in the remote network.
- 0:02:22: Indicates the last time the route was updated.
- The metric for the route is also called the cost. In the case of the OSPF routes above, the cost is 5.

The administrative distance for any particular protocol can be changed if you would like to use a routing protocol that is normally not the preferred provider. For example, if you prefer that RIP routes be installed in the routing table rather than OSPF routes, you could change the administrative distance of RIP to a lower value than OSPF (110), as shown below.

```
Router(config)# router rip
Router(config)# distance 100
```

All the other options are incorrect because they do not represent the administrative distance.

Objective:

Routing Fundamentals

Sub-Objective:

Interpret the components of routing table

References:

[Cisco > Support > IP > IP Routing > Design > Design TechNotes > What Is Administrative Distance? > Document ID: 15986](#)

### QUESTION 100

What is the purpose of frame tagging in Virtual LAN (VLAN) configurations?

- A. inter-VLAN routing
- B. encryption of network packets
- C. frame identification over trunk links
- D. frame identification over access links

**Correct Answer: C**

**Section: (none)**

**Explanation**

#### Explanation/Reference:

Explanation:

Frame tagging is used when VLAN traffic travels over a trunk link. Trunk links carry frames for multiple VLANs. Therefore, frame tags are used for identification of frames from different VLANs. Inter Switch Link (ISL) and Institute of Electrical and Electronics Engineers (IEEE) 802.1q are the two frame tagging methods supported on Cisco devices.

The purpose of frame tagging is not inter-VLAN routing. A Layer 3 device, such as a router or multilayer switch, is used for inter-VLAN routing. To configure inter-VLAN routing a logical or subinterface for each VLAN must be created on the single physical interface used to connect to the switch. An IP address is NOT applied to the physical interface; instead, each subinterface is configured with an IP address that will become the default gateway of all devices residing in that VLAN. Consequently, each subinterface and its VLAN devices must reside a different subnet as well. If a subinterface on the router is NOT configured with an IP address that resides in the same network as the hosts that reside in the VLAN that the subinterface serves, the hosts in that VLAN will be isolated from the other VLANs. The hosts in the VLAN served by the subinterface should also use this address as their default gateway, or the hosts in the VLAN will likewise be isolated from the other VLANs.

To verify the IP address of the subinterface, execute the show interfaces subinterface ID command. As shown below, the IP address will appear in line 3 of the output. Compare this IP address with the IP address set as the default gateway of each host in the VLAN served by the subinterface. They should be the same, and the IP address of the hosts should be in the same subnet as this address as well.

```
router# show interfaces fastEthernet 0/0.1
FastEthernet0/0.1 is up, line protocol is up
Hardware is AmdFE, address is 0003.e36f.41e0 (bia 0003.e36f.41e0)
Internet address is 10.10.10.1/24
MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ISL Virtual LAN, Color 1.
ARP type: ARPA, ARP Timeout 04:00:00
```

Frame tagging does not provide encryption of network packets. Packets are transmitted unencrypted unless the network device or the application uses an additional encryption mechanism. A Virtual Private Network (VPN) is a popular solution for providing encrypted network communication.

An access link is a connection between a switch and an end-user computer with a normal Ethernet Network Interface Card (NIC). On these links, Ethernet frames are transmitted without frame tagging.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot VLANs (normal/extended range) spanning multiple switches

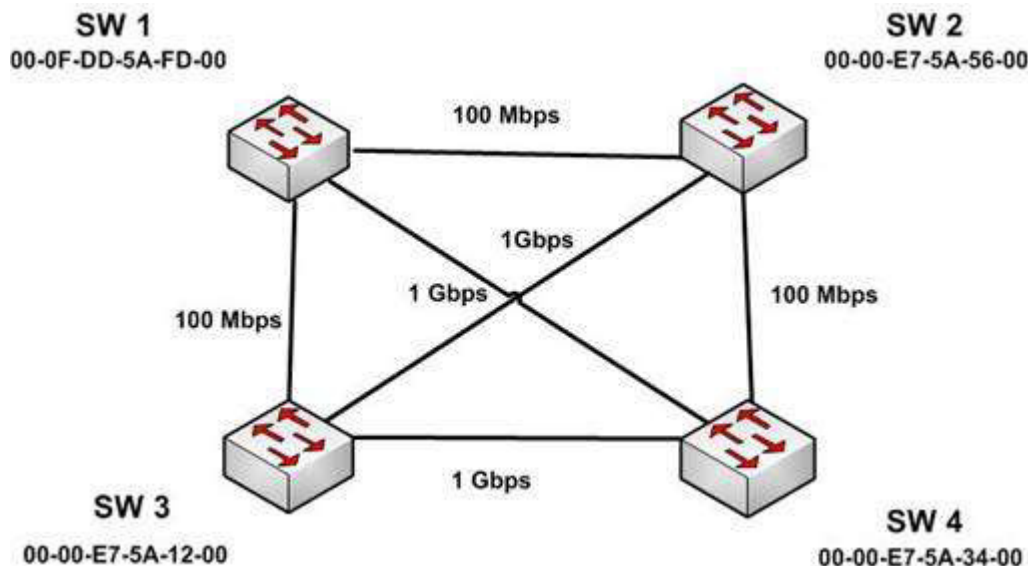
References:

[Cisco > Cisco IOS LAN Switching Configuration Guide, Release 12.4 > Part 1: Virtual LANs > Routing Between VLANs Overview](#)

[Cisco > Technology Support > LAN Switching > Virtual LANs/VLAN Trunking Protocol \(VLANs/VTP\) > Design > Design Technotes > Inter-Switch Link and IEEE 802.1Q Frame Format > Document ID: 17056](#)

### QUESTION 101

The four switches in the diagram below have default configurations. Considering the bandwidths indicated on each link and the MAC addresses indicated for each switch, which ports will be forwarding after RSTP has converged? (Choose all that apply.)



- A. SW 1 port that connects to SW 4
- B. SW 1 port that connects to SW 2
- C. SW 1 port that connects to SW 3
- D. SW 2 port that connects to SW 3
- E. SW 2 port that connects to SW 4
- F. SW 3 port that connects to SW 4
- G. SW 3 port that connects to SW 1
- H. SW 3 port that connects to SW 2

**Correct Answer:** ADFGH

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The ports that will be forwarding after convergence are the SW1 port that connects to SW4, the SW2 port that connects to SW3, and all of the ports on SW3. The process of determining these port states occurs in this order:

1. Selection of the root bridge. All ports on the root bridge become designated ports and are set to forward.
2. Determination of the root ports on each non-root bridge.
3. Determination of the designated port on each segment that does not connect directly to the root bridge.
4. Designated and root ports will be set to forwarding, and all other ports will be set to discarding.

For step 1, when all bridge priorities have been left to their default, all switches will have same bridge priority. When that is the case, as in this scenario, the switch with the lowest MAC address will be selected as root bridge. In this case, SW3 has the lowest MAC address and becomes the root bridge. ALL ports are in a forwarding state on the root bridge, which explains why all of the ports on SW3 will be in a forwarding state.

For step 2, each non-root bridge will select the interface it possesses with the least cost path to the root bridge. Once selected, that port will be placed in a forwarding state. 100 Mbps links will be assigned a cost of 19, and 1 Gbps links will be assigned a cost of 4. Each path cost is the cumulative cost of the links in the path. The root ports for the non-root bridges are determined as follows.

SW1 has four paths to the root bridge, with each path yielding the following costs:

SW1 to SW3 (100 Mbps) cost = 19

SW1 to SW4 to SW3 (1 Gbps + 1 Gbps) cost = 4 + 4 = 8

SW1 to SW2 to SW 4 to SW3 (100 Mbps + 100 Mbps + 1 Gbps) cost = 19 + 19 + 4 = 42

SW1 to SW2 to SW3 (100 Mbps + 1 Gbps) cost = 19 + 4 = 23

SW1 will use the lowest cost path (SW1 to SW4 to SW3) as its root path. It will set the SW1 connection to SW4 to forwarding and the connection from SW1 to SW3 to blocking. The status of its third interface (SW1 to SW2) will be determined in Step 3, since it is a shared segment with SW2 that does not have a direct connection to the root bridge.

Switch 2 (SW2) has three paths to the root bridge, with each path yielding the following costs:

SW2 to SW3 (1 Gbps) cost = 4

SW2 to SW1 to SW3 (100 Mbps + 100 Mbps) cost = 19 + 19 = 38

SW2 to SW4 to SW3 (100 Mbps + 1 Gbps) cost = 19 + 4 = 23

SW2 will use the lowest cost path (SW2 to SW3) as its root path and will set the SW2 connection to SW3 to forwarding. The status of its second and third interfaces (SW2 to SW1 and SW2 to SW4) will be determined in step 3 since both are shared segments with SW2 and SW4 respectively that do not have a direct connection to the root bridge.

Switch 4 (SW4) has four paths to the root bridge, with each path yielding the following costs:

SW4 to SW3 (1 Gbps) cost = 4

SW4 to SW1 to SW3 (1 Gbps + 100 Mbps) cost = 4+19 = 23

SW4 to SW2 to SW1 to SW3 (100 Mbps + 100 Mbps + 100 Mbps) cost = 19 + 19 + 19 = 57

SW4 to SW2 to SW3 (1 Gbps + 100 Mbps) cost = 4 +19 = 23

SW4 will use the lowest cost path (SW4 to SW3) as its root path and set the SW4 connection to SW3 to forwarding. The status of SW4's second and third interfaces, SW4 to SW1 and SW4 to SW2, will be determined in step 3. Since these interfaces are shared segments with SW1 and SW2, they do not have a direct connection to the root bridge.

For Step 3, there are two segments in the diagram (SW1 to SW2 and SW2 to SW4) that do not connect directly to the root bridge. The interface on either end of the segment that has the least cost path to the root bridge will be the designated port for that section.

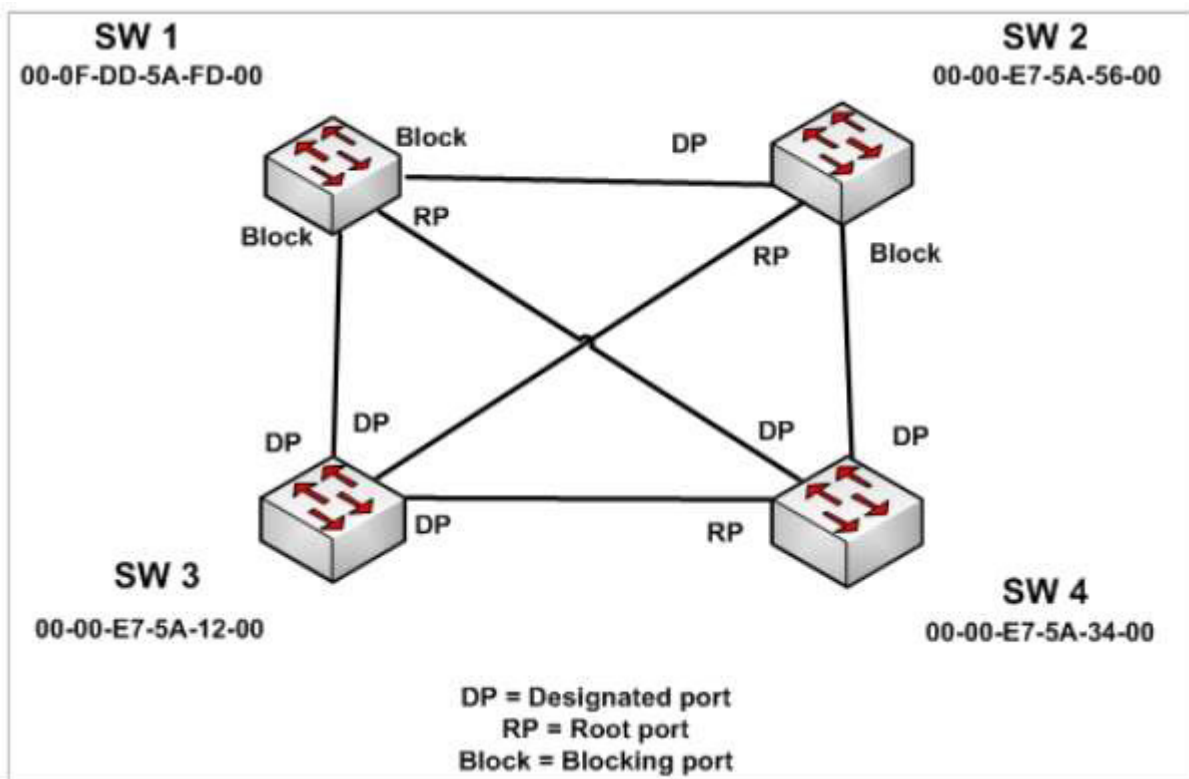
The designated port of each segment is determined in this way.

- For the SW1 to SW2 segment, the SW2 end of the segment has a shortest path cost of 1 Gbps (4) to the root, and the SW1 end of the segment has a shortest path cost through SW4 of 2 Gbps (8) to the root. The SW2 port to SW1 will be the designated port and will be forwarding.
- For the SW2 to SW4 segment, the SW2 end of the segment has a shortest path cost of 1 Gbps (4) to the root and the SW4 end of the segment has a shortest path cost of 1 Gbps (4) to the root. This is a tie. In the case of a tie, the interface connected to the switch with the lowest MAC address becomes the designated port for the segment. SW4 has the lowest MAC address, so the SW4 port to SW2 will be the designated



port and will be forwarding.

Once determined, the designated and root ports will be set to forwarding and all other ports will be set to discarding. The converged state of all ports is shown in the diagram below.



Once STP has converged, the port states will determine the path used when sending traffic from a host connected to one switch to a host connected to another switch. For example, if a host connected to SW3 were destined for a host connected to SW2, the path taken would be SW3 to SW2. It would not take SW3-SW1-SW2 or SW3-SW4-SW2 because on both of those paths, STP is blocking at least one port in the path.

Objective:

LAN Switching Fundamentals

Sub-Objective:

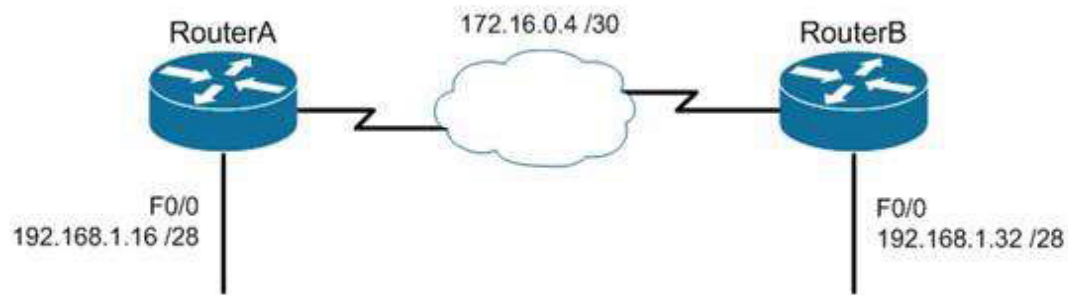
Configure, verify, and troubleshoot STP protocols

References:

[Home > Support > Technology Support > LAN Switching > Spanning Tree Protocol > Technology Information>Technology White Paper>Understanding Rapid Spanning Tree Protocol \(802.1w\)](#)

### QUESTION 102

Consider the following diagram:



Which of the following routing protocols could NOT be used with this design?

- A. RIPv1
- B. RIPv2
- C. EIGRP
- D. OSPF

**Correct Answer:** A

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The network design displayed has subnets of a major classful network located in opposite directions from the perspective of some of the individual routers. This configuration can be accommodated by any routing protocol that supports Variable Length Subnet masks (VLSM) or the transfer of subnet mask information in routing advertisements.

RIPv1 supports neither of these. RIPv1 will automatically summarize routing advertisements to their classful network (in this case 192.168.1.0/24). This action will cause some of the routers to have routes to the same network with different next hop addresses, which will NOT work.

EIGRP, RIPv2 and OSPF all support VLSM and can be used in the design shown in the scenario.

Objective:

Routing Fundamentals

Sub-Objective:

Compare and contrast distance vector and link-state routing protocols

References:

[Cisco > Home > Support > Technology Support > IP > IP Routed Protocols > Design > Design TechNotes > Why Don't IGRP and RIP v1 support VLSM?](#)

**QUESTION 103**

Which of the following methods will ensure that only one specific host can connect to port F0/1 on a switch?

- A. Configure port security on F0/1 to forward traffic to a destination other than that of the MAC address of the host.
- B. Configure the MAC address of the host as a static entry associated with port F0/1.

- C. Configure port security on F0/1 to accept traffic only from the MAC address of the host.
- D. Configure an inbound access control list on port F0/1 limiting traffic to the IP address of the host.
- E. Configure port security on F0/1 to accept traffic other than that of the MAC address of the host.

**Correct Answer:** C

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

To limit connections to a specific host, you should configure port security to accept traffic only from the MAC address of the host. By default, an unlimited number of MAC addresses can be learned on a single switch port, whether it is configured as an access port or a trunk port. Switch ports can be secured by defining one or more specific MAC addresses that should be allowed to connect, and by defining violation policies (such as disabling the port) to be enacted if additional hosts try to gain a connection.

The following example secures a switch port by manually defining the MAC address of allowed connections:

```
switch(config-if)# switchport port-security
switch(config-if)# switchport port-security mac-address 00C0.35F0.8301
```

The first command activates port security on the interface, while the second command statically defines the MAC address of 00c0.35f0.8301 as an allowed host on the switch port.

The mac-address-table static command assigns a permanent MAC address to the port, but does not prevent any other MAC addresses from being associated with the port. . The command below would assign the MAC address 0050.3e8d.62bb to port 15 on the switch:

```
switch(config)# mac-address-table static 0050.3e8d.6400 interface fastethernet0/15
```

You should not configure port security on F0/1 to forward traffic to a destination other than that of the MAC address of the host. Traffic from other hosts should be rejected, not forwarded or accepted. For the same reason, you should not configure port security on F0/1 to accept traffic other than that of the MAC address of the host.

You cannot configure an inbound access control list on port F0/1 limiting traffic to the IP address of the host. It is impossible to filter traffic based on IP addresses on a Layer 2 switch.

Objective:

Infrastructure Security

Sub-Objective:

Configure, verify, and troubleshoot port security

References:

[Cisco > Catalyst 6500 Release 12.2SXH and Later Software Configuration Guide > Configuring Port Security > Enabling Port Security](#)

**QUESTION 104**

You are advising a client on the options available to connect a small office to an ISP.

Which of the following is an advantage of using an ADSL line?

- A. it uses the existing cable TV connection
- B. it uses the existing phone line
- C. you receive a committed information rate (CIR) from the provider
- D. the upload rate is as good as the download rate

**Correct Answer:** B

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

xDSL lines, including the ADSL variant, use the existing phone line and as such make installing only a matter of hooking up the DSL modem to the line.

It does not use the existing cable TV connection. This is a characteristic of using a cable modem rather than ADSL.

You do not receive a committed information rate (CIR) from the provider. CIR is provided with a frame relay connection.

The upload rate is NOT as good as the download rate with asynchronous DSL (ADSL). The download rate is significantly better than the upload rate. Symmetric Digital Subscriber Line (SDSL) is a version of DSL that supplies an equal upload and download rate, but that is not the case with ADSL.

Objective:

WAN Technologies

Sub-Objective:

Describe WAN access connectivity options

References:

[Cisco Documentation > Internetworking Technology Handbook > Introduction to WAN Technologies > DSL](#)

### **QUESTION 105**

Which type of network uses Carrier Sense Multiple Access with Collision Detection (CSMA/CD) as an access method?

- A. Token Ring
- B. LocalTalk
- C. 100VG-AnyLan
- D. Ethernet

**Correct Answer: D**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

Ethernet networks use CSMA/CD as an access method. In CSMA/CD, if a device wants to send a frame in the network, it first determines if the network is free. If the network is not free, the node will wait before sending the frame into a network. If the network is free, it sends the frame; if another device sends a frame simultaneously then their signals or frames collide. When the collision is detected, both packets wait for a random time before retrying.

The following statements are true regarding CSMA/CD:

- CSMA/CD is required for shared collision domains, such as when hosts are connected via hubs. (Hubs are Layer 1 devices, and thus do not create collision domains.)
- CSMA/CD networks normally operate in half-duplex mode, since in a shared collision domain, a host cannot send and receive data at the same time.
- CSMA/CD is not required when connected to non-shared (private) collision domains, such as when hosts are connected to dedicated switch ports.
- Switches create dedicated collision domains, so devices can operate in full-duplex mode.

Token Ring is incorrect because Token Ring uses token passing as the access method.

LocalTalk is incorrect because LocalTalk uses CSMA/CA (Collision Avoidance) as the access method.

100VG-AnyLan is incorrect because 100VG-AnyLan uses demand priority as the access method.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Interpret Ethernet frame format

References:

[Cisco > Internetworking Technology Handbook > Introduction to LAN Protocols > LAN Media-Access Methods](#)

### QUESTION 106

Which two statements are TRUE of Internet Protocol (IP) addressing? (Choose two.)

- A. Public addresses are registered with the Internet Assigned Numbers Authority (IANA).
- B. These addresses are publicly registered with the Internet Service Provider (ISP).
- C. Through a public IP address, you can access another computer on the Internet, such as a Web server.
- D. The ranges of public IP addressing are 10.0.0.0 to 10.255.255.255, 172.16.0.0 to 172.31.255.255, and 192.168.0.0 to 192.168.255.255.
- E. Private addresses are allocated by the Internet Assigned Numbers Authority (IANA).

**Correct Answer:** AC

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

Public addresses are publicly registered with the Internet Assigned Numbers Authority (IANA). Through a public IP address, you can access an Internet computer like a Web server.

The following statements are true of public IP addressing:

- These addresses are publicly registered with the Internet Assigned Numbers Authority (IANA)
- Through a public IP address, you can access another Internet computer, such as a Web server.
- Other people on the Internet can obtain information about or access to your computer via a public IP address.
- Public IP addresses are visible to the public.

The option stating that public IP addresses are publicly registered with the Internet Service Provider (ISP) is incorrect. Public IP addresses are registered with the Internet Assigned Numbers Authority (IANA). Since 1998, InterNIC has been primarily responsible for allocating domain names and IP addresses under the governance of the Internet Corporation for Assigned Names and Numbers (ICANN) body, a U.S. non-profit corporation that was created to oversee work performed by the Internet Assigned Numbers Authority (IANA).

The option stating that 10.0.0.0 to 10.255.255.255, 172.16.0.0 to 172.31.255.255, and 192.168.0.0 to 192.168.255.255 are the range of public IP addressing is incorrect. These ranges belong to private IP addressing.

The option stating that private addresses are allocated by the IANA is incorrect. Private IP addresses are not managed, but are used by private organizations as they see fit.. The IANA is governed by ICANN, and its primary role is to allocate overseas global IP addresses from the pools of unallocated addresses, as well as DNS root zone management.

Objective:

Network Fundamentals

Sub-Objective:

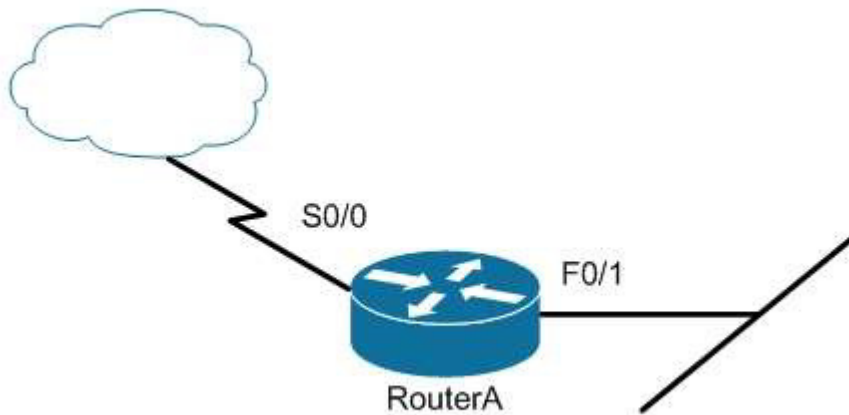
Describe the need for private IPv4 addressing

References:

<http://www.debianadmin.com/private-and-public-ip-addresses-explained.html>

### QUESTION 107

Users on the LAN are unable to access the Internet. How would you correct the immediate problem?



```
Router# show ip interface brief
```

```
Interface IP-Address OK? Method Status Protocol
FastEthernet 0/0 unassigned YES unset down down
FastEthernet 0/1 172.16.1.254 YES NVRAM up up
Serial0/0 200.16.4.25 YES NVRAM administratively down down
Serial0/1 unassigned YES unset down down
```

- A. Configure a bandwidth on the serial interface.
- B. Perform a no shutdown command on the serial interface.
- C. Configure a private IP address on the Fastethernet0/0 LAN interface.
- D. Change the IP address on the serial interface.

**Correct Answer: B**

**Section: (none)**

**Explanation**

#### **Explanation/Reference:**

Explanation:

The output indicates that the serial interface leading to the Internet is administratively down. All router interfaces are disabled by default due to the presence of a shutdown command in the running configuration. The no shutdown command removes this configuration, and the interface becomes active. The command sequence is:

```
Router(config)# interface serial0/0
Router(config-if)# no shutdown
```

Although it was not the problem in the scenario, the S0/0 interface could also cause an error if it is configured as shown in this output:

```
Interface IP-Address OK? Method Status Protocol
```

```
Serial0/0 200.16.4.25 YES NVRAM up down
```

In this example, the S0/0 interface has been enabled, and while there is Layer 1 connectivity (the Status column), Layer 2 is not functioning (the Protocol column). There are two possible reasons for this result:

- Interface S0/0 is not receiving a clock signal from the CSU/DSU (if one is present).
- The encapsulation type configured on S0/0 does not match the type configured on the other end of the link (if the other end is a router).

Configuring a bandwidth on the serial interface is incorrect because the output indicates the interface is administratively down, which does not pertain to bandwidth.

Configuring a private IP address on the FastEthernet0/0 LAN interface is incorrect because the output indicates the problem is with the disabled serial interface.

The IP address on the serial interface may or may not be valid, but it is not the immediate cause of the connectivity problem. The serial interface is disabled.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Troubleshoot interface and cable issues (collisions, errors, duplex, speed)

References:

[Cisco > Support > Administrative Commands > shutdown](#)

### QUESTION 108

Two catalyst switches on a LAN are connected to each other with redundant links and have Spanning Tree Protocol (STP) disabled.

What problem could occur from this configuration?

- A. It may cause broadcast storms.
- B. All ports on both switches may change to a forwarding state.
- C. It may cause a collision storm.
- D. These switches will not forward VTP information.

**Correct Answer: A**

**Section: (none)**

**Explanation**

#### Explanation/Reference:

Explanation:

The configuration in the scenario may cause broadcast storms. When there are redundant links between two switches, it is recommended that you enable Spanning Tree Protocol to avoid switching loops or broadcast storms. Loops occur when there is more than one path between two switches. STP allows only one active path at a time, thus preventing loops. A broadcast storm occurs when the network is plagued with constant broadcasts. When the switches have redundant links, the resulting loops would generate more broadcasts, eventually resulting in a complete blockage of available bandwidth that could bring the complete network down. This situation is referred to as a broadcast storm.

The option stating that all ports on both switches may change to a forwarding state is incorrect. Forwarding is a port state that is available when using STP. When STP is disabled, the switch cannot change the STP states of its ports.

The option stating that the switches will not forward VLAN Trunking Protocol (VTP) information is incorrect. Enabling or disabling STP does not have a direct effect on VTP messages.

The term collision storm is not a valid term.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot interswitch connectivity



References:

[Cisco > Support > Technology Support > LAN Switching > Ethernet > Design > Troubleshooting LAN Switching Environments > Document ID: 12006 > Spanning Tree Protocol](#)

#### QUESTION 109

Which two are the limitations of the service password-encryption command? (Choose two.)

- A. It uses the MD5 algorithm for password hashing.
- B. It uses the Vigenere cipher algorithm.
- C. An observer cannot read the password when looking at the administrator's screen.
- D. The algorithm used by this command cannot protect the configuration files against detailed analysis by attackers.

**Correct Answer:** BD

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

The following are limitations of the service password-encryption command:

- It uses the Vigenere cipher algorithm, which is simple in nature.
- A cryptographer can easily crack the algorithm in a few hours.
- The algorithm used by this command cannot protect the configuration files against detailed analysis by attackers.

The service password-encryption command does not use the MD5 algorithm for password hashing. The MD5 algorithm is used by the enable secret command.

The option stating that an observer cannot read the password when looking at the administrator's screen is incorrect because this is an advantage of the service password-encryption command.

Objective:

Infrastructure Security

Sub-Objective:

Configure, verify, and troubleshoot basic device hardening

References:

[Cisco Documentation > Cisco IOS Security Command Reference, Release 12.4 > service password-encryption](#)  
[Cisco > Tech Notes > Cisco Guide to Harden Cisco IOS Devices > Document ID: 13608](#)

#### QUESTION 110

Which of the following items are NOT required to match for two routers to form an OSPF adjacency?

- A. Area IDs
- B. Hello/Dead timers
- C. Passwords (if OSPF authentication has been configured)
- D. Process IDs

**Correct Answer:** D

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

All of the listed items must match except for the process IDs. The process IDs are locally significant, which keeps multiple instances of OSPF separate on a router, and do not need to match between neighboring routers for the adjacency to form. Process identifiers can be valued from 1 to 65535.

Adjacencies must be formed before routing updates can be exchanged. OSPF routers will form neighbor adjacencies on common subnets if the following three items match:

- Area IDs
- Hello/Dead timers
- Passwords (if OSPF authentication has been configured)

Once an adjacency has been formed it will be maintained by the exchange of Hello messages. On a broadcast medium like Ethernet, they will be sent every 10 seconds. On point-to-point links, they will be sent every 30 seconds.

The show ip ospf interface interface number command can be used to display the state of the DR/BDR election process.

Consider the following output:

```
RouterA# show ip ospf interface fastethernet0/0
```

```
Fastethernet0/0 is up, line protocol is up
Internet Address 192.168.30.2/24, Area 0
Process ID 1, Router ID 192.168.45.1, Network Type BROADCAST,
Cost: 10
Transmit Delay is 1 sec, State DR, Priority 1
Designated Router (ID) 192.168.45.1, Interface address
192.168.30.2
No backup designated router on this network
Timer intervals configured, Hello 10, Dead 40, Wait 40,
Retransmit 5
Hello due in 00:00:06
```

```
RouterB# show ip ospf interface fastethernet0/0
Fastethernet0/0 is up, line protocol is up
Internet Address 192.168.30.1/24, Area 0
Process ID 2, Router ID 192.168.60.1, Network Type BROADCAST,
Cost: 10
Transmit Delay is 1 sec, State DR, Priority 2
Designated Router (ID) 192.168.60.1, Interface address
192.168.30.1
No backup designated router on this network
Timer intervals configured, Hello 30, Dead 60, Wait 40,
Retransmit 5
Hello due in 00:00:12
```

The timer intervals' configured output reveals that RouterA is showing a Hello timer of 10 seconds and a Dead timer of 40 seconds. RouterB has a Hello timer of 30 seconds and a Dead timer of 60 seconds. Hello/Dead timers have to match before OSPF routers will form an adjacency. If you executed the debug ip ospf events command on one of the routers, the router at serial /01 will not form a neighbor relationship because of mismatched hello parameters:

```
RouterA# debug ip ospf events
OSPF events debugging is on
RouterA#
*Nov 9 05:41:21.456:OSPF:Rcv hello from 10.16.2.3 area 0 from Serial0/1
```

```
192.168.35.1
*Nov 9 05:41:21.698:OSPF:Mismatched hello parameters from
192.168.35.1
```

Hellos are used to establish neighbor adjacencies with other routers. On a point-to-point network, hello packets are sent to the multicast address 224.0.0.5, which is also known as the ALLSPFRouters address.

Area IDs have to match for OSPF routers to form an adjacency. Both of these routers have the interface correctly configured in matching Area 0.

The interface priorities do not have to match for OSPF routers to form an adjacency. Interface priorities can be configured to control which OSPF router becomes the designated router (DR) or backup designated router (BDR) on a multi-access network segment.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot single area and multi-area OSPFv2 for IPv4 (excluding authentication, filtering, manual summarization, redistribution, stub, virtual-link, and LSAs)

References:

[Cisco > Home > Support > Technology Support > IP > IP Routing > Design > Design TechNotes > OSPF Neighbor Problems Explained](#)

### QUESTION 111

Which command will save a dynamically learned MAC address in the running-configuration of a Cisco switch?

- A. switchport port-security mac-address
- B. switchport port-security
- C. switchport port-security sticky mac-address
- D. switchport port-security mac-address sticky
- E. switchport mac-address sticky

**Correct Answer: D**

**Section: (none)**

**Explanation**

#### **Explanation/Reference:**

Explanation:

Issuing the switchport port-security mac-address sticky command will allow a switch to save a dynamically learned MAC address in the running-configuration of the switch, which prevents the administrator from having to document or configure specific MAC addresses. Once the approved MAC addresses have all been learned, the network administrator simply saves the running-configuration file to NVRAM with the copy running-config startup-config command.

Switches dynamically build MAC address tables in RAM, which allow the switch to forward incoming frames to the correct target port. By default, an unlimited number of MAC addresses can be learned on a single switch port, whether it is configured as an access port or a trunk port. Switch ports can be secured by defining one or more specific MAC addresses that should be allowed to connect, and by defining violation policies (such as disabling the port) if additional hosts try to gain a connection. The following command secures a switch by manually defining an allowed MAC address:

**switch(config-if)# switchport port-security mac-address 00C0.35F0.8301**

This command statically defines the MAC address of 00c0.35f0.8301 as an allowed host on the switch port. Manually configuring all of your switch ports in this way, however, would require documenting all of your existing MAC addresses and configuring them specifically per switch port, which could be an extremely time-consuming task.

An example of the use of the switchport port-security mac-address sticky command is shown below:

```
Switch(config)#interface fastethernet0/16
Switch(config-if)#switchport port-security
Switch(config-if)#switchport port-security mac-address sticky
Switch(config-if)#switchport port-security maximum 1
```

With the above configuration, if a computer with a MAC address of 0000.00bb.bbbb were plugged into the switch, the following two things would occur:

- Only the host with MAC address 000.00bb.bbbb will be allowed to transmit on the port. This is a result of the port-security mac-address-sticky command, which instructs the switch to learn the next MAC address it sees on the port, and of the port-security maximum 1 command, which further instructs the switch that the address learned is the only address allowed on the port.
- All frames arriving at the switch with a destination address of 0000.00bb.bbb will be forwarded out on Fa0/16.

The switchport port-security mac-address sticky command can also be used in combination with the interface-range command to make every port on the switch behave in this fashion as shown below for a 24-port switch.

```
Switch(config)#interface range fastethernet0/1-24
Switch(config-if)#switchport port-security
Switch(config-if)#switchport port-security mac-address sticky
Switch(config-if)#switchport port-security maximum 1
```

The switchport port-security mac-address command is incorrect since this command requires an additional argument to be valid (either a statically configured MAC address or the sticky option).

The switchport port-security command activates port security on the switch port, but does not configure sticky MAC address learning.

The switchport port-security sticky mac-address and switchport mac-address sticky options are incorrect because these are not valid Cisco IOS commands.

Objective:

Infrastructure Security

Sub-Objective:

Configure, verify, and troubleshoot port security

References:

[Cisco > Catalyst 6500 Release 12.2SXH and Later Software Configuration Guide > Configuring Port Security > Enabling Port Security with Sticky MAC Addresses on a Port](#)

[Cisco > Cisco IOS Security Command Reference > show vtemplate through switchport port-security violation > switchport port-security mac-address](#)

## QUESTION 112

### DRAG DROP

Group the special DHCP messages exchanged over the network, on the left, into the different transmission types, on the right.

**Select and Place:**

DHCP Messages	Unicast	Multicast	Broadcast
DHCPACK			
DHCPOFFER			
DHCPREQUEST			
DHCPDISCOVER			

Correct Answer:



Sub-Objective:

Configure and verify DHCP on a router (excluding static reservations)

References:

[Cisco Documentation > Cisco IOS IP Configuration Guide, Release 12.2 > Part 1: IP Addressing and Services > Configuring DHCP](#)

### QUESTION 113

Which Cisco Internetwork Operating System (IOS) command would be used to define a static route for network 192.168.11.0 through default gateway 192.168.43.1?

- A. router(config)# ip route 192.168.11.0 255.255.255.0 192.168.43.1
- B. router# ip route 192.168.11.0 255.255.255.0 192.168.43.1
- C. router(config)# ip classless 192.168.43.1
- D. router(config)# ip default gateway 192.168.11.0 255.255.255.0 192.168.43.1
- E. router# ip default gateway 192.168.43.1

**Correct Answer: A**

**Section: (none)**

**Explanation**

#### Explanation/Reference:

Explanation:

The router(config)# ip route 192.168.11.0 255.255.255.0 192.168.43.1 command would be used to define a static route for network 192.168.11.0 through default gateway 192.168.43.1. Static routing is used to manually configure routes to remote networks. The syntax of the ip route command is as follows:

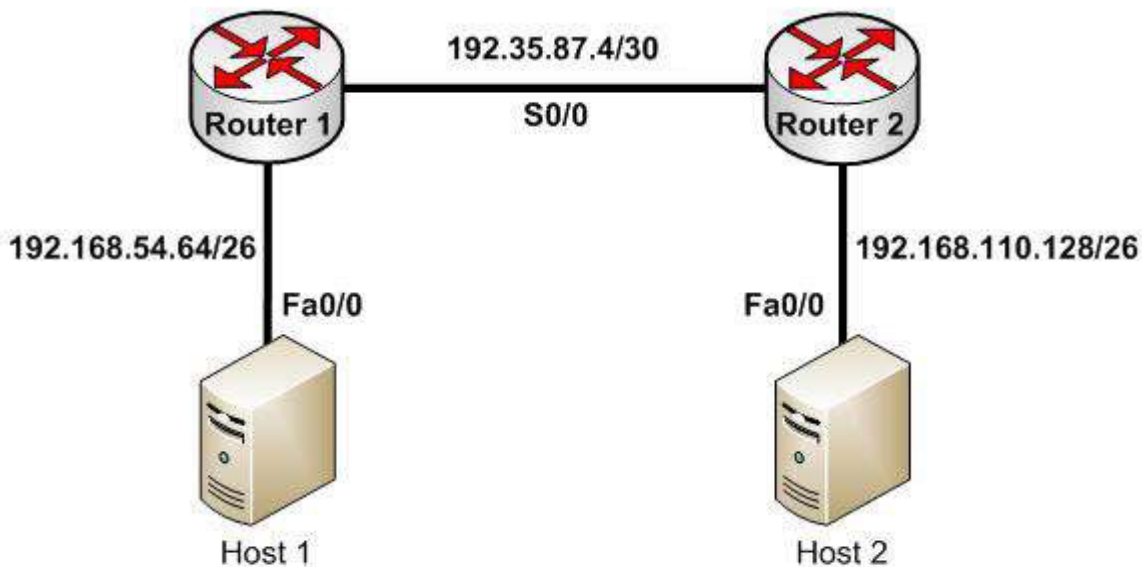
**ip route [destination\_network] [mask] [next-hop\_address or exit interface] [administrative\_distance] [permanent]**

The parameters of the command are as follows:

- destination\_network: Defines the network that needs to be added in the routing table.
- mask: Defines the subnet mask used on the network.
- next-hop\_address: Defines the default gateway or next hop router that receives and forwards the packets to the remote network.
- administrative\_distance (AD): Static routes have an AD of 1, which can be changed to change the priority of the route.

Static routing is often implemented in small yet stable networks where the number of routes is small and manageable, and the network can benefit from the elimination of the traffic that dynamic routing protocols would introduce. If this is the case, it is important that all routes be statically created, or else networking problems can occur. For example, if in the diagram below no route to the 192.168.110.128/26 network on Router 2 exists on Router 1, Host 1 will be unable to ping Host 2. The fact that Host 1 would still be able to ping the S0/0 interface on Router 2 could obscure this missing route.





Host 1 will be able to ping the S0/0 interface of Router 2 because the 192.35.87.4/30 network will be in the routing table of Router 1, being directly connected to Router 1. Directly connected routes are automatically placed in the routing table. However, if you executed the show run command on Router 1, the output would indicate that no route to the 192.168.110.128/26 exists:

```

<output omitted>
interface Fa0/1
  ip address 192.168.54.65 255.255.255.192
  no shutdown
interface S0/0
  ip address 192.35.87.5 255.255.255.252
  no shutdown

```

The option router# ip route 192.168.11.0 255.255.255.0 192.168.43.1 is incorrect because the ip route command should be configured in the global configuration mode.

The option router(config)# ip classless 192.168.43.1 is incorrect because the ip classless global configuration mode command allows a router to accept and forward packets for subnets that are not directly connected. The packets are forwarded to the best available supernet route.

The option router(config) # ip default gateway 192.168.11.0 255.255.255.0 192.168.43.1 is incorrect because the ip default gateway command is used to define the default gateway address when IP routing is disabled in the network.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot IPv4 and IPv6 static routing

References:

[Cisco > Cisco ASDM User Guide, 6.1 > Configuring Dynamic And Static Routing > Field Information for Static Routes](#)

[Cisco > Support > IP > IP Routing > Design > Design TechNotes > Specifying a Next Hop IP Address for Static Routes > Document ID: 27082](#)

[Cisco > Cisco IOS IP Routing Protocols Command Reference > IP Routing Protocol-Independent Commands:](#)

[A through R > ip route](#)

#### QUESTION 114

Which of the following statements are true of Class C IP addresses?

- A. The decimal values of the first octet can range from 192 to 223
- B. The decimal values of the first octet can range from 1 to 126
- C. The first octet represents the entire network portion of the address
- D. The first three octets represent the entire network portion of the address
- E. The value of the first binary place in the first octet must be 0
- F. The value of the first two binary places in the first octet must be 11

**Correct Answer:** ADF

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

A class C IP addresses will have the following characteristics:

- The decimal values of the first octet can range from 192 to 223
- The first three octets represent the entire network portion of the address
- The value of the first two binary place in the first octet must be 11

Class B IP addresses will have the following characteristics:

- The decimal values of the first octet can range from 128 to 191
- The first two octets represent the entire network portion of the address
- The value of the first two binary place in the first octet must be 10

Class A IP addresses will have the following characteristics:

- The decimal values of the first octet can range from 1 to 126
- The first octet represents the entire network portion of the address
- The value of the first binary place in the first octet must be 0

Objective:

Network Fundamentals

Sub-Objective:

Compare and contrast IPv4 address types

References:

[Cisco > IP Routing > IP Addressing and Subnetting for New Users](#)

#### QUESTION 115

Which protocol is used in redundant network topologies to avoid receiving multiple copies of the same frame?

- A. 802.1q
- B. Spanning Tree Protocol
- C. Cisco Discovery Protocol
- D. Routing Information Protocol

**Correct Answer:** B

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

Spanning Tree Protocol (STP) is used to remove switching loops in redundantly configured switched

environments, and to create a single active Layer 2 path between any two network segments. This eliminates the chance of multiple copies of the same unicast frame being sent in the LAN. It also prevents broadcast packets from creating a broadcast storm when redundant connections exist between the switches. The benefits of STP include:

- Prevention of broadcast storms
- Prevention of multiple frame copies
- Media Access Control (MAC) address database stability

Whenever a network segment can be handled by more than one switch, STP will elect one switch to take responsibility, and the other switches will be placed into a blocking state for the ports connected to that segment. In this way, only one switch receives and forwards data for this segment, which removes the potential for multiple copies of the same frame being generated. For STP to provide this functionality it must be running on all of the switches. Therefore, a properly implemented redundant topology STP is required in order to prevent multiple copies of the same unicast frame from being transmitted.

802.1q is a frame tagging method for identifying Virtual LAN (VLAN) memberships over trunk links. Frame tagging ensures identification of individual VLAN frames over a trunk link carrying frames for multiple VLANs. This frame tagging method is a standardized protocol that was developed by The Institute of Electrical and Electronics Engineers (IEEE). Cisco has also developed a proprietary frame tagging method known as Inter-Switch Link (ISL). 802.1q does not mitigate loops or the reception of multiple copies of frames. The IEEE specification for STP is 802.1d.

Cisco Discovery Protocol is a Cisco proprietary protocol used to collect hardware and protocol information for directly connected Cisco devices. CDP has nothing to do with redundant network topologies.

Routing Information Protocol (RIP) is a distance vector routing protocol. It populates routing tables dynamically about the topology changes. However, RIP does not control the receipt of multiple copies of frames in redundant network topologies.

Objective:

LAN Switching Fundamentals

Sub-Objective:

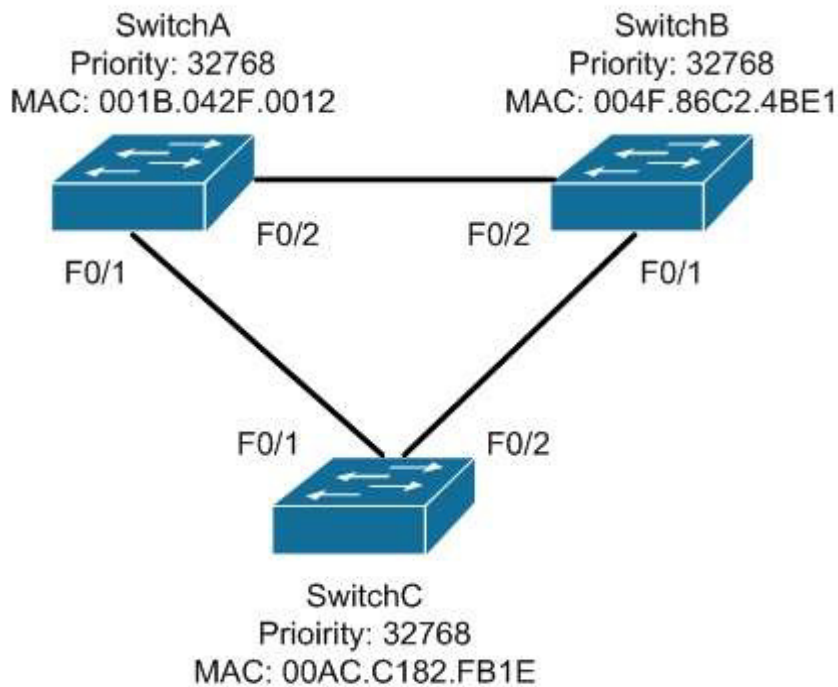
Configure, verify, and troubleshoot STP protocols

References:

[Cisco > Support > Configuring Spanning Tree-Protocol > How STP Works](#)

## **QUESTION 116**

View the following network diagram:



Which switch will become the root bridge?

- A. SwitchA
- B. SwitchB
- C. SwitchC
- D. The root bridge cannot be determined from the given information.

**Correct Answer:** A

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

SwitchA will become the root bridge. The bridge ID, also known as the switch ID, is used to elect the root bridge in a redundant network topology. The bridge ID has two components:

- Switch's priority number: Configured as 32768 on Cisco switches by default
- Switch's Media Access Control (MAC) address: The burnt-in hardware address of the network interface card

The switch with the lowest bridge ID is selected as the root bridge. If the same priority number is configured on two or more switches in the network, the switch with the lowest MAC address will become the root. Bridge Protocol Data Units (BPDUs) communicate the details of the switch with the lowest bridge ID in the network. The election process for the root bridge takes place every time there is a topology change in the network. A topology change may occur due to the failure of a root bridge or the addition of a new switch in the network. The root bridge originates BPDUs every two seconds, which are propagated by other switches throughout the network. BPDUs are used as keepalives between switches, and if a switch stops receiving BPDUs from a neighboring switch for ten intervals (20 seconds), it will assume a designated role for the network segment.

Neither SwitchB nor SwitchC will become the root bridge. Although both have an equal priority value to SwitchA (32768), the MAC addresses of SwitchB and SwitchC are higher than that of SwitchA.

The root bridge can be determined with the information given. If the diagram did not indicate MAC addresses, then the root bridge would not be able to be determined, since the priorities are equal.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot STP protocols

References:

[Cisco Documentation > Cisco 7600 Series Cisco IOS Software Configuration Guide, 12.2SX > Configuring STP and IEEE 802.1s MST > Understanding the Bridge ID Support > Technology Support > LAN Switching > Spanning Tree Protocol > Configure > Configuration Examples and TechNotes > Understanding and Configuring Spanning Tree Protocol \(STP\) on Catalyst Switches](#)

### QUESTION 117

You are configuring Open Shortest Path First (OSPF) protocol for IPv6 on Router5. The router has two interfaces, which have been configured as follows:

S0/0 - 192.168.5.1/24

S0/1 - 10.0.0.6/8

You would like OSPF to route for IPv6 only on the S0/0 network. It should not route for IPv6 on the S0/1 network. The process ID you have chosen to use is 25. You do not want to apply an IPv6 address yet.

Which of the following command sets would enable OSPF for IPv6 as required?

- A. Router5(config)#ipv6 ospf 25  
Router5(config)# network 192.168.5.0
- B. Router5(config)#ipv6 ospf 25  
Router5(config)#router-id 192.168.5.1
- C. Router5(config)#ipv6 unicast-routing  
Router5(config)#ipv6 router ospf 25  
Router5(config-rtr)#router-id 1.1.1.1  
Router5(config)#interface S0/0  
Router5(config-if)#ipv6 ospf 25 area 0
- D. Router5(config)#ipv6 unicast-routing  
Router5(config)#ipv6 ospf 25  
Router5(config-rtr)#router-id 1.1.1.1

**Correct Answer: C**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

The correct command sequence would be as follows:

```
Router5(config)# ipv6 unicast-routing
Router5(config)# ipv6 router ospf 25
Router5(config-rtr)# router-id 1.1.1.1
Router5(config)# interface S0/0
Router5(config-if)# ipv6 ospf 25 area 0
```

The first line enables IPv6 routing with the ipv6 unicast-routing command. The second line enables OSPF routing for IPv6 with the ipv6 router ospf command. The third assigns a necessary router ID (which was chosen at random) with the router-id command. The last two lines enable OSPF for area 0 on the proper interface.

The following command set is incorrect because it does not enable OSPF routing for IPv6, assign a necessary router ID, or enable OSPF for area 0 on the proper interface:

```
Router5(config)# ipv6 ospf 25
Router5(config)# network 192.168.5.0
```

This command set also displays incorrect use of the network command. The network command would be used with OSPF v2.

The following command set fails to enable OSPF routing for IPv6, assign a necessary router ID, or enable OSPF for area 0 on the proper interface:

```
Router5(config)# ipv6 ospf 25
Router5(config)# router-id 192.168.5.1
```

It also assigns the router ID under global configuration mode, rather than under router ospf 25 configuration mode as required.

The following command set fails to enable OSPF for area 0 on the proper interface:

```
Router5(config)# ipv6 unicast-routing
Router5(config)# ipv6 ospf 25
Router5(config-rtr)# router-id 1.1.1.1
```

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot single area and multi-area OSPFv3 for IPv6 (excluding authentication, filtering, manual summarization, redistribution, stub, virtual-link, and LSAs)

References:

[Cisco > Implementing OSPF for IPv6 > How to Implement OSPF for IPv6](#)

[Cisco > Cisco IOS IPv6 Command Reference > ipv6 unicast-routing](#)

[Cisco > Cisco IOS IPv6 Command Reference > ipv6 ospf area](#)

### QUESTION 118

The conference room has a switch port available for use by the presenter during classes. Each presenter uses the same PC attached to the port. You would like to prevent any other PCs from using that port. You have completely removed the former configuration in order to start anew.

Which of the following steps are required to prevent any other PCs from using that port?

- A. make the port a trunk port
- B. enable port security
- C. make the port an access port
- D. assign the MAC address of the PC to the port
- E. make the port a sticky port
- F. set the maximum number of MAC addresses on the port to 1

**Correct Answer:** BCD

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

You should create the port as an access port, enable port security, and statically assign the MAC address of the PC to the port. Creating the port as an access port ensures that the PC can use the port and port security can be enabled on the port. The second step is to enable port security, which is required to use the third command.

The third command sets the MAC address of the PC as the statically assigned address on that port, meaning that only that address can send and receive on the port.

You should not make the port a trunk port. There is no need to make this a trunk port because it will not be carrying multiple VLAN traffic, only the traffic of the PC.

You should not make the port a sticky port. The sticky keyword, when used with switchport port-security command, is used to allow a port to dynamically learn the first MAC address it sees in the port, add it to the MAC address table, and save it to the running configuration of the switch. It will not limit the MAC addresses allowed on the port to that of the PC.

You should not set the maximum number of MAC addresses on the port to 1. That would prevent the attachment of a hub or switch to the port, but would not restrict the MAC addresses allowed on the port to the MAC address of the PC.

Objective:

Infrastructure Security

Sub-Objective:

Configure, verify, and troubleshoot port security

References:

[Catalyst 4500 Series Switch Cisco IOS Software Configuration Guide, 12.2\(20\)EWA > Configuring Port Security](#)

## **QUESTION 119**

DRAG DROP

Click and drag the VLAN Trunking Protocol (VTP) mode descriptions on the left to their corresponding VTP modes on the right. (The descriptions on the left can be used more than once.)

**Select and Place:**



Descriptions	Server Mode	Client Mode	Transparent Mode
Switch can add, modify, or delete VLANs.			
Switch can generate VTP messages.			
Switch can forward VTP messages.			
Switch can synchronize VTP information.			

Correct Answer:



- Switches forward advertisements.
- Does not synchronize VTP information.
- VLAN information is saved in NVRAM.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot inter-VLAN routing

References:

[Support > Technology Support > LAN Switching > Virtual LANs/VLAN Trunking Protocol \(VLANs/VTP\) > Configure > Configuration Examples and TechNotes > Configuring VLAN Trunk Protocol \(VTP\)](#)  
[CCNA Routing and Switching Complete Study Guide: Exam 100-105, Exam 200-105, Exam 200-125, 2nd Edition](#), Chapter 2: LAN Switching Technologies - Configure, verify, and troubleshoot VLANs (normal/extended range) spanning multiple switches

### QUESTION 120

Which command is used to view the entire routing table?

- A. show route-map
- B. show ip mroute
- C. show ip route
- D. show ip protocols

**Correct Answer: C**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

The show ip route command is used to view the entire routing table. The output of this command consists of codes, gateway of last resort, directly connected networks, and routes learned through different protocols working on the network. The syntax of the show ip route command is as follows:

**show ip route [address [mask] [longer-prefixes]] | [protocol [process-id]]**

The parameters of the show ip route command are as follows:

- address: Specifies the address for which the routing information should be displayed.
- mask: Specifies the subnet mask.
- longer-prefixes: Specifies the combination of mask and address.
- protocol: Specifies the name of the routing protocols such as Routing Information Protocol (RIP), or Open Shortest Path First (OSPF).
- protocol-id: Specifies the protocol ID used to identify a process of a particular protocol.

The show route-map command is incorrect because this command is used to view the route-maps configured on the router.

The show ip mroute command is incorrect because this command is used to view the contents of the IP multicast routing table.

The show ip protocols command is incorrect because this command is used to view the routing protocols parameters, and the current timer values.

Objective:

Routing Fundamentals

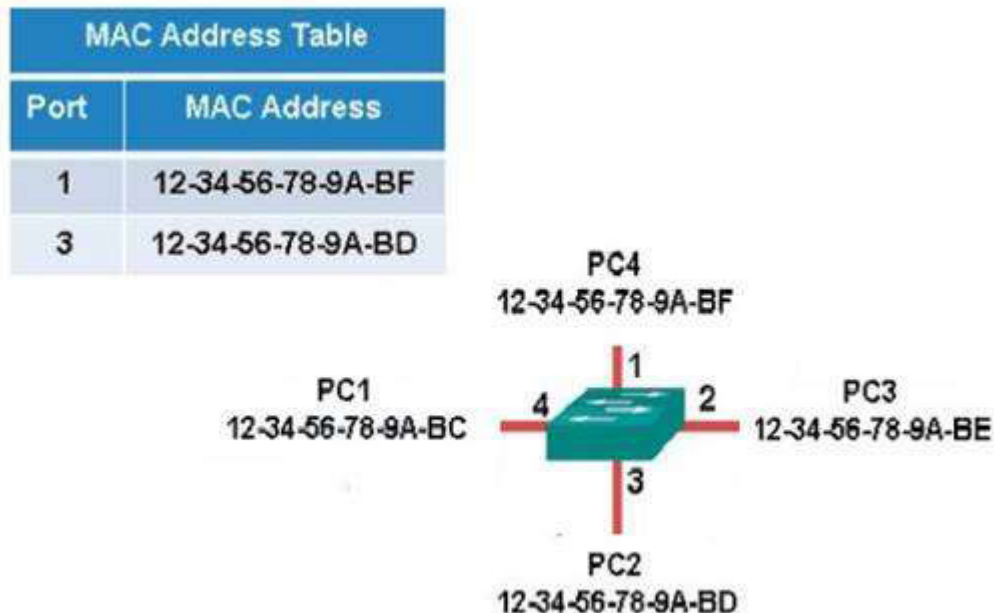
Sub-Objective:

Interpret the components of routing table

References:

### QUESTION 121

The exhibit displays the MAC address table of a switch in your network, along with the location of each device connected to the switch.



Which of the following frames will cause the switch to add a new MAC address to its table and forward the frame to all ports when the frame is received?

- A. source MAC: 12-34-56-78-9A-BC, destination MAC: ff-ff-ff-ff-ff-ff
- B. source MAC: ff-ff-ff-ff-ff-ff, destination MAC: 12-34-56-78-9A-BC
- C. source MAC: 12-34-56-78-9A-BF, destination MAC: 12-34-56-78-9A-BC
- D. source MAC: 12-34-56-78-9A-BC, destination MAC: 12-34-56-78-9A-BF

**Correct Answer: A**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

The only frame that will be handled in the specified way is the one with a source MAC of 12-34-56-78-9A-BC and a destination MAC of ff-ff-ff-ff-ff-ff. Since the source address 12-34-56-78-9A-BC is not already in the MAC table, the switch will add it. It will forward the frame to all ports because the destination is the broadcast MAC address of ff-ff-ff-ff-ff-ff.

A frame with a source MAC of ff-ff-ff-ff-ff-ff and a destination MAC of 12-34-56-78-9A-BC is an impossible combination. That would mean that the frame is coming from all devices, which is not possible.

The frame with a source MAC of 12-34-56-78-9A-BF and a destination MAC of 12-34-56-78-9A-BC would be sent to all ports because the destination MAC address is not in the MAC address table. However, the switch would not add a new MAC address to the table because the source address is already in the table.

The frame with a source MAC of 12-34-56-78-9A-BC and a destination MAC of 12-34-56-78-9A-BF would not be forwarded to all ports because the destination MAC address is in the table. The switch would add a new MAC address to the table because the source MAC address is not currently in the MAC address table.

Objective:

LAN Switching Fundamentals

Sub-Objective:

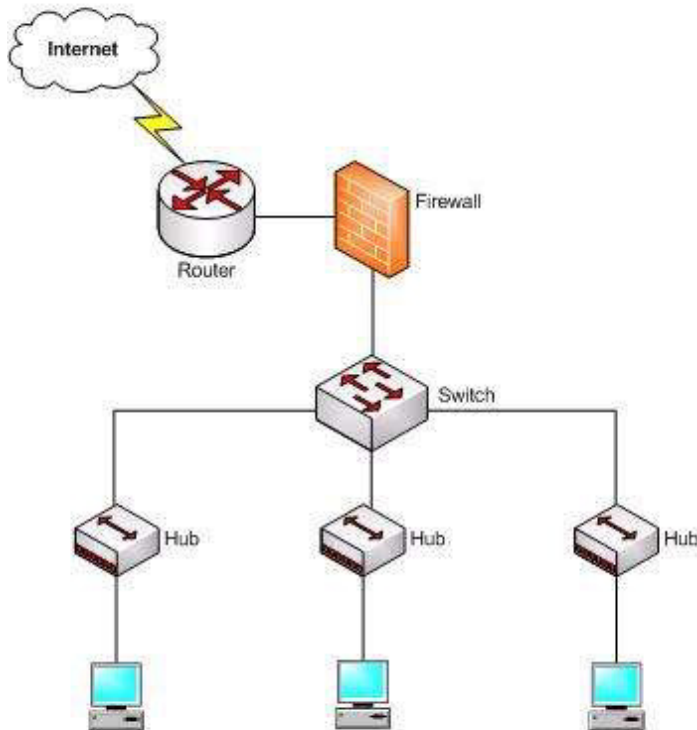
Interpret Ethernet frame format

References:

[Cisco Press > Articles > Cisco Certification > CCNA Routing and Switching > Basic Data Transmission in Networks: MAC Tables and ARP Tables](#)  
[How do Switches Work?](#)

### QUESTION 122

Which device in the given network diagram has as its primary responsibility the regulation of network traffic flow based on different trust levels for different computer networks?



- A. the router
- B. the switch
- C. the hub(s)
- D. the firewall

**Correct Answer:** D

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The firewall has as its primary responsibility the regulation of network traffic flow based on different trust levels for different computers or networks. In the network diagram shown in the exhibit, a firewall protects the network from unauthorized access attempts. A firewall can be implemented in hardware or software. Firewalls permit, deny, or filter data packets coming into and going out of the network. This helps prevent unauthorized access attempts from outside the network.

The primary function of a router is to perform routing between two subnets or between dissimilar network technologies. Routers can provide limited firewall functionality, but a firewall is a dedicated hardware or software solution with the primary responsibility of securing the network. A router does not have as its primary responsibility the regulation of network traffic flow based on different trust levels.

Switches work at Layer 2 in the Open System Interconnection (OSI) model and perform the function of separating collision domains. A switch does not have as its primary responsibility the regulation of network traffic flow based on different trust levels.

A hub is a device that provides a common connection point for network devices. The primary responsibility of a hub is not to regulate network traffic flow based on different trust levels.

Objective:

Network Fundamentals

Sub-Objective:

Describe the impact of infrastructure components in an enterprise network

References:

[Cisco > Home > Internetworking Technology Handbook > Internetworking Basics> Bridging and Switching Basics](#)

**QUESTION 123**

Which Cisco IOS command enables a router to copy IOS images to a router?

- A. copy tftp flash
- B. copy flash tftp
- C. copy running-config tftp
- D. copy running-config startup-config
- E. copy tftp running-config

**Correct Answer:** A

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The copy tftp flash command enables a router to copy an IOS image (the router operating system) to a router from a TFTP server. One router can act as a TFTP server to the other in this process.

The following example illustrates the steps to copy an image from Router A to Router B:

- Verify the connectivity between Router A and Router B using the ping command.
- Check the image size on both of the routers with the show flash command to verify that enough space exists on Router B.
- Configure Router A as the TFTP server using the configure terminal command. Use the tftp-server flash [partition-number:]filename1 [alias filename2] [access-list-number] command to define the path to system image that needs to be transferred. There can be multiple entries for multiple images.

- Copy the image from Router A to Router B using the copy tftp flash command.
- Verify the flash for the copied new image on Router B with the show flash command.

The copy flash tftp command is used to copy an IOS image from the router to a TFTP server.

The copy running-config tftp command is used to copy the active or running configuration file from RAM to a TFTP server.

The copy running-config startup-config command copies the active or running configuration from RAM to NVRAM. This command creates the configuration file that will be used as the startup configuration at reboot. This should always be done after making changes to the router so that the changes are saved when the router is rebooted.

The copy tftp running-config command merges a backup configuration with the currently active running configuration in RAM.

Objective:  
Infrastructure Management  
Sub-Objective:  
Perform device maintenance

References:

#### **QUESTION 124**

You have been assigned a network ID of 172.16.0.0/26. If you utilize the first network resulting from this ID, what would be the last legitimate host address in this subnet?

- A. 172.16.0.64
- B. 172.16.0.63
- C. 172.16.0.62
- D. 172.16.0.65

**Correct Answer: C**

**Section: (none)**

**Explanation**

#### **Explanation/Reference:**

Explanation:

When a class B address such as 172.16.0.0 is subnetted with a /26 mask, the subnet mask in dotted decimal format is 255.255.255.192. This means that the interval between the network IDs of the resulting subnets is 64. The resulting network IDs are as follows:

172.16.0.0  
172.16.0.64  
172.16.0.128  
172.16.0.192  
172.16.1.0  
and so on.

For the network ID 172.16.0.0, the last address in the range is 172.16.0.63, which is the broadcast address. Neither the network ID nor the broadcast address for any subnet can be assigned to computers. This means that the addresses that can actually be assigned range from 172.16.0.1 to 172.16.0.62. The last legitimate host address, therefore, is 172.16.0.62.

172.16.0.63 cannot be used because it is the broadcast address for the 172.16.0.0 network.

172.16.0.64 is the network ID for the 172.16.0.64 network, and 172.16.0.65 is the first address in the second network.



Objective:  
Network Fundamentals  
Sub-Objective:  
Apply troubleshooting methodologies to resolve problems

References:  
[Cisco > Support > IP Routing > Design TechNotes > Document ID: 13788 > IP Addressing and Subnetting for New Users](#)

### QUESTION 125

How many IP addresses can be assigned to hosts in subnet 192.168.12.64/26?

- A. 32
- B. 62
- C. 128
- D. 256

**Correct Answer:** B

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

Subnet 192.168.12.64/26 has 62 IP addresses that can be assigned to hosts.

The formula to calculate the available number of hosts is:

$$2^n - 2 = x$$

Where n = the number of host bits in the subnet mask and x = the number of possible hosts.

You will subtract 2 from the hosts calculation to remove the first address (the network ID) and the last address (the broadcast ID) from the valid hosts range. These addresses are reserved as the network ID and the broadcast address, respectively, in each subnet.

An IP address has 32 available bits divided into four octets. In this scenario, the /26 indicates that the subnet mask is 26 bits long, or that 26 bits are reserved for the network portion of the address. This leaves 6 bits for the host addresses ( $32 - 26 = 6$ ). The number of host addresses would be calculated as follows:

Number of hosts =  $2^6 - 2$

Number of hosts =  $64 - 2 = 62$

Another simple way of determining the number of hosts in a range, when the subnet mask extends into the last octet, is to determine the decimal value of the last bit in the subnet mask after converting it to binary notation. This process only works when the subnet extends into the last octet, meaning that the subnet is greater than /24. The /26 subnet mask equals 26 network bits and 6 hosts bits, written as follows:

11111111.11111111.11111111.11000000

The 1s represent network bits and the 0s represent host bits.

In this example, the 26th bit (read from left to right) has a decimal value of 64, indicating that this subnet has 64 addresses. Subtract 2 to represent the network and broadcast addresses ( $64 - 2 = 62$ ). This shows that this subnet range can be used to address 62 hosts.

Network address: 192.168.12.0

Subnet Mask in decimal: 255.255.255.192

Subnet Mask in binary: 11111111.11111111.11111111.11000000

Hosts:  $64 - 2 = 62$

For subnet 192.168.12.64, the valid host range will start from 192.168.12.65 to 192.168.12.126. For the next subnet 192.168.12.128, the valid host range will start from 192.168.12.129 to 192.168.12.190.

To construct a subnet that would contain 32 addresses would require using a mask of 255.255.255.224. This mask would leave 5 host bits, and  $2^5 - 2 = 32$ .

To construct a subnet that would contain 128 addresses would require using a mask of 255.255.255.128. This mask would leave 7 host bits, and  $2^7 - 2 = 128$ .

To construct a subnet that would contain 256 addresses would require using a mask of 255.255.255.0. This mask would leave 8 host bits, and  $2^8 - 2 = 256$ .

Objective:

Network Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot IPv4 addressing and subnetting

References:

[Cisco > Design Tech Notes > IP Routing > IP Addressing and Subnetting for New Users > Understanding IP Addresses > Document ID: 13788](#)

[Nooning, Thomas. "TechRepublic Tutorial: Subnetting a TCP/IP Network." TechRepublic, 20 May 2003.](#)

### QUESTION 126

Which command would be used to establish static translation between an inside local address 192.168.144.25 and an inside global address 202.56.63.102?

- A. router(config)#ip nat inside source static 192.168.144.25 202.56.63.102
- B. router(config)#ip source nat inside static local-ip 192.168.144.25 global-ip 202.56.63.102
- C. router(config)#ip nat static inside source 192.168.144.25 202.56.63.102
- D. router(config)#ip nat inside static source 192.168.144.25 202.56.63.102

**Correct Answer: A**

**Section: (none)**

**Explanation**

### Explanation/Reference:

Explanation:

To establish a static translation between an inside local address 192.168.144.25 and an inside global address 202.56.63.102, you would use the ip nat inside source static 192.168.144.25 202.56.63.102 command executed in global configuration mode. The correct format of the command is:

**ip nat inside source static local-ip global-ip**

This static configuration can be removed by entering the global no ip nat inside source static command.

Simply executing the ip nat inside source command will not result in NAT functioning. The NAT process also has to be applied correctly to the inside and outside interfaces. For example if, in this scenario the Fa0/0 interface hosted the LAN and the S0/0 interface connected to the Internet the following commands would complete the configuration of static NAT.

**Router(config)#interface F0/0**

**Router(config-if)#ip nat inside**

**Router(config-if)#exit**

**Router(config)#interface S0/0**

**Router(config-if)#ip nat outside**

The other options are incorrect because they are not valid Cisco IOS configuration commands. They all contain

syntax errors.

Objective:

Infrastructure Services

Sub-Objective:

Configure, verify, and troubleshoot inside source NAT

References:

### QUESTION 127

Consider the following output of the show ip interface brief command:

```
R1# show ip interface brief
```

Interface	IP-Address	OK?	Method	Status	Protocol
Ethernet0	192.168.12.65	YES	manual	up	up
Ethernet1	192.168.12.129	YES	manual	up	up
Serial0	192.168.12.187	YES	manual	up	up
Serial1	192.168.12.125	YES	manual	up	up
Serial2	192.168.12.121	YES	manual	up	up
Serial3	unassigned	YES	unset	up	up

You have a single area OSPF network. What command should you execute on R1 so that OSPF is operational on the E0, S1, and S2 interfaces ONLY?

- A. R1(config-router)#network 192.168.12.64 0.0.0.127 area 0
- B. R1(config-router)#network 192.168.12.64 0.0.0.63 area 0
- C. R1(config-router)#network 192.168.12.64 0.0.0.66 area 0
- D. R1(config-router)#network 192.168.12.64 255.255.255.192 area 0
- E. R1(config-router)#network 192.168.12.64 0.0.0.63 area1

**Correct Answer:** B

**Section:** (none)

**Explanation**

#### Explanation/Reference:

Explanation:

The command R1(config-router)#network 192.168.12.64 0.0.0.63 area 0 would ensure that OSPF is operational on the E0, S1, and S2 interfaces only. When executing the network command in OSPF, a wildcard mask in combination with the network ID used in the command determines which interfaces will participate in OSPF. Any interfaces that are included in the network created by the network ID and the mask will participate in OSPF.

Wildcard masks in OSPF network statements are expressed inversely, and not as a regular subnet masks. For example, if the network you are configuring for OSPF operation is 192.168.10.0/24, then the inverse version of a /24 mask (or 255.255.255.0) would be 0.0.0.255.

The network ID is the starting point and the wildcard mask specifies where the network will end or the range of the network. In this case, the network begins at 192.168.12.64. The value in the last octet of the mask indicates the number of values (including 64) that will be included in the network, which means that it will range from 192.168.12.64 - 192.168.12.127. 64 to 127 equals 64 values if you include the endpoints 64 and 127.

The network, and therefore the operation of OSPF, includes the interfaces E0 (192.168.12.65), S1 (192.168.12.125), and S2 (192.168.12.121) because these three IP addresses lie within the range 192.1268.12.64 - 192.168.12.127.

The command R1(config-router)#network 192.168.12.64 0.0.0.127 area 0 is incorrect because the resulting network would range from 192.168.12.64 - 192.168.12.191. This would include all of the required interfaces, but would also include E1 (192.168.12.129) and S0 (192.18.12.187), which is not desired.

The command R1(config-router)#network 192.168.12.64 0.0.0.66 area 0 is incorrect because the resulting network would range from 192.168.12.64 - 192.168.12.129. This would include all of the required interfaces, but would also include E1 (192.168.12.129).

The command R1(config-router)#network 192.168.12.64 255.255.255.192 area 0 is incorrect because the mask, while correct in its breadth and the exact inverse of the wild card mask 0.0.0.63, is not stated in wildcard mask format.

The command R1(config-router)#network 192.168.12.64 0.0.0.63 area 1 is incorrect because it specifies area 1. At least one area of an OSPF network must be area 0 and since this is a single area OSPF network, the command must specify area 0.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot single area and multi-area OSPFv2 for IPv4 (excluding authentication, filtering, manual summarization, redistribution, stub, virtual-link, and LSAs)

References:

[Cisco > Home > Support > Technology Support > IP > IP Routing > Technology Information > Technology White paper > OSPF Design Guide > Enabling OSPF on the Router](#)

### QUESTION 128

Which option lists the given applications in the correct sequence of increasing bandwidth consumption?

- A. an interactive Telnet session on a server running an SAP application  
a voice conversation between PC-based VoIP services  
a voice conversation between two IP phones while accessing an online video site
- B. a voice conversation between two IP phones while accessing an online video site  
an interactive Telnet session on a server running an SAP application  
a voice conversation between PC-based VoIP services
- C. a voice conversation between PC-based VoIP services  
a voice conversation between two IP phones while accessing an online video site  
an interactive Telnet session on a server running an SAP application
- D. an interactive Telnet session on a server running an SAP application  
a voice conversation between two IP phones while accessing an online video site  
a voice conversation between PC-based VoIP services

**Correct Answer: A**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

The correct sequence of increasing bandwidth consumption in the given scenario would be, from lowest to highest:

1. an interactive Telnet session on a server running an SAP application
2. a voice conversation between PC-based VoIP services
3. a voice conversation between two IP phones while accessing an online video site

An interactive Telnet session uses the least amount of bandwidth of the three application examples because it mainly involves the transfer of text.

A voice conversation between IP phones, also known as voice over IP (VoIP) traffic, requires more bandwidth than Telnet. Voice traffic is delay-sensitive and benefits from Quality of Service (QoS) to ensure service quality.

A voice conversation between two IP phones while accessing an online video site would consume the most bandwidth. A voice conversation with real-time video exchange is the equivalent of real-time video traffic. Video traffic is real-time and benefits from dedicated bandwidth with QoS implementation to ensure quality.

Objective:

WAN Technologies

Sub-Objective:

Describe basic QoS concepts

References:

[Cisco Documentation > Internetworking Technology Handbook > Voice/Data Integration Technologies](#)

### QUESTION 129

#### DRAG DROP

Click and drag the features on the left to their corresponding frame tagging method on the right.

Select and Place:

Features	ISL	IEEE 802.1Q
Cisco standard		
Industry standard		
Adds a 4-byte tag in the middle of original Ethernet frame		
Adds a 26-byte header and 4-byte trailer		
Does not modify Ethernet frame		
Native VLAN frames are not tagged while traversing over trunk links		

Correct Answer:

Features

ISL	IEEE 802.1Q
Cisco standard	Industry standard
Adds a 26-byte header and 4-byte trailer	Adds a 4-byte tag in the middle of original Ethernet frame
Does not modify Ethernet frame	Native VLAN frames are not tagged while traversing over trunk links

**Section: (none)**  
**Explanation**

**Explanation/Reference:**

Explanation:

ISL and IEEE 802.1Q are VLAN frame tagging methods.

ISL:

- Is Cisco proprietary
- Adds a 26-byte header and 4-byte trailer
- Does not modify Ethernet frame

IEEE 802.1Q frame tagging method:

- Is a standard method
- Adds a 4-byte tag in the middle of original Ethernet frame
- Has a concept called native VLAN. Native VLAN frames are not tagged while traversing over a trunk link.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot interswitch connectivity

References:

[Cisco > Technology Support > LAN Switching > Virtual LANs/VLAN Trunking Protocol \(VLANs/VTP\) > Design > Design Technotes > Inter-Switch Link and IEEE 802.1Q Frame Format > Document ID: 17056](#)

**QUESTION 130**

Which Cisco Internetwork Operating System (IOS) command is used to save the running configuration to non-volatile random access memory (NVRAM)?

- A. copy startup-config running-config
- B. move startup-config running-config
- C. copy running-config startup-config

D. move startup-config running-config

**Correct Answer:** C

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The copy running-config startup-config command is used to save the running configuration to NVRAM. This command will should always been run after making changes to the configuration. Failure to do so will result in the changes being discarded at the next restart of the router. When the router is restarted, the startup configuration file is copied to RAM and becomes the running configuration.

The copy startup-config running-config command is incorrect because this command is used to copy the startup configuration to the running configuration. The command would be used to discard changes to the configuration without restarting the router.

The move startup-config running-config and move startup-config running-config commands are incorrect because these are not valid Cisco IOS commands. There is no move command when discussing the manipulation of configuration files.

Objective:

Infrastructure Management

Sub-Objective:

Perform device maintenance

References:

[Cisco Documentation > RPM Installation and Configuration > IOS and Configuration Basics](#)

### QUESTION 131

Which of the following statements is true with regard to SDN?

- A. It combines the control plane and the data plane
- B. It separates the data plane and the forwarding plan
- C. It implements the control plane as software
- D. It implements the data plane as software

**Correct Answer:** C

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

In Software-defined networking (SDN), the control plane is separated from the data (or forwarding) plane and is implemented through software. The data plane remains on each physical device but the control plane is managed centrally for all devices though software.

SDN does not combine the data and control plane. Instead it decouples them.

SDN does not separate the data plane and the forwarding plan. These are both names for the same plane; that is, a data plane is a forwarding plane.

SDN does not implement the data plane as software. The data plane remains on each physical device.

Objective:

Infrastructure Management

Sub-Objective:



Describe network programmability in enterprise network architecture

References:

[Software Defined Networking: The Cisco approach](#)

### QUESTION 132

Which of the following is the correct command to define a default route using a gateway address of 172.16.0.254?

- A. ip default-route 172.16.0.254 255.255.0.0
- B. ip route 0.0.0.0 0.0.0.0 172.16.0.254
- C. default-gateway 172.16.0.254
- D. ip route default 172.16.0.254

**Correct Answer:** B

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

The ip route command is used to manually define a static route to a destination network. The syntax of the command is as follows:

**ip route [destination\_network] [mask] [next-hop\_address or exit interface] [administrative\_distance] [permanent]**

The attributes of the command are as follows:

- **destination\_network:** Defines the network that needs to be added in the routing table.
- **mask:** Defines the subnet mask used on the network.
- **next-hop\_address:** Defines the default gateway or next-hop router that receives and forwards the packets to the remote network.
- **administrative\_distance (AD):** States the administrative distance. Static routes have an AD of 1, which can be changed to change the priority of the route.

Creating a default route is accomplished by substituting 0.0.0.0 for both the [destination\_network] and [mask] fields, yielding the following command to create a default route through host 172.16.0.254:

**router(config)# ip route 0.0.0.0 0.0.0.0 172.16.0.254**

Any route configured manually is considered a static route. Another example of a command that creates a non-default route is shown below:

**router(config)# ip route 192.168.12.0 255.255.255.0 172.65.3.1**

This command would instruct the router on which the command was executed to send any traffic for the 192.168.12.0/24 network to the router located at 172.65.3.1.

You can also affect the route by changing the administrative distance of the route. By default, all static routes have an AD of 1, making them preferable to routes learned from routing protocols. However, you can add the AD parameter at the end of the command as shown below, making the static route less desirable than one learned from a routing protocol such as RIP:

**router(config)# ip route 192.168.12.0 255.255.255.0 172.65.3.1 150**

One reason to configure the routes this way could be to make the static route a backup route to the route learned by RIP, such as when the static route is a less desirable route through a distant office.

Once the ip route command has been used to add either a static route or a static default route to a router, the routes should appear in the routing table. They will be indicated with an S next to a static route and an S\* for a

default static route. The first two examples from the explanation above would appear in the routing table as follows:

```
S*0.0.0.0/0 [1/0] via 172.16.0.254
S 192.168.12.0/24 [1/0] via 172.65.3.1
```

The ip default-route, default-gateway, and ip route default commands are incorrect because they are not valid Cisco IOS commands.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot IPv4 and IPv6 static routing

References:

[Cisco > Cisco ASDM User Guide, 6.1 > Configuring Dynamic And Static Routing > Field Information for Static Routes](#)

[Cisco > Support > IP > IP Routing > Design > Design TechNotes > Specifying a Next Hop IP Address for Static Routes > Document ID: 27082](#)

### QUESTION 133

Which command will display the Virtual LAN (VLAN) frame tagging method for a switch link?

- A. show vlan
- B. show vlan encapsulation
- C. show vtp status
- D. show interfaces trunk

**Correct Answer: D**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

The show interfaces trunk command displays the list of trunk ports and the configured VLAN frame tagging methods.

Sample output of the show interfaces trunk command would be as follows:

```
SwitchB# show interfaces trunk
Port Mode Encapsulation Status Native vlan
Fa0/1 on 802.1q trunking 1
Fa0/2 on 802.1q trunking 1
Fa0/3 on 802.1q trunking 1
<<output omitted>>
```

The show vlan command displays the VLAN number, name, status, and ports assigned to individual VLANs. Although the command cannot be used to determine the frame tagging method used for each trunk, it can be used to determine which ports are trunk ports by the process of elimination.

In the output below, generated from a six-port switch, the missing port (Fa0/6) is a trunk port. For communication to be possible between the two VLANs configured on the switch, Fa0/6 must be connected to a router, and trunking must be configured on the router end as well. The command is also useful for verifying that a port has been assigned to the correct VLAN as it indicates in the VLAN column the VLAN to which each port belongs.

```
Switch# show vlan
```

Vlan name	Status	Ports
-----------	--------	-------

1 default	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4
58 vlan 58	active	Fa0/5

The show vlan encapsulation command is not a valid command for Cisco switches.

The show vtp status command does not display VLAN frame tagging method. The command is used to verify the status of VTP. The output of the show vtp status command would be as follows:

```
SwitchB# show vtp status
VTP Version : 2
Configuration Revision : 1
Maximum VLANs supported locally : 64
Number of existing VLANs : 16
VTP Operating Mode : Client
VTP Domain Name : MARKETING
VTP Pruning Mode : Disabled
VTP V2 Mode : Disabled
VTP Traps Generation : Disabled
MD5 digest : 0x4D 0x60 0xA3 0x5E 0xC7 0x41 0x8C 0x47
```

Line 6 of the given output indicates that the switch is operating in VTP Client mode. There are three possible VTP modes in which a switch can operate: Server, Client, and Transparent.

- In Server mode, any changes made in the switch, such as adding a VLAN, will be recorded in the local database and also passed on to the other switches, where the change will be added.
- In Client mode, the switch will accept and record changes from switches in Server mode, but will not accept changes made on the local switch.
- In Transparent mode, the switch adds changes made locally to the database, but will not send or accept changes sent from other switches.

The mode in use could be a useful piece of information during troubleshooting. For example, if you were unsuccessfully attempting to add a VLAN to the database, the reason would be that the switch is in VTP Client mode. If you were adding a VLAN in Transparent mode, the VLAN would be added to the local database but fail to appear on the other switches. If the switch were in Transparent mode, Line 6 in the above output would appear as follows:

VTP Operating Mode: Transparent

Only switches operating in VTP Server mode can accept changes to the VLAN database. This situation could be corrected easily and a VLAN 50 could be successfully added at two different configuration prompts by executing the following commands:

At global configuration mode:

```
switchB# config t
switchB(config)# vtp mode server
switchB(config)# vlan 50
```

At VLAN configuration mode:

```
switchB# vlan database
switchB(vlan)# vtp server
switchB(vlan)# vlan 50
```

Objective:

LAN Switching Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot VLANs (normal/extended range) spanning multiple switches

References:

[Cisco Press Home > Articles > Cisco Certification > CCNA > CCNA Self-Study \(ICND Exam\): Extending Switched Networks with Virtual LANs](#)

#### QUESTION 134

Which trunk encapsulation defines one VLAN on each trunk as a native VLAN?

- A. ISL
- B. IEEE 802.1q
- C. IEEE 802.11a
- D. auto

**Correct Answer:** B

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

IEEE 802.1q defines one VLAN on each trunk as the native VLAN.

The default value of a native VLAN is VLAN1. The IEEE 802.1q method does not encapsulate frames when forwarded over a trunk in a native VLAN; that is, IEEE 802.1q does not add its header information while transmitting frames in the native VLAN. This traffic is called untagged traffic. Frames originating from other VLANs, however, will have a 4-byte 802.1q header inserted into the frame to identify the VLAN number.

The native VLAN number can be changed if desired. If done it should be done on both ends of the connection. Otherwise, traffic that uses the native VLAN (untagged traffic) will not be able to cross the link. The command to change the native VLAN is

**Switch(config)#switchport trunk native vlan vlan number**

Inter Switch Link (ISL) does not define one VLAN on each trunk as a native VLAN. ISL is the Cisco proprietary trunk encapsulation, and it can only be used between two Cisco switches.

IEEE 802.11a is a wireless standard defined by the IEEE, and has nothing to do with VLANs.

Auto is not an encapsulation method. The auto trunking mode is a method for negotiating an encapsulation method over trunk links.

Objective:

LAN Switching Fundamentals

Sub-Objective:

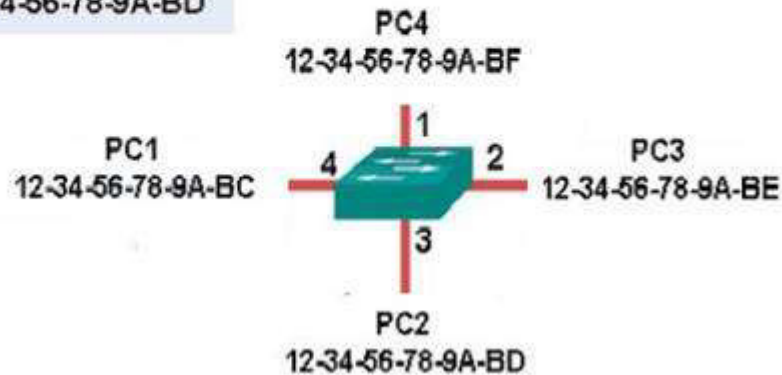
Configure and verify Layer 2 protocols

References:

#### QUESTION 135

The following exhibit displays the MAC address table of a switch in your network, along with the location of each device connected to the switch:

MAC Address Table	
Port	MAC Address
1	12-34-56-78-9A-BF
3	12-34-56-78-9A-BD



Which of the following frames will be flooded to all ports after it is received by the switch?

- A. source MAC: 12-34-56-78-9A-BD, destination MAC: 12-34-56-78-9A-BF
- B. source MAC: 12-34-56-78-9A-BF, destination MAC: 12-34-56-78-9A-BD
- C. source MAC: 12-34-56-78-9A-BF, destination MAC: 12-34-56-78-9A-BC
- D. source MAC: 12-34-56-78-9A-BC, destination MAC: 12-34-56-78-9A-BF

**Correct Answer:** C

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The frame with a source MAC of 12-34-56-78-9A-BF and a destination MAC of 12-34-56-78-9A-BC would be sent to all ports because the destination MAC address is not already in the MAC address table.

The frame with a source MAC of 12-34-56-78-9A-BD and a destination MAC of 12-34-56-78-9A-BF would not be sent to all ports because the destination MAC address is in the MAC address table.

The frame with a source MAC of 12-34-56-78-9A-BF and a destination MAC of 12-34-56-78-9A-BD would not be sent to all ports because the destination MAC address is in the MAC address table.

The frame with a source MAC of 12-34-56-78-9A-BC and a destination MAC of 12-34-56-78-9A-BF would not be sent to all ports because the destination MAC address is in the MAC address table.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Interpret Ethernet frame format

References:

[Cisco Press > Articles > Cisco Certification > CCNA Routing and Switching > Basic Data Transmission in](#)

[Networks: MAC Tables and ARP Tables](#)  
[How do Switches Work?](#)

**QUESTION 136**

Refer to the partial output of the show interfaces command:

```
Serial 0 is administratively down, line protocol is down
Hardware is MCI Ethernet, address is 0000.0c00.750c (bia 0000.0c00.750c)
Internet address is 134.108.28.8, subnet mask is 255.255.255.0
MTU 1500 bytes, BW 10000 Kbit, DLY 100000 usec, rely 255/255, load 1/255
Encapsulation ARPA, loopback not set, keepalive set (10 sec)
ARP type: ARPA, ARP Timeout 4:00:00
Last input 0:00:00, output 0:00:00, output hang never
Last clearing of "show interface" counters 0:00:00
Output queue 0/40, 0 drops; input queue 0/75, 0 drops
Five minute input rate 0 bits/sec, 0 packets/sec
Five minute output rate 2000 bits/sec, 4 packets/sec
1127576 packets input, 447251251 bytes, 0 no buffer
Received 354125 broadcasts, 0 runts, 0 giants, 57186* throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
5332142 packets output, 496316039 bytes, 0 underruns
0 output errors, 432 collisions, 0 interface resets, 0 restarts
<<output omitted>>
```

What does the Serial 0 is administratively down, line protocol is down line indicate with certainty?

- A. There is no problem with the physical connectivity.
- B. There is a configuration problem in the local or remote router.
- C. There is a problem at the telephone company's end.
- D. The shutdown interface command is present in the router configuration.

**Correct Answer: D**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

The Serial 0 is administratively down, line protocol is down line in the output of the show interfaces command indicates the following:

- The shutdown interface command is present in the router configuration. This indicates that the administrator might have manually shut down the interface by issuing the shutdown command.
- A duplicate Internet Protocol (IP) address might be in use.

This line does not show that there is no problem with the physical connectivity. Since the interface is administratively shut down, there is no way of determining the operational status of the physical layer.

The Serial 0 is administratively down, line protocol is down line does not indicate a configuration problem in the local or remote router. A problem in the configuration of local or remote router would be indicated by the Serial 0 is up, line protocol is down message.

This line does not show that there is a problem at the telephone company's end. Since the interface is administratively shut down, there is no way of determining the operational status of the physical layer or protocol layer on the other end of the line.

Objective:

Infrastructure Management

Sub-Objective:

Use Cisco IOS tools to troubleshoot and resolve problems

References:

#### **QUESTION 137**

Which layer in the Open Systems Interconnection (OSI) model defines an Internet Protocol (IP) address that helps in selecting the route to the destination?

- A. Data Link
- B. Network
- C. Application
- D. Transport

**Correct Answer:** B

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

The Network layer in the OSI model defines a logical address that helps select the route to the destination. Logical addresses, such as IP addresses or IPX-SPX addresses, are used by routers to forward the packets to the destination. This is accomplished systematically by comparing the destination address with the network addresses listed in the routing table. The logical layout of the network is also defined at this layer. The Network layer is primarily concerned with logical addressing, routing, and path determination.

Protocol data units (PDUs) are called packets at the Network layer. The information that is applied at this layer, which consists of IP addresses, is used in the routing process.

The Data Link layer does not define an IP address. This layer ensures the reliable transmission of data across a network and defines the Media Access Control (MAC) address, which defines the physical device addressing. This layer also defines the format of the header and trailer.

Protocol data units (PDUs) are called frames at the Data Link layer. The information that is applied at this layer, which consists of MAC addresses, is used in the switching process.

The application layer does not define an IP address. The application layer is responsible for interacting directly with the application and provides application services, such as e-mail, FTP, and Telnet. It also defines the user authentication process.

The Transport layer does not define an IP address. The Transport layer is responsible for the error-free and sequential delivery of data. This layer is used to manage data transmission between devices, a process known as flow control.

Protocol data units (PDUs) are called segments at the Transport layer, where the two protocols TCP and UDP operate. Windowing, which is the real-time management of the number of packets that can be received without an acknowledgement, is handled by TCP at this layer.

Objective:

Network Fundamentals

Sub-Objective:

Compare and contrast OSI and TCP/IP models

References:

[Cisco Documentation > Internetworking Technology Handbook > Internetworking Basics>Internet Protocols](#)

#### **QUESTION 138**

When a router has been configured with a loopback address, which of the following determines the OSPF router ID?



- A. The highest MAC address assigned to a physical interface on the router
- B. The lowest priority of a physical interface on the router
- C. The lowest IP address assigned to a physical interface on the router
- D. The highest IP address assigned to a loopback interface on the router

**Correct Answer:** D

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

Routers configured with OSPF must be assigned a router ID (RID), which is an IP address unique across the entire OSPF autonomous system. The RID can be assigned manually with the router-id command, or it will be determined automatically by OSPF. If the RID has not been manually assigned, then OSPF will use the highest numerical IP address of a loopback interface on the local router. If there are no configured loopback interfaces, then the RID will be determined by the highest numerical IP address on an active physical interface. The sequence for determining the RID is as follows:

1. Any address manually configured with the router-id command
2. The highest IP address on a loopback interface
3. The highest IP address on an active physical interface

Either of the first two options would be a recommended best practice, since they each offer fault tolerance to the RID. If the RID is determined by a physical interface IP address, then the entire OSPF routing process is bound to an interface that could become unplugged or go down due to network reasons.

Loopback interfaces remain operational unless they are manually shut down. Loopback interfaces are configured as follows:

**Router(config)# interface loopback0**

**Router(config-if)# ip address 192.168.1.254 255.255.255.255**

The highest media access control (MAC) address assigned to a physical interface on the router is not used. IP addresses are used for the determination of the router ID.

Priorities are not used to determine the OSPF router ID. Priorities are used by OSPF to influence the election of the designated router (DR) and backup designated router (BDR) on a multi-access segment.

Router IDs are determined by the highest IP address on a loopback or physical interface, not the lowest.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot single area and multi-area OSPFv2 for IPv4 (excluding authentication, filtering, manual summarization, redistribution, stub, virtual-link, and LSAs)

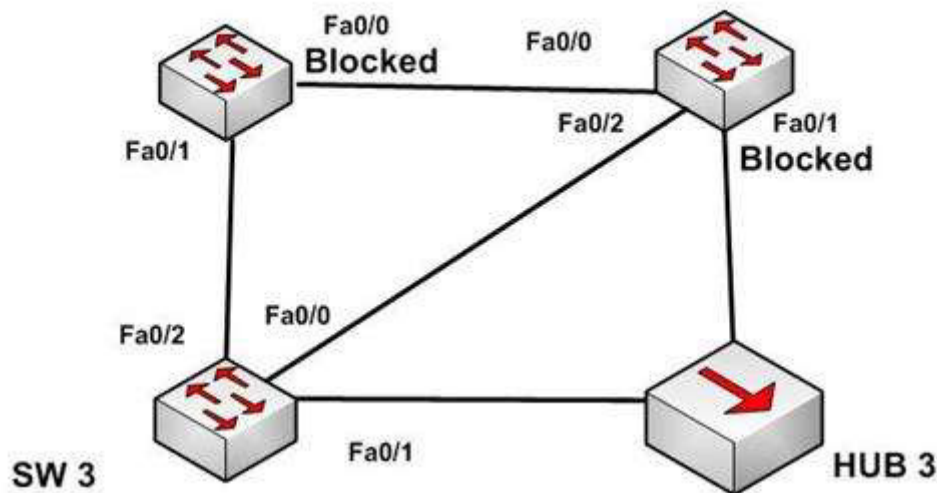
References:

**QUESTION 139**

The diagram below shows the state of the switch interfaces after STP has converged.

SW 1

SW 2



Based on the interface states, which of the following statements are true? (Choose all that apply.)

- A. The Fa0/2 interface on SW 2 is a designated port
- B. SW 3 is the root bridge
- C. SW 2 is the root bridge
- D. The Fa0/0 interface on SW 2 is a designated port
- E. The Fa0/0 interface on SW 2 is a root port

**Correct Answer:** BD

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

Convergence has occurred in a spanning-tree network when all switch ports are in either a forwarding state or a blocking state (known as discarding state in RSTP). You can use the location of these blocked and forwarding ports to infer the location of the root bridge and the state of any unlabeled ports in the diagram.

SW3 is the root bridge and the Fa0/0 interface on SW2 is a designated port. It can be determined that SW3 is the root bridge because all of its ports are in a forwarding state. Any switch that has at least one port blocking (such as SW1 and SW2) are non-root bridges. As there must be a root bridge, that leaves SW3 as the only candidate.

After establishing that SW3 is the root, it can be determined that the connection between SW1 and SW2 is a segment that does not have a direct connection to the root bridge. These segments must have one end set as a designated port and thus set to forward. Since the Fa0/0 interface on SW2 is forwarding, it is the designated port for that segment.

The Fa0/2 interface on SW2 is not a designated port. The interface on each non-root switch with the lowest cost path to the root bridge will be the root port. Since SW3 is the root bridge, the connection to SW3 via Fa0/2 is the lowest cost path to the root bridge for SW1 and thus is a root port, not a designated port. Moreover, designated ports only exist on segments that do not have a direct connection to the root bridge.

SW2 is not the root bridge. One of its ports is blocking, which will not occur on a root bridge.

The Fa0/0 interface on SW2 is a not root port. It is the designated port for the segment between SW1 and SW2.

The process of determining these port states occurs in this order:

1. Selection of the root bridge. When all bridge priorities have been left to their default, all switches will have same bridge priority. When that is the case, the switch with the lowest MAC address will be selected root bridge. ALL ports are in a forwarding state on the root bridge, which explains why all of the ports on SW3 will be in a forwarding state.
2. Determination of the root ports on each non-root bridge. Each non-root bridge will select the interface it possesses with the least cost path to the root bridge. Once selected, that port will be placed in a forwarding state.
3. Determination of the designated port on each segment that does not connect directly to the root bridge. There is one such segment in the diagram (SW1 to SW2). The interface on either end of the segment that has the least cost path to the root bridge will be the designated port for that section. It may have several paths, but the least cost path is used in the determination of the designated port for the segment.

Once determined, the designated ports will be set to forwarding, and all ports that are neither root nor designated ports will be set to blocking.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot STP protocols

References:

[Cisco > Internetworking Technology Handbook > Bridging and Switching > Transparent Bridging > Spanning-Tree Algorithm](#)

#### QUESTION 140

Examine the network diagram.



Which switch port(s) will be in a forwarding state? (Choose two.)

- A. SwitchA - Fa0/1 and Fa0/2
- B. SwitchA - Fa0/1
- C. SwitchA - Fa0/2
- D. SwitchB - Fa0/1
- E. SwitchB - Fa0/2

**Correct Answer:** AD

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

Both switch ports on Switch A and Fa0/1 on Switch B will be in a forwarding state. Switch A will become the STP root bridge due to its lower MAC address. All ports on the root bridge will become designated ports in a forwarding state. Switch B has redundant connectivity to the root bridge, and must block one of its interfaces to prevent a switching loop. Both interfaces are the same speed (FastEthernet), and thus their cost to the root is the same. Finally, the interface with the lowest number will become the forwarding port. F0/1 has a lower port number than F0/2, so F0/1 becomes a forwarding port, and F0/2 becomes a blocking port.

In this scenario there are only two switches in the diagram. However, if there were more switches and Switch A were not the root bridge, the result would be the same with regard to the ports between Switch A and B. Whenever there are redundant links between switches, one of the four ports involved will be set to a blocking (or in the case of RSTP, discarding) mode. The logic will still be the same, since the cost to get to the root bridge will still be equal if the port speeds are equal.

Without STP (which can be disabled) operating on switches with redundant links, such as those in the figure, loops can and almost surely will occur. For example, if a host connected to Switch A were to send an ARP request for the MAC address of a host connected to Switch B, the request could loop and cause a broadcast storm, slowing performance dramatically. This would probably occur when any host connected to either switch sends a broadcast frame, such as a DHCP request.

Rapid Spanning Tree Protocol (RSTP) uses the term discarding for a switch port that is not forwarding frames.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot STP protocols

References:

[Cisco > Support > Technology Support > LAN Switching > Spanning Tree Protocol > Configure > Configuration Examples and TechNotes > Understanding and Configuring Spanning Tree Protocol \(STP\) on Catalyst Switches](#)

### QUESTION 141

Examine the following partial output of the show interfaces command.

```
Router# show interfaces ethernet 0/0
Ethernet0/0 is administratively down, line protocol is down
Hardware is AmdP2, address is 0003.e39b.9220 (bia 0003.e39b.9220)
Internet address is 10.1.0.254/16
MTU 1500 bytes, BW 10000 Kbit, DLY 1000 usec,
reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ARPA, loopback not set
Keepalive set (10 sec)
ARP type: ARPA, ARP Timeout 04:00:00
<<output omitted>>
```

Which of the following statements are true? (Choose all that apply.)

- A. the interface is functional
- B. the largest frame allowed through this connection is 1500 bytes
- C. the interface needs the no shutdown command executed to be functional
- D. the largest frame allowed through this connection is 10000 Kbs

**Correct Answer:** BC

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

From this output, we can determine that the largest frame allowed through this connection is 1500 bytes and that the interface needs the no shutdown command executed to be functional. The portions of the output that tell us this are:

MTU 1500 bytes indicates that the Maximum Transmission Unit (MTU) is 1500 bytes. The MTU is the largest frame size allowed.

Ethernet0/0 is administratively down indicates that the interface has either been disabled or has never been enabled. The command no shutdown is used to enable an interface, and until enabled, it will not function.

The interface is not functional, as indicated by the Ethernet0/0 is administratively down portion of the output.

The largest frame allowed through this connection is not 10000 Kbs. It is 1500 bytes. It is interesting to note that the bandwidth of the connection is 10000 Kbs, as indicated by the section:

BW 10000 Kbit

Objective:

LAN Switching Fundamentals

Sub-Objective:

Troubleshoot interface and cable issues (collisions, errors, duplex, speed)

References:

### QUESTION 142

You are the Cisco administrator for Verigon Incorporated. The given exhibit displays some of the devices in the network. (Click the Exhibit(s) button.) Workstation A can communicate with Workstation C but cannot communicate with Workstation B.

What is the problem?

- A. Workstation B has an incorrect default gateway
- B. Workstation A has an incorrect subnet mask
- C. Workstation A has an incorrect default gateway
- D. Workstation B has an incorrect subnet mask

**Correct Answer: C**

**Section: (none)**

**Explanation**

#### **Explanation/Reference:**

Explanation:

Workstation A has an incorrect default gateway. To communicate with remote computers or those computers outside of its own subnet, a computer must have the address of the nearest router interface as its default gateway. In this case, the default gateway of Workstation A should be 192.168.10.5/24, which is the Serial0 address of Router A. The diagram shows that it is instead configured as 192.168.10.4/24. This will not cause a problem for Workstation A to communicate with Workstation C, but it will make communication with remote subnets impossible.

Workstation B does not have an incorrect default gateway. Its nearest router interface is 10.0.0.1/8, which is the configuration of its default gateway.

Workstation A does not have an incorrect subnet mask. The mask used by Workstation C and the router interface of Router A, which are in the same subnet, is /24, or 255.255.255.0, which is also the subnet mask used by Workstation A.

Workstation B does not have an incorrect subnet mask. Since the subnet mask of the router interface that is nearest to Workstation B is /8, or 255.0.0.0, then Workstation B also should have an 8-bit mask.

Objective:  
Routing Fundamentals  
Sub-Objective:  
Troubleshoot basic Layer 3 end-to-end connectivity issues

References:

[Cisco > Technology Support > IP > IP Routing > Design Technotes > IP Addressing and Subnetting for New Users > Document ID: 13788 > Understanding IP Addresses](#)

[Cisco > Technology Support > IP > IP Addressing Services > Design Technotes > Subnet Zero and the All-Ones Subnet > Document ID: 13711](#)

CCNA ICND2 Official Exam Certification Guide (Cisco Press, ISBN 1-58720-181-X), Appendices D, E and H: Subnetting.

**QUESTION 143**

Multiple routes to a destination already exist from various routing protocols.

Which of the following values is used FIRST to select the route that is inserted into the route table?

- A. composite metric
- B. administrative distance
- C. prefix length
- D. hop count

**Correct Answer:** B

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

When multiple routes to a destination exist from various routing protocols, the first value to be evaluated is the administrative distance of the source of the route. The following are examples of default administrative distance values:

Connected	0
Static	1
eBGP	20
EIGRP (internal)	90
IGRP	100
OSPF	110
IS-IS	115
RIP	120
EIGRP (external)	170
iBGP	200
EIGRP summary route	5

The second value to be compared is the composite metric, or any metric value for that matter. It is only used when multiple routes exist that have the same administrative distance.

The prefix length is only used to compare two existing routes in the routing table that lead to the destination, yet have different mask or prefix lengths. In that case, the route with the longest prefix length will be chosen.

Hop count is ONLY used when comparing multiple RIP routes. It is not the first consideration when multiple routes from various routing protocols exist in a routing table.

Objective:

Routing Fundamentals

Sub-Objective:

Describe how a routing table is populated by different routing information sources

References:

[Support > Technology Support > IP > IP Routing > Troubleshoot and Alerts > Configuration Example and TechNotes > Route Selection in Cisco Routers](#)

#### QUESTION 144

Which technique is used to stop routing loops by preventing route update information from being sent back over the interface on which it arrived?

- A. Holddown timer
- B. Triggered updates
- C. Route poisoning
- D. Split horizon
- E. Maximum hop count

**Correct Answer: D**

**Section: (none)**

**Explanation**

#### Explanation/Reference:

Explanation:

Split horizon stops routing loops by preventing route update information from being sent back over the interface on which it arrived. Routing loops can occur due to slow convergence and inconsistent routing tables, and can cause excessive use of bandwidth or even complete network failure. Split horizon can prevent routing loops between adjacent routers.

Holddown timers prevent regular update messages from reinstating a route that is unstable. The holddown timer places the route in a suspended, or "possibly down" state in the routing table, and regular update messages regarding this route will be ignored until the timer expires.

Triggered updates are sent as soon as a change in network topology is discovered, as opposed to waiting until the next regular update interval (every 30 seconds in RIP networks). This speeds convergence and helps prevent problems caused by outdated information.

Route poisoning "poisons" a failed route by increasing its cost to infinity (16 hops, if using RIP). Route poisoning is combined with triggered updates to ensure fast convergence in the event of a network change.

Objective:

Routing Fundamentals

Sub-Objective:

Compare and contrast distance vector and link-state routing protocols

References:

[Cisco > Articles > Network Technology > General Networking > Dynamic Routing Protocols](#)

#### QUESTION 145

You need to manually assign IPv6 addresses to the interfaces on an IPv6-enabled router. While assigning addresses, you need to ensure that the addresses participate in neighbor discovery and in stateless auto-configuration process on a physical link.

Which of the following addresses can be assigned to the interfaces?

- A. FEC0:0:0:1::1/64
- B. FE80::260:3EFF:FE11:6770/10

- C. 2001:0410:0:1:0:0:0:1/64
- D. 2002:500E:2301:1:20D:BDFF:FE99:F559/64

**Correct Answer:** B

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The FE80::260:3EFF:FE11:6770/10 address can be assigned to an interface of the IPv6-enabled router. This address is a link-local address as it has the prefix FE80::/10. Link-local addresses can be configured for an interface either automatically or manually.

Link-local addresses are IPv6 unicast addresses that are configured on the interfaces of an IPv6-enabled router. With link-local addresses, the nodes can connect to a network (local link) and communicate with other nodes. In addition, these addresses participate in the neighbor discovery protocol and the stateless auto-configuration process.

The FEC0:0:0:1::1/64 address should not be used for the interfaces because this address is a site-local address. Site-local addresses are IPv6 equivalent addresses to IPv4's private address classes. These addresses are available only within a site or an intranet, which typically is made of several network links.

You should not use the 2001:0410:0:1:0:0:0:1/64 and 2002:500E:2301:1:20D:BDFF:FE99:F559 addresses for the interfaces. These two addresses are global unicast addresses as they fall in the range from 2000::/3 and to E000::/3. A global address is used on links that connect organizations to the Internet service providers (ISPs).

Objective:

Network Fundamentals

Sub-Objective:

Configure and verify IPv6 Stateless Address Auto Configuration

References:

[Cisco > Understanding IPv6 Link Local Address](#)

**QUESTION 146**

When the auth keyword is used in the snmp-server host command, which of the following must be configured with an authentication mechanism?

- A. the interface
- B. the host
- C. the user
- D. the group

**Correct Answer:** C

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The auth keyword specifies that the user should be authenticated using either the HMAC-MD5 or HMAC-SHA algorithms. These algorithms are specified during the creation of the SNMP user.

For example, the following command creates a user named V3User who will be a member of the SNMP group V3Group and will use HMAC-MD5 with a password of Password:

```
snmp-server user V3User V3Group v3 auth md5 Password
```

The authentication mechanism is not configured on the interface. All SNMP commands are executed at the



global configuration prompt.

The authentication mechanism is not configured at the host level. The version and security model (authentication, authentication and encryption, or neither) are set at the host level.

The authentication mechanism is not configured at the SNMP group level. The group level is where access permissions like read and write are set. This is why a user account must be a member of a group to derive an access level, even if it is a group of one.

Objective:

Infrastructure Management

Sub-Objective:

Configure and verify device-monitoring protocols

References:

[Configuring SNMP Support > Understanding SNMP > SNMP Versions](#)

[Cisco IOS Network Management Command Reference > snmp-server engineID local through snmp trap link-status > snmp-server host](#)

#### **QUESTION 147**

Which of the following is NOT a benefit of cloud computing to cloud users?

- A. On-demand self-service resources provisioning
- B. Centralized appearance of resources
- C. Highly available, horizontally scaled applications
- D. Cost reduction from standardization and automation

**Correct Answer:** D

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

Cost reduction from standardization and automation is a benefit that accrues to the cloud provider, not the cloud users. Additional benefits to cloud providers are:

- High utilization through virtualization and shared resources
- Easier administration
- Fail-in-place operations model

Benefits that accrue to cloud users include:

- On-demand self-service resources provisioning
- Centralized appearance of resources
- Highly available, horizontally scaled applications
- No local backups required

Cloud users can also benefit from new services such as intelligent DNS, which can direct user requests to locations that are using fewer resources.

Objective:

Network Fundamentals

Sub-Objective:

Describe the effects of cloud resources on enterprise network architecture

References:

[Cloud and Systems Management Benefits](#)

#### **QUESTION 148**

Which Cisco Internetwork Operating System (IOS) command is used to make the running configuration in Random Access Memory (RAM) to the configuration the router will use at startup?

- A. copy running-config startup-config
- B. copy flash running-config
- C. copy tftp flash
- D. copy running-config flash memory
- E. copy startup-config tftp
- F. copy tftp running-config
- G. copy running-config tftp

**Correct Answer:** A

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The copy running-config startup-config command is used to make the running configuration in Random Access Memory (RAM) the configuration the router will use at startup. It saves the running configuration in RAM to the router's NVRAM. This command should always follow changes to the configuration; otherwise, the changes will be lost at the next router restart. The startup configuration loads into memory from NVRAM at boot and resides in memory. When the router restarts, memory information is lost.

The copy flash running-config command is incorrect because this would copy a configuration from the router's flash memory to the running configuration, causing it to be the active configuration. While this can be done, it is not a common practice. Configuration files are normally stored in NVRAM.

The copy tftp flash command is incorrect because this command is used to replace the IOS image with a backup IOS image stored on a TFTP server to the target router. A router can also act as a TFTP server for another router. When you execute this command, you will be prompted for the IP address or hostname of the TFTP server. This prompt will display as in this example:

```
router#enable
router#copy tftp flash
Address or name of remote host []? 192.168.1.5.2
```

Before performing an upgrade of the IOS version from a TFTP server, you should verify that the upgrade is necessary by verifying the current IOS version number. The IOS version number can be found in the output of the following commands:

- **show running-config**
- **show version**
- **show flash**

The copy running-config flash memory command is incorrect because this command would copy the running configuration to the router's flash memory. It is the opposite of the copy flash-running config command. While this can be done, it is not a common practice. Flash is typically used to store the Cisco IOS or operating system. Configuration files are normally stored in NVRAM.

The copy startup-config tftp command is incorrect because this command would be used to copy the current configuration stored in NVRAM to a TFTP server. When you execute this command, you will be prompted for the IP address or hostname of the TFTP server. This prompt will display as below:

```
router#copy start tftp
Address or name of remote host []? 192.168.1.5
Destination filename [router-config]?
```

The address 192.168.1.5 is the address of the TFTP server. If no file name is given, it will save the file as router-config.

The copy tftp running-config is incorrect. This command is used to merge a backup configuration located on a

TFTP server with the configuration in RAM.

The copy running-config tftp command is incorrect. It is used to make a backup copy of the configuration residing in RAM to a TFTP server.

Objective:

Infrastructure Management

Sub-Objective:

Perform device maintenance

References:

[Cisco > Tech Notes > How To Copy a System Image from One Device to Another > Document ID: 15092](#)  
[Cisco Documentation > Cisco IOS Release 12.4 Command References > Using Cisco IOS Software for Release 12.4 > Understanding Command Modes](#)

### QUESTION 149

Which statement is TRUE of the CSMA/CD Ethernet media access method?

- A. It requires centralized monitoring and control.
- B. It is ideal for a switched network environment.
- C. It uses a back-off algorithm to calculate a random time value.
- D. Each station is allotted a time slot in which they can transmit data.

**Correct Answer: C**

**Section: (none)**

**Explanation**

#### **Explanation/Reference:**

Explanation:

The Carrier Sense Multiple Access - Collision Detection (CSMA/CD) Ethernet Media Access Control (MAC) method uses a back-off algorithm to calculate random times to transmit packets across a channel. When two stations start transmitting at same time, their signals will collide. The CSMA/CD method detects the collision and causes both stations to hold the retransmission for an amount of time determined by the back-off algorithm. This is done in an effort to ensure that the retransmitted frames do not collide.

CSMA/CD does not require centralized monitoring and control nor does it assign time slots to stations. Moreover, the CSMA/CD method is designed to work in non-switched environment. It is an alternative to a token-passing topology, in which each station waits in turn to receive a token that allows it to transmit data. With CSMA/CD, each station is capable of making the decision regarding when to transmit the data.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Describe and verify switching concepts

References:

[Cisco Documentation > Internetworking Technology Handbook > Ethernet Technologies](#)

### QUESTION 150

How is the designated router (DR) determined by OSPF on a multi-access network segment?

- A. The lowest interface priority, then the highest RID
- B. The highest interface priority, then the highest RID
- C. The lowest interface priority, then the highest OSPF process ID
- D. The highest interface priority, then the highest OSPF process ID

**Correct Answer: B**

**Section: (none)**

## Explanation

### Explanation/Reference:

Explanation:

OSPF routers elect a designated router (DR) and backup designated router (BDR) on multi-access network segments in order to minimize the amount of update traffic sent between OSPF neighbors. All routers on multi-access network segment form adjacencies with the DR and BDR, but not with each other. Network events are communicated to the DR, and the DR distributes the event to the rest of the network.

The DR is determined by the router with the highest interface priority number. If the priority numbers tie (which will be the case if they are left to the default of 1), then the router with the highest router ID (RID) becomes the DR. The default priority number is 1, and can be configured as high as 255.

In many cases, it is desirable to intervene in this process and select the router you want to be the DR. If that is the case and the selected router is not becoming the DR for whatever reason, the following options are available to ensure that the selected router wins the election:

- Change the priority value of the router to a value higher than the other routers
- Set the priority value of the other routers to 0
- Create a loopback address on the selected router with an IP address higher than the IP addresses used on the other routers

Changing the priority to 0 makes the router ineligible to become the DR or BDR. The `ip ospf priority #` command is used to manually configure a priority on a specific interface.

It is also worth noting that a single OSPF area can have more than one DR. The election is NOT performed per area, but per network segment. So if you had six OSPF routers in area 0 with three in one IP subnet and three in another, there would be two elections, one for each segment.

The lowest interface priority does not determine the DR.

The OSPF process ID has no effect on DR elections.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot single area and multi-area OSPFv2 for IPv4 (excluding authentication, filtering, manual summarization, redistribution, stub, virtual-link, and LSAs)

References:

[Cisco > Support > IP > IP Routing > Technology Information > Technology White Paper > OSPF Design Guide > Document ID: 7039 > DR Election](#)

### QUESTION 151

Refer to the following partial output of the `show interfaces` command:

```
Serial 0 is down, line protocol is down
Hardware is MCI Ethernet, address is 0000.0c00.750c (bia 0000.0c00.750c)
Internet address is 134.108.28.8, subnet mask is 255.255.255.0
MTU 1500 bytes, BW 10000 Kbit, DLY 100000 usec, rely 255/255, load 1/255
Encapsulation ARPA, loopback not set, keepalive set (10 sec)
ARP type: ARPA, ARP Timeout 4:00:00
Last input 0:00:00, output 0:00:00, output hang never
Last clearing of "show interface" counters 0:00:00
Output queue 0/40, 0 drops; input queue 0/75, 0 drops
Five minute input rate 0 bits/sec, 0 packets/sec
Five minute output rate 2000 bits/sec, 4 packets/sec
1127576 packets input, 447251251 bytes, 0 no buffer
Received 354125 broadcasts, 0 runts, 0 giants, 57186* throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
5332142 packets output, 496316039 bytes, 0 underruns
0 output errors, 432 collisions, 0 interface resets, 0 restarts
<<output omitted>>
```

What are the two troubleshooting steps that you should perform to resolve the problem depicted in the output? (Choose two.)

- A. Check the cable connections.
- B. Reset the equipment.
- C. Check the router configuration.
- D. Check the router configuration for the shutdown interface command.

**Correct Answer:** AB

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

You should check the cable connections and reset the equipment to troubleshoot the problem depicted in the output. The Serial 0 is down, line protocol is down message indicates that there is no carrier detect (CD) signal sensed by the router. This problem might be due to incorrect cabling or a possible hardware failure.

A complete list of the possible troubleshooting steps that should be performed to resolve this issue include:

- Checking the cable connections.
- Resetting the equipment.
- Checking the CD LED on the CSU/DSU.
- Reporting the issue to the leased-line provider.
- Replacing the faulty equipment.

The router configuration is not a possible issue in this scenario because both serial 0 and line protocol are down, indicating a problem in the physical layer. Configuration issues, such as an incorrect IP address, would be indicated in the second section of the output (line protocol is up/down). The second section, regardless of whether it says up or down is meaningless when the first section indicates a problem.

You should not check the router configuration for the shutdown interface command. When an interface has been manually shut down with this command, it will be indicated in the output as Serial 0 is administratively down, line protocol is down.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Troubleshoot interface and cable issues (collisions, errors, duplex, speed)

References:

[Cisco > Cisco IOS Interface and Hardware Component Command Reference > show interfaces summary](#)  
[Cisco Documentation > Cisco 1700 Series Router Software Configuration Guide > Configuring a Leased Line > Troubleshooting Problems with Leased Lines](#)

### QUESTION 152

Which of the following commands will enable a global IPv6 address based on the Modified EUI-64 format interface ID?

- A. ipv6 address 5000::2222:1/64
- B. ipv6 address autoconfig
- C. ipv6 address 2001:db8:2222:7272::72/64 link-local
- D. ipv6 enable

**Correct Answer:** B

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

To configure the interface to create a global IPv6 address based on the Modified EUI-64 format interface ID, you must enable stateless autoconfiguration. In stateless autoconfiguration, the interface will receive the network prefix from the router advertisement (RA) and generate a full IPv6 address by spreading the 48-bit MAC address of the interface across 64 bits to complete the address. This can all be done simply by executing the ipv6 address autoconfig command at the interface configuration prompt.

The command ipv6 address 5000::2222:1/64 is used to manually assign a full IPv6 address to the interface without using stateless autoconfiguration or the eui-64 keyword to manually specify the first 64 bits and allow the last 64 bits to be generated from the MAC address of the interface.

The command ipv6 address 2001:db8:2222:7272::72/64 link local is used to configure a link-local address manually without allowing the system to generate one from the MAC address, which is the default method.

The command ipv6 enable is used to allow the system to generate a link-local address from the MAC address. Because this is the default behavior, the command is not required if any other ipv6 commands have been issued. Regardless of how many manual IPv6 addresses you configure, a link local address is always generated by default.

Objective:

Network Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot IPv6 addressing

References:

[Cisco > Product Support > Security > Cisco ASA 5500-X Series Firewalls > Configure > Configuration Guides > Cisco Security Appliance Command Line Configuration Guide, Version 7.2 > Chapter: Configuring IPv6 > Enforcing the Use of Modified EUI-64 Interface IDs in IPv6 Addresses](#)  
[Cisco > Support > Cisco IOS IPv6 Command Reference > ipv6 address](#)

### QUESTION 153

You are a network administrator for your organization. Your organization has two Virtual LANs, named Marketing and Production. All switches in the network have both VLANs configured on them. Switches A, C, F, and G have user machines connected for both VLANs, whereas switches B, D, and E have user machines connected to the Production VLAN only. (Click the Exhibit(s) button to view the network diagram.)

To meet a new requirement, Marketing VLAN users must communicate with Production VLAN users and vice versa. What changes would be required for the network in this scenario?

- A. Disable VTP pruning.

- B. Convert all switch ports into trunk ports.
- C. Create an access list with permit statements.
- D. Install a routing device or enable Layer 3 routing on a switch.

**Correct Answer:** D

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

In this scenario, either a Layer 3 device or Layer 3 routing on a switch would be required to implement inter-VLAN routing. Although you could use multiple physical interfaces for the VLAN traffic, using trunk links between the switches and an external router would make more efficient use of the physical interfaces that you have. Only trunk links can carry traffic from multiple VLANs. These data frames must be frame tagged over the trunk link to identify the VLAN that sourced the frame. The receiving switch sees the VLAN ID, and uses this information to forward the frame appropriately. Additionally, the cables used to connect the router to the switches must be a straight-through cable and not a crossover cable.

When trunks links do not appear to be operating, it is always a good idea to make sure the port used for the trunk link is set as a trunk link and not as an access link. For example, the output below of the show interface fastethernet 0/15 switchport command indicates that Switch2 will not trunk because the port is set as an access link. This is shown in line 5 of the output:

```
<<output omitted>>
Switch2#show Interface fastethernet 0/15 switchport
Name: Fa0/15
SwitchportEnabled
Administrative Mode: access
Operational Mode: access
<<output omitted>>
```

The VLAN Trunking Protocol (VTP) pruning feature restricts unnecessary broadcast traffic between multiple switches. It does not affect inter-VLAN traffic. Therefore, disabling VTP pruning will not permit inter-VLAN communication between the Marketing and Production VLANs.

Converting all switch ports into trunk ports will permit traffic from multiple VLANs to traverse over these links. However, traffic from one VLAN will be restricted to that VLAN only, and inter-VLAN communication will not be possible.

Access lists can permit or deny packets based on the packets' source/destination IP address, protocol, or port number. However, access lists can manipulate inter-VLAN traffic only when inter-VLAN traffic is enabled using a Layer 3 device or Layer 3 routing. Therefore, creating access lists will not enable inter-VLAN routing between the Marketing and Production VLANs.

Objective:

Network Fundamentals

Sub-Objective:

Describe the impact of infrastructure components in an enterprise network

References:

**QUESTION 154**

When executed on a HSRP group member named Router 10, what effect does the following command have?

```
Router10(config-if)# standby group 1 track serial0 25
```

- A. It will cause the router to increase its HSRP priority by 25 if the Serial0 interface on the standby router goes down
- B. It will cause the router to shut down the Serial0 interface if 25 packets have been dropped



- C. It will cause the router to notify Router 25 is serial 0 goes down
- D. It will cause the router to decrement its HSRP priority by 25 if Serial 0 goes down

**Correct Answer:** D

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

This command will cause the router to decrement its HSRP priority by 25 if Serial 0 goes down. Interface tracking can be configured in Hot Standby Routing Protocol (HSRP) groups to switch traffic to the standby router if an interface goes down on the active router. This is accomplished by having the active router track its interface. If that interface goes down, the router will decrement its HSRP priority by the value configured in the command. When properly configured, this will cause the standby router to have a higher HSRP priority, allowing it to become the active router and to begin serving traffic.

When the standby router in an HSRP group is not taking over the active role when the active router loses its tracked interface, it is usually a misconfigured decrement value, such that the value does not lower the HSRP priority of the active router far enough for the standby to have a superior priority value.

The command will not cause the router to increase its HSRP priority by 25 if the Serial0 interface on the standby router goes down. HSRP routers track their own interfaces, not those of another router.

The command will not cause the router to shut down the Serial0 interface if 25 packets have been dropped. It will only do this if the link becomes unavailable.

The command will not cause the router to notify Router 25 is serial 0 goes down. The number 25 in the command is the decrement value, not the ID of another router.

Objective:

Infrastructure Services

Sub-Objective:

Configure, verify, and troubleshoot basic HSRP

References:

[Cisco > Home > Support > Technology Support > IP > IP Application Services > Design > Design Technotes > How to Use the standby preempt and standby track Commands](#)

[Cisco > Cisco IOS IP Application Services Command Reference > standby track](#)

## QUESTION 155

DRAG DROP

Match the Dynamic Trunking Protocol (DTP) configuration on the switch ports so that a trunk link can be established. (Click and drag the DTP modes on the left and place them with their corresponding port on the right.)

**Select and Place:**

**Modes:**

Nonegotiate
Trunk
Desirable
Auto

**Ports:**

	Trunk or Desirable or Auto
	Trunk or Desirable or Auto
	Trunk or Desirable
	Nonegotiate



Correct Answer:

### Modes:


### Ports:

Trunk	Trunk or Desirable or Auto
Desirable	Trunk or Desirable or Auto
Auto	Trunk or Desirable
Nonegotiate	Nonegotiate

Section: (none)

Explanation

#### Explanation/Reference:

Explanation:

There are five DTP modes:

- Trunk: Switch will establish trunk if other end port is configured as Trunk/Desirable/Auto.
- Dynamic Desirable: Switch will establish trunk if other end port is configured as Trunk/Desirable/Auto.
- Dynamic Auto: Switch will establish trunk if other end port is configured as Trunk/Desirable.
- Nonegotiate: Other end port should also be configured with Nonegotiate, or should be a device that does not support DTP.
- Access: No trunk establishment.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Configure and verify Layer 2 protocols

References:

#### QUESTION 156

You are in the process of verifying the operation of your core switches, which are using HSRP. One core switch was left with the default priority; the other was given a lower priority to make it the standby switch. The command show standby brief was executed on one of the switches. Output of the command is shown below:

```
Interface Grp Prio P State Active Standby Virtual IP
Vl10      1   90  P Active local 192.168.10.20 192.168.10.1
Vl20      1   90  P Active local 192.168.20.20 192.168.20.1
```

What does this output mean? (Choose all that apply.)

- A. this switch is using the default priority
- B. this switch is the active HSRP switch
- C. the HSRP devices are up and functioning correctly
- D. the switch intended to be the active switch has failed and this switch has taken over
- E. preemption is enabled for the group

Correct Answer: BDE

Section: (none)

Explanation

Explanation/Reference:

Explanation:

The output in the exhibit indicates that this switch is the active HSRP switch, the switch intended to be the active switch has failed, and that preemption is enabled for the group.

This is the active switch because Active is the State listed for each interface that is a member of HSRP.

The question states that the switch that was intended to be the standby switch was given a priority lower than the default. The default priority is 100, so this is not the switch intended to be the active switch. This information indicates that the switch intended to be the active switch has failed.

Preemption is enabled, as indicated by the P following the priority value in line 2. Since preemption is enabled, the switch with the priority of 100 is still down. When that switch is corrected and joins the group again, it will take over as active.

The HSRP group is still providing access for users, but not all devices are functioning properly.

Objective:

Infrastructure Services

Sub-Objective:

Configure, verify, and troubleshoot basic HSRP

References:

[Cisco IOS Master Command List, Release 12.4T>show ip route profile through ssh show mpls atm-ldp summary>Cisco IOS IP Application Services Command Reference>show standby through show udp>show standby](#)

### QUESTION 157

Which two are NOT valid Cisco IOS commands used for Cisco Discovery Protocol (CDP)? (Choose two.)

- A. show cdp
- B. show cdp entry \*
- C. show cdp neighbor entries
- D. show cdp neighbors detail
- E. show cdp devices

**Correct Answer:** CE

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The show cdp neighbor entries command and the show cdp devices command are not valid Cisco IOS commands.

The Cisco IOS commands used for CDP are as follows:

show cdp: This command is used to view global CDP information, such as timer and hold time.

show cdp entry \*: This command is used to view information regarding all neighboring devices.

show cdp neighbors detail: This command is used to view the details regarding the neighboring devices which are discovered by the CDP. This command is used to view details such as network address, enabled protocols, and hold time. The complete syntax of this command is:

show cdp neighbors [type number] [detail]

Objective:

LAN Switching Fundamentals

Sub-Objective:

Configure and verify Layer 2 protocols

References:

[Cisco > Cisco IOS Network Command Reference, Release 12.4 > show cdp neighbors](#)

### QUESTION 158

Which of the following statements are TRUE regarding EIGRP operation? (Choose two.)

- A. A successor is a backup route, and is installed in both the routing and topology tables.
- B. A successor is a primary route, and is installed in both the routing and topology tables.
- C. A successor is a primary route, and is installed only in the routing table.
- D. A feasible successor is a backup route, and is installed in both the routing and topology tables.
- E. A feasible successor is a primary route, and is only installed in the routing table.
- F. A feasible successor is a backup route, and is only installed in the topology table.
- G. If the successor route fails and no feasible successor route exists, the router will send an update with the route marked with an unreachable metric of 16.

**Correct Answer:** BF

**Section:** (none)

**Explanation**

#### Explanation/Reference:

Explanation:

In EIGRP operations, primary or active routes are known as successors. These routes are maintained in both the routing and topology tables. The routing table is the list of network paths that are currently used by the router.

EIGRP also has the ability to maintain backup routes to destination networks. These backup routes are known as feasible successors. If a feasible successor is discovered by EIGRP, it will be maintained only in the topology table, since it is not currently being used to route traffic. In the event of a successor failure, the backup feasible successor will become the successor, and will be installed in the routing table automatically. If the successor route fails and no feasible successor route exists, the router will send queries to all neighbors until a new successor is found.

EIGRP maintains three dynamic tables in RAM:

- Neighbor table, which is a list of all neighboring EIGRP routers on shared subnets
- Topology table, which contains all discovered network paths in the internetwork
- Routing table, which contains the best path (based on lowest metric) to each destination network

A successor is not a backup route. A successor is a primary or active route, and it is stored in both the routing and topology tables.

A feasible successor is not a primary route. It is a backup route, and it is stored only in the topology table.

If the successor route fails and no feasible successor route exists, the router will not send an update with the route marked with an unreachable metric of 16. EIGRP does not send an update with the route marked with an unreachable metric, and even if it did, 16 is not an unreachable metric in EIGRP as it is in RIP. Instead it sends a multicast query packet to all adjacent neighbors requesting available routing paths to the destination network.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot EIGRP for IPv4 (excluding authentication, filtering, manual summarization, redistribution, stub)

References:

[Cisco > Support > IP > IP Routing > Technology Information > Technology White Paper > Enhanced Interior Gateway Routing Protocol > Document ID: 16406 > Feasible Distance, Reported Distance, and Feasible Successor](#)

**QUESTION 159**

Which Cisco IOS command disables Cisco Discovery Protocol Version 2 (CDPv2) advertisements?

- A. no cdp advertise-v2
- B. no cdp v2-advertise
- C. no cdp run
- D. no cdp enable

**Correct Answer:** A

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The no cdp advertise-v2 command disables CDPv2 advertisements. It is the reverse of the cdp advertise-v2 command, which enables CDPv2 advertisements on a device.

The no cdp v2-advertise command is not a valid Cisco IOS command.

The no cdp run command disables CDP, not CDPv2 advertisements.

The no cdp enable command disables CDP on an interface.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Configure and verify Layer 2 protocols

References:

[Cisco > Support > Using Cisco Discovery Protocol](#)

**QUESTION 160**

Which of the following fields are in a Transmission Control Protocol (TCP) header? (Choose three.)

- A. Length
- B. Sequence Number
- C. Data Offset
- D. Type-of-Service
- E. Window

**Correct Answer:** BCE

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

- Sequence Number, Data Offset, and Window are the fields found in a TCP header. TCP hosts create a connection-oriented session with one another. The following are the fields found in a TCP header:
- Sequence Number: Refers to the first byte of data in the current message. This field helps TCP to reassemble the packets in the correct order. For example, when data is transferred between an FTP server and FTP client, the receiver uses this field to reassemble the packets into the original file.
- Data Offset: Refers to the number of 32-bit words in the TCP header.
- Window: Refers to the size of the available space for the incoming data.
- Source Port and Destination Port: Refer to the point where upper-layer source and destination processes receive TCP services. Both TCP and UDP packets contain these fields.
- Acknowledgment Number: Refers to the sequence number of the next byte of data which the sender will

receive.

- Reserved: Reserved for future use.
- Flags: Contains control information, such as the SYN and ACK bits which are used to establish and acknowledge communication, and the FIN bit which is used to terminate the connection.
- Checksum: An indicator of any damage to the header while being in transit. Both TCP and UDP packets contain this field.
- Urgent Pointer: Refers to the first urgent data byte in the packet.
- Options: Used to specify TCP options. Only TCP packets contain this field.
- Data: Has upper-layer information.

TCP is used for unicast transmissions and provides connection-oriented services for upper layer protocols. It will establish a state of connection between two devices before any data is transferred; for example, before a workstation can exchange HTTP packets with Web server, a TCP connection must be established between the workstation and the Web server.

The Length field is found in a User Datagram Protocol (UDP) header, where it specifies the length of the UDP header and data. UDP headers contain the Source Port, Destination Port, Length, and Checksum fields.

Sequence number, acknowledgment number, and windows size are fields not found in a UDP header because UDP provides none of the services that require use of these fields. That is, UDP cannot re-sequence packets that arrive out of order, nor does UDP acknowledge receipt (thus the term non-guaranteed to describe UDP). Furthermore, since UDP does not acknowledge packets, there is no need to manage the window size, which refers to the number of packets that can be received without an acknowledgment.

The Type-of-Service field is found in an Internet Protocol (IP) header, where it specifies the handling of a current datagram by an upper-layer protocol.

Objective:

Network Fundamentals

Sub-Objective:

Compare and contrast TCP and UDP protocols

References:

[Cisco Documentation > Internetworking Technology Handbook > Routing Basics > Internet Protocols > TCP Packet Format](#)

### QUESTION 161

What command would provide the output displayed in the exhibit? (Click on the Exhibit(s) button.)

Interface	Grp	Prio	P	State	Active	Standby	Virtual IP
Vl64	2	100	P	Standby	192.168.64.10	local	192.168.64.1
Vl65	1	110	P	Active	local	192.168.65.20	192.168.65.1
Vl66	2	100	P	Standby	192.168.66.10	local	192.168.66.1
Vl67	1	110	P	Active	local	192.168.67.20	192.168.67.1
Vl68	2	100	P	Standby	192.168.68.10	local	192.168.68.1
Vl69	1	110	P	Active	local	192.168.69.20	192.168.69.1
Vl70	2	100	P	Active	local	192.168.70.20	192.168.70.1

- A. switch# show hsrp
- B. switch# show standby
- C. switch# show interface vlan
- D. switch# show standby brief

**Correct Answer:** D

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The command `show standby brief` displays the output in the exhibit. It is used to display a summary of the HSRP groups of which the switch is a member. The summary information it provides includes the group number, priority, state, active device address, standby address, and group address. In the exhibit, the interface VLAN 64 is a member of HSRP group 2. Its priority in the group is 100 and it is currently the standby switch. Since preemption is configured (as indicated by the P following the priority), we know that the priority of this switch must be lower than the priority of the active device. The active device has an IP address of 192.168.64.10 and the group IP address is 192.168.64.1.

The command `show standby` can be used to display detailed information about HSRP groups of which a switch is a member. It does not provide the quick summary display of the exhibit. This command displays information about HSRP on all configured interfaces and for all HSRP groups. It also displays hello timer information and the expiration timer for the standby switch. The command syntax is `show standby [type number [group]]`.

Below is an example of this command's output:

```
RouterA#show standby vlan 5

VLAN 5 - group 1
Local state is Active, priority 105, may preempt
Hellotime 3 sec, holdtime 10 sec
Next hello sent in 1.424
Virtual IP address is 192.12.23.10 configured
Active router is local
Standby router is 192.12.23.3 expires in 9.600
Virtual mac address is 0000.0c07.ac01
2 state changes, last state change 00:01:38
<output omitted>

VLAN 5- group 2
Local state is Standby, priority 100
Hellotime 3 sec, holdtime 10 sec
Next hello sent in 1.424
Virtual IP address is 192.12.23.11 configured
Active router is 192.168.23.3 expires in 9.600
Standby router is local
2 state changes, last state change 00:01:38
<output omitted>
```

In the above output, Router A is load-sharing traffic for VLAN 5. It is active for group 1 and standby for group 2. The router at address 192.168.23.3 is active for group 2 and standby for group 1. This allows traffic to be sent to both routers while still allowing for redundancy. Router A was also configured with the `standby 1 preempt` command (results seen in line 1), which allows it to resume its role as active for group 1 if it comes back up from an outage.

The command `show interface vlan` is not a complete command. A VLAN number must follow the command. When provided with a VLAN number, the output would display the status of the SVI, but no HSRP information.

The command `show hsrp` is not a valid command due to incorrect syntax.

Objective:

Infrastructure Services

Sub-Objective:

Configure, verify, and troubleshoot basic HSRP

References:

[Cisco > Cisco IOS IP Application Services Command Reference > show standby through show udp > show standby](#)



**QUESTION 162**

Which command would you use to see which switch interface is associated with a particular MAC address?

- A. show interface mac
- B. show mac
- C. show mac-address-table
- D. show ip interface

**Correct Answer: C**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

The show mac-address-table command displays a table of every learned MAC address, and the switch port associated with the MAC address. Sample output is as follows:

```
Switch# show mac-address-table
Mac Address Table
-----
Vlan Mac Address Type Ports
-----
1 0040.63d8.ba0a DYNAMIC Fa0/1
1 0004.274c.9ca0 DYNAMIC Fa0/3
1 0040.63d8.bab8 DYNAMIC Fa0/10
1 000f.1fd3.d85a DYNAMIC Fa0/7

Total Mac Addresses for this criterion: 4
```

This output indicates that four MAC addresses have been learned by this switch, and the last column indicates the switch port over which each MAC address was learned, and for which frames destined for each MAC address will be forwarded. The MAC address table is built dynamically by examining the source MAC address of received frames. If the switch receives a MAC address not listed in this table, it will send the frame out all ports except the one from which it was originated.

The show ip interface command is a router command, and displays no information on MAC address tables.

The show interface mac and show mac commands are incorrect because they are not valid Cisco IOS commands.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Describe and verify switching concepts

References:

**QUESTION 163**

In the following partial output of the show ip route command, what does the letter D stand for?

```
D 192.1.2.0/24 via 5.1.1.71 [w:0 m:0]
C 192.8.1.1/32 directly connected to loopback 0
```

- A. This is a default route

- B. This is an EIGRP route
- C. This is static route
- D. This is a directly connected route

**Correct Answer:** B

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The letter D indicates that it was a route learned by the EIGRP routing protocol. In the output of the show ip route command, each route will have a letter next to it that indicates the method by which the route was learned. At the beginning of the output will be a legend describing the letters as shown below:

```
Router# show ip route
Codes: I - IGRP derived, R - RIP derived, O - OSPF derived,
C - connected, S - static, E - EGP derived, B - BGP derived,
* - candidate default route, IA - OSPF inter area route,
i - IS-IS derived, ia - IS-IS, U - per-user static route,
o - on-demand routing, M - mobile, P - periodic downloaded static route,
D - EIGRP, EX - EIGRP external, E1 - OSPF external type 1 route,
E2 - OSPF external type 2 route, N1 - OSPF NSSA external type 1 route,
N2 - OSPF NSSA external type 2 route
```

The letter does not indicate that it is a default route. The default route (if configured) will appear at the end of the legend as follows:

```
Gateway of last resort is 10.119.254.240 to network 10.140.0.0
```

The letter does not indicate that it is a static route. Static routes will have an "S" next to them.

The letter does not indicate that it is a directly connected route. Directly connected routes will have a "C" next to them.

Objective:

Routing Fundamentals

Sub-Objective:

Interpret the components of routing table

References:

[Cisco > Support > Cisco IOS IP Routing: Protocol-Independent Command Reference > show ip route](#)

**QUESTION 164**

What is the significance of the following BECN packet statistics?

```
Router# show frame-relay pvc 16

PVC Statistics for interface serial0 (Frame Relay DTE)

DLCI = 16, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0
input pkts 0 output pkts 0 in bytes 0
out bytes 0 dropped pkts 0 in FECN pkts 0
in BECN pkts 100 out FECN pkts 0 out BECN pkts 0
<<output omitted>>
```

- A. The router is experiencing congestion in sending frames.



- B. The router is experiencing congestion in receiving frames.
- C. The Frame Relay mapping table is missing an entry.
- D. The Frame Relay mapping table is corrupt.

**Correct Answer:** A

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

When frames arrived at a router with the Backwards Explicit Congestion Notification (BECN) bit set, congestion was encountered in the opposite direction from which the frame was traveling. This bit is set by the Frame Relay switch. If an incoming packet has the BECN bit set, then this indicates congestion in outgoing packets, so the router will experience congestion in sending frames.

When a Frame Relay switch encounters congestion, it will mark packets being sent in both directions on a PVC with either the Forward Explicit Congestion Notification (FECN) or the BECN bit set. It will set the BECN bit on packets headed in the opposite direction of the congestion and FECN in the same direction as the congestion. When a packet with the FECN bit is received by a router, it means there will be congestion when the receiving router receives packets.

A third type of marking is the Discard Eligibility (DE) bit. When this bit is set on a packet, it ensures that if congestion occurs and packets need to be discarded, the packet with the DE bit set should be discarded first. ALL packets in excess of the committed information rate (CIR) are marked with the DE bit.

Frame Relay mapping tables have nothing to do with congestion in the Frame Relay network.

Objective:

WAN Technologies

Sub-Objective:

Describe basic QoS concepts

References:

[Cisco > Home > Support > Technology Support > WAN > Frame Relay > Design > Design TechNotes > show Commands for Frame Relay Traffic Shaping](#)

**QUESTION 165**

You are the network administrator for your company. You want to upgrade the network, which is currently running on IPv4, to a fully functional IPv6 network. During the transition, you want to ensure that hosts capable only of IPv6 can communicate with hosts capable only of IPv4 on the network.

Which solution should you implement to accomplish the task in this scenario?

- A. IPv6 over IPv4 tunnels
- B. IPv6 over dedicated Wide Area Network (WAN) links
- C. Dual-Stack Backbones
- D. Protocol translation

**Correct Answer:** D

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The protocol translation deployment model should be used to accomplish the task in this scenario. It is the only offered solution that does not require at least one end of the communication solution to support both IPv6 and IPv4.

The following deployment models are available for IPv4 to IPv6 migration:

- IPv6 over IPv4 tunnels: IPv6 traffic is encapsulated into IPv4 packets. Then these packets are transferred over IPv4 WAN. This model eliminates the need to create separate circuits to connect to the IPv6 networks. This model increases protocol overhead because of the IPv6 headers and requires the edge router at each end be capable of both protocols.
- Protocol translation: A method allowing an IPv6 host to communicate with an IPv4 host. This is accomplished with the help of Network Address Translation - Protocol Translation (NAT-PT) used to configure translation between IPv6 and IPv4 hosts. NAT-PT allows communication between IPv6 hosts and applications, and native IPv4 hosts and applications.
- IPv6 over dedicated WAN links: A new deployment of IPv6 is created. In this model, IPv6 hierarchy, addressing, and protocols are used by all nodes. However, this model involves cost for creating IPv6 WAN circuits. This solution is not designed for LAN translation but rather communication over WAN links.
- Dual-Stack Backbones: A hybrid model in which backbone routers have dual-stack functionality, which enables them to route both IPv4 and IPv6 packets. It is suitable for an enterprise that uses both IPv4 and IPv6 applications. Running IPv6 and IPv4 together in a network is known as dual-stack routing.

Objective:

Network Fundamentals

Sub-Objective:

Identify the appropriate IPv6 addressing scheme to satisfy addressing requirements in a LAN/WAN environment

References:

[Cisco > Products and Services > Security > Cisco IOS Network Address Translation \(NAT\) > Data Sheets and Literature > White Papers > Network Address Translator-Protocol Translator](#)

### QUESTION 166

You recently implemented SNMPv3 to increase the security of your network management system. A partial output of the show run command displays the following output that relates to SNMP:

<output omitted>

```
snmp-server group TECHS v3 noauth read TECHS write TECHS
```

Which of the following statements is true of this configuration?

- A. It provides encryption, but it does not provide authentication
- B. It provides neither authentication nor encryption
- C. It provides authentication, but it does not provide encryption
- D. It provides both authentication and encryption

**Correct Answer: B**

**Section: (none)**

**Explanation**

### Explanation/Reference:

Explanation:

It provides neither authentication nor encryption. In SMNPv3, there are three combinations of security that can be used:

- noAuthNoPriv- no authentication and no encryption; includes the noauth keyword in the configuration
- AuthNoPriv - messages are authenticated but not encrypted; includes the auth keyword in the configuration
- AuthPriv - messages are authenticated and encrypted; includes the priv keyword in the configuration

In this case, the keyword noauth in the configuration indicates that no authentication and no encryption are provided. This makes the implementation no more secure than SNMPv1 or SNMPv2.

In SNMPv1 and SNMPv2, authentication is performed using a community string. When you implement SNMP using the noauth keyword, it does not use community strings for authentication. Instead it uses the configured user or group name (in this case TECHS). Regardless, it does not provide either authentication or encryption.

Objective:  
Infrastructure Management  
Sub-Objective:  
Configure and verify device-monitoring protocols

References:  
[SNMP Configuration Guide, Cisco IOS XE Release 3SE \(Catalyst 3850 Switches\) > SNMPv3](#)

#### QUESTION 167

Which Enhanced Interior Gateway Routing Protocol (EIGRP) packet is NOT sent reliably over the network?

- A. Update
- B. Query
- C. Reply
- D. Acknowledgement

**Correct Answer:** D

**Section:** (none)

**Explanation**

#### Explanation/Reference:

Explanation:

Acknowledgement packets are sent unreliably over the network, and there is no guaranteed delivery of acknowledgement packets between neighboring routers.

Acknowledgement packets are a special type of hello packets that do not contain data and have a non-zero acknowledgement number. These are sent as a unicast.

Update, Query, and Reply packets use Reliable Transport Protocol (RTP), which ensures guaranteed delivery of packets between neighboring devices. The RTP mechanism ensures loop-free synchronized network.

Objective:  
Routing Fundamentals  
Sub-Objective:  
Configure, verify, and troubleshoot EIGRP for IPv4 (excluding authentication, filtering, manual summarization, redistribution, stub)

References:  
[Internetworking Technology Handbook > Enhanced Interior Gateway Routing Protocol \(EIGRP\)](#)

#### QUESTION 168

Which of the following characteristics are NOT shared by RIPv1 and RIPv2?

- A. They share an administrative distance value
- B. They use the same metric
- C. They both send the subnet mask in routing updates
- D. They have the same maximum hop count

**Correct Answer:** C

**Section:** (none)

**Explanation**

#### Explanation/Reference:

Explanation:

RIPv1 and RIPv2 do NOT both send the subnet mask in routing updates. RIPv1 is classful, while RIPv2 is classless. This means the RIPv1 does not send subnet mask information in routing updates, while RIPv2 does.

Both versions have the same administrative distance of 120.

Both versions have the same metric, which is hop count.

Both versions have the same maximum hop count, which is 15.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot RIPv2 for IPv4 (excluding authentication, filtering, manual summarization, redistribution)

References:

[Home > Knowledgebase > Cisco Certified Network Associate \(CCNA\) > Difference between RIPv1 and RIPv2](#)  
[Cisco Press > Articles > Cisco Certification > CCDA > CCDA Self-Study: RIP, IGRP, and EIGRP Characteristics and Design](#)

### QUESTION 169

In which two situations would it be appropriate to issue the ipconfig command with the /release and /renew options? (Choose two.)

- A. When the result of running the ipconfig /all command indicates a 169.254.163.6 address
- B. When recent scope changes have been made on the DHCP server
- C. When no IP helper address has been configured on the router between the client and the DHCP server
- D. When the no ip directed-broadcast command has been issued in the router interface local to the client, and no IP helper address has been configured on the router between the client and the DHCP server

**Correct Answer:** AB

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

It would be appropriate to issue the ipconfig command with the /release and /renew options when the result of running the ipconfig /all command indicates a 169.254.163.6 address, or when recent scope changes have been made on the DHCP server. When a computer has an address in the 169.254.0.0 network, it indicates that the computer has not been issued an address from the DHCP server. Instead, the computer has utilized Automatic Private IP Addressing (APIPA) to issue itself an address. If the reason for this assignment is a temporary problem with the DHCP server or some other transitory network problem, issuing the ipconfig /release command followed by the ipconfig /renew command could allow the computer to receive the address from the DHCP server.

Similarly, if changes have been made to the settings on the DHCP server, such as a change in the scope options (such as gateway or DNS server), issuing this pair of commands would update the DHCP client with the new settings when his address is renewed.

These commands will have no effect when no IP helper address has been configured on the router between the client and the DHCP server. An IP helper address can be configured on the local interface of a router when no DHCP server exists on that subnet and you would like to allow the router to forward DHCP DISCOVER packets to the DHCP server on a remote subnet. DHCP DISCOVER packets are broadcast, and routers do not pass on broadcast traffic by default.

These commands also will be of no benefit if the no ip directed-broadcast command has been issued in the router interface local to the client and no IP helper address has been configured on the router between the client and the DHCP server. The no ip directed-broadcast command instructs the router to deny broadcast traffic (which is the default). Under those conditions, the command will not result in finding the DHCP server or receiving an address.

Objective:

## Infrastructure Services

### Sub-Objective:

Troubleshoot client- and router-based DHCP connectivity issues

References:

### QUESTION 170

Which of the following statements is TRUE about trunk ports?

- A. A trunk port connects an end-user workstation to a switch.
- B. A trunk port uses 802.1q to identify traffic from different VLANs.
- C. A trunk port supports a single VLAN.
- D. A trunk port uses a straight-through Ethernet cable when connecting two switches.

**Correct Answer:** B

**Section:** (none)

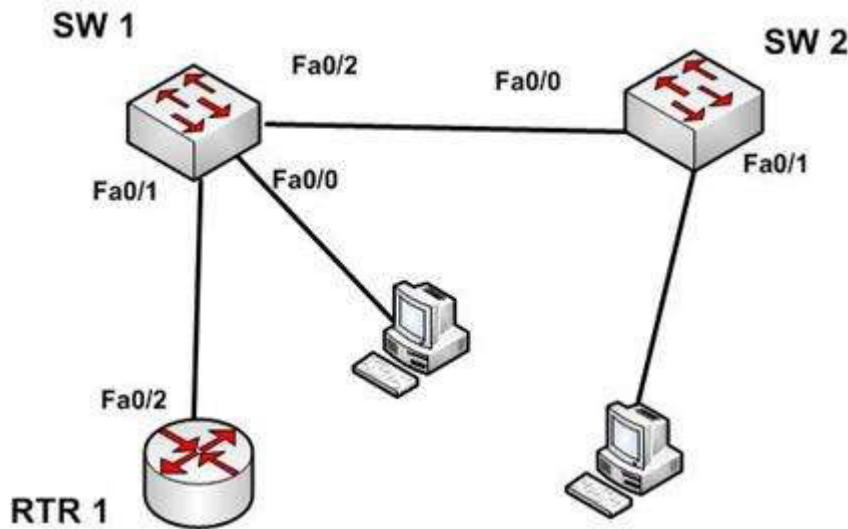
**Explanation**

#### Explanation/Reference:

Explanation:

A switch port can operate as an access port or a trunk port. An access port is used to connect to an end-user device, such as a workstation, server, or printer, while a trunk port is used to connect to neighboring switches or routers. The trunk link is responsible for carrying data between workstations connected to different switches, or a switch and a router configured for inter-VLAN routing. For example, in the diagram below where VLANs are in use on both switches and inter-VLAN routing is configured, the interfaces will operate as follows:

- SW1 - Fa0/1 and Fa0/2 are trunk links, Fa0/0 is an access link
- SW2 - Fa0/0 is trunk link and Fa0/1 is an access link
- RTR - Fa0/2 is a trunk link



With the exception of frames traveling on the native VLAN, data frames crossing a trunk link must be frame tagged over the link to identify the VLAN that sourced the frame. The receiving switch sees the VLAN ID, and uses this information to forward the frame appropriately. 802.1q and ISL are the two possible frame tagging methods between Cisco switches. In summary, some facts about access and trunk ports:

Access ports:

- Carry traffic for a single VLAN
- Connect end user workstations to the switch
- Use a straight-through cable to connect to the device

Trunk ports:

- Facilitate inter-VLAN communication when connected to a Layer 3 device
- Carry traffic from multiple VLANs
- Use 802.1q to identify traffic from different VLANs

When a new trunk link is created on a switch, all VLANs are allowed to use the trunk, by default.

Trunk ports are used between switches and routers, and do not connect to end-user workstations.

Trunk ports support all VLANs known to the switch by default, so that devices in the same VLAN can communicate across multiple switches. Trunk ports are not limited to a single VLAN, as access ports are.

Trunk ports connected between switches using crossover Ethernet cables, not straight-through Ethernet cables. Trunk ports between switches and routers use straight-through cables.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot interswitch connectivity

References:

[Home > Articles > Network Technology > General Networking > VLANs and Trunking](#)

### QUESTION 171

Which of the following excerpts from the output of the show ip eigrp topology command include EIGRP learned routes or pairs of routes that will be included in the routing table? (For excerpts that include multiple routes, do not include the entry unless BOTH routes will be included in the routing table.)

- A. P 172.16.16.0/24, 1 successors, FD is 284244  
via 172.16.250.2 (284244/17669856), Serial0/0  
via 172.16.251.2 (12738176/27819002), Serial0/1
- B. P 172.16.250.0/24, 1 successors, FD is 2248564  
via Connected, Serial0/0
- C. P 172.16.10.0/24 2 successors, FD is 284244  
via 172.16.50.1 (284244/17669856), Serial1/0  
via 172.16.60.1 (284244/17669856), Serial1/1
- D. P 172.16.60.0/24, 1 successors, FD is 2248564  
via Connected, Serial1/1

**Correct Answer:** C

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The following excerpt indicates two successor routes, and they will both be included:

```
P 172.16.10.0/24 2 successors, FD is 284244
  via 172.16.50.1 (284244/17669856), Serial1/0
  via 172.16.60.1 (284244/17669856), Serial1/1
```

Both of these routes will be included because they have identical metrics (284244/17669856). Only the EIGRP successor routes will appear in the routing table, as these are considered the best-path routes to each remote network.

The route for 172.16.16.0/24 via 172.16.251.2 (12738176/27819002) will not be included because only successor routes are included, and this route is a feasible successor. Feasible successor routes are routes that are used only as a backup if the successor route(s) becomes unavailable. If you examine the output of each option, it will indicate how many successor routes are in the entry. The entry shows that there is only one

successor to this route:

P 172.16.16.0/24, 1 successors, FD is 284244  
via 172.16.250.2 (284244/17669856), Serial0/0  
via 172.16.251.2 (12738176/27819002), Serial0/1

The first listed is the successor and the second is the feasible successor. The first has the best or lowest metric (284244/17669856), which is the criterion used for selection.

These entries indicate successor routes, but they also indicate they are via Connected, which means they are networks directly connected to the router.

P 172.16.250.0/24, 1 successors, FD is 2248564  
via Connected, Serial0/0

and

P 172.16.60.0/24, 1 successors, FD is 2248564  
via Connected, Serial1/1

Therefore, they are not EIGRP learned routes.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot EIGRP for IPv4 (excluding authentication, filtering, manual summarization, redistribution, stub)

References:

[Cisco > Cisco IOS IP Routing Protocols Command Reference > EIGRP Commands: M through V > show ip eigrp topology](#)

### QUESTION 172

What data structure is pictured in the graphic?

0-15	16-31
Source Port Number	Destination Port Number
Length	Checksum
Data	

- A. TCP segment
- B. UDP datagram
- C. IP header
- D. Http header

**Correct Answer:** B

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The data structure pictured in the graphic is an UDP datagram. It uses a header (not shown) that contains the



source and destination MAC address. It has very little overhead as compared to the TCP segmented (shown later in this explanation) as any transmission that uses UDP is not provided the services of TCP.

It is not a TCP segment, which has much more overhead (shown below). The TCP header contains fields for sequence number, acknowledgment number, and windows size, fields not found in a UDP header because UDP provides none of the services that require use of these fields. That is, UDP cannot re-sequence packets that arrive out of order, nor does UDP acknowledge receipt (thus the term non-guaranteed to describe UDP). Furthermore, since UDP does not acknowledge packets there is no need to manage the window size (the window size refers to the number of packets that can be received without an acknowledgment).

Bit 0				Bit 15				Bit 16				Bit 31			
Source Port (16)								Destination Port (16)							
Sequence Number (32)															
Acknowledgement Number (32)															
Header length (4)				Reserved				Code Bits (6)				Window (16)			
Checksum (16)								Urgent (16)							
Options ( 0 or 32 if any)															
Data (Varies)															

It is not an IP header. An IP header contains fields for the source and destination IP address. The IP header, like the UDP segment, does not contain fields for sequence number, acknowledgment number, and windows size, fields not found in a TCP header because TCP provides none of the services that require use of these fields. IP provides best-effort user data. This does not cause a delivery problem, however, as IP relies on TCP to provide those services when the transmission is a unicast.

An HTTP header does not include fields for HTTP requests and responses.

Objective:

Network Fundamentals

Sub-Objective:

Compare and contrast TCP and UDP protocols

References:

[Cisco > Home > Internetworking Technology Handbook > Internet Protocols > User Datagram Protocol \(UDP\)](#)

### QUESTION 173

A new trainee is setting up a router in a test lab, and he asks you to describe the use of the connector marked BRI on the router.



Which is a correct use for this connector?

- A. A WAN interface for a T1 connection
- B. A LAN interface to connect to a switch
- C. An interface to connect a console cable
- D. A WAN interface for an ISDN connection

**Correct Answer: D**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

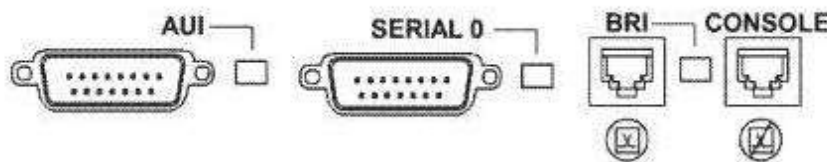
The connector marked BRI is used for an Integrated Services Digital Network (ISDN) connection, specifically a basic rate interface (BRI). An ISDN basic rate interface provides three channels: a D channel for control signaling, and two B or bearer channels for data, resulting in 128 bits of bandwidth.

A WAN interface for a T1 connection would be connected to a serial port on the router, not the BRI interface. It would not accept a basic rate ISDN connection.

A LAN interface to connect to a switch would be an Ethernet connection that used either an RJ-45 connector or a legacy AUI connector. It would not accept a basic rate ISDN connection.

An interface to a console connector will look like an RJ-45 Ethernet connector but will only accept a console or rollover cable, and is used to manage the router. It would not accept a basic rate ISDN connection.

These various ports can be seen on the backplane of a router as shown below:



Objective:

WAN Technologies

Sub-Objective:

Describe WAN access connectivity options

References:

[http://www.tutorialsworld.com/networking/routers/cisco-routers-ios.htm#Hardware%20Components: Cisco>Support>Product Support>End-of-Sale and End-of-Life Products>Cisco 3600 Series Multiservice Platforms>Troubleshoot and Alerts> Troubleshooting TechNotes> Understanding the 1-Port ISDN BRI \(S/T\) WAN Interface Card \(WIC-1B-S/T or WIC36-1B-S/T\)](http://www.tutorialsworld.com/networking/routers/cisco-routers-ios.htm#Hardware%20Components: Cisco>Support>Product Support>End-of-Sale and End-of-Life Products>Cisco 3600 Series Multiservice Platforms>Troubleshoot and Alerts> Troubleshooting TechNotes> Understanding the 1-Port ISDN BRI (S/T) WAN Interface Card (WIC-1B-S/T or WIC36-1B-S/T))

**QUESTION 174**

Which Cisco Internetwork Operating System (IOS) command is used to assign a router a name for identification?

- A. description
- B. banner motd
- C. hostname
- D. banner exec

**Correct Answer:** C

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The hostname command is used to assign the router a name for identification. This command is a global configuration mode command. The syntax of the command is as follows:

**Router(config)# hostname [name]**

The name parameter of the command specifies the new host name for the router.

The description command is incorrect because this command is used to set a description for an interface. The description command is an interface configuration mode command.

The banner motd command is used to specify a message of the day (MOTD) banner to users logging into the router. This is a global configuration mode command, but it does not assign a name to the router for identification.

The banner exec command enables a banner message to be displayed when an EXEC process is created; for example, if a line is activated or an incoming connection is made to a telnet line.

Objective:

Infrastructure Management

Sub-Objective:

Configure and verify initial device configuration

References:

[Cisco > Cisco IOS Configuration Fundamentals Command Reference > F through K > hostname](#)

### QUESTION 175

You have a class C address range and are planning a network that has an average of 50 hosts per subnet.

How many host bits will have to be borrowed for subnetting so that the maximum number of subnets can be implemented?

- A. 1
- B. 2
- C. 3
- D. 4
- E. 6

**Correct Answer:** B

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

A class C address has 8 bits in host space. By using 2 bits from the host space for subnetting, leaving 6 host bits, you can create subnets that can accommodate up to 62 hosts each ( $2^6 - 2 = 62$ ). This will ensure that the requirement of 50 hosts per subnet is met and the maximum number of subnets is provided.

The formulas to calculate the number of subnets and hosts are:

Number of subnets =  $2^{\text{number-of-subnet-bits}}$

Number of hosts per subnet =  $2^{\text{number-of-host-bits}} - 2$

If you take 1 bit for subnetting:

Number of subnets =  $2^1 = 2$

Number of hosts per subnet =  $2^7 - 2 = 126$

This results in a mask of 255.255.255.128 or /25. Since each subnet need not be bigger than 50, this solution would not maximize the number of subnets.

If you take 2 bits for subnetting:

Number of subnets =  $2^2 = 4$

Number of hosts per subnet =  $2^6 - 2 = 62$

This results in a mask of 255.255.255.192 or /26. This solution would create more subnets, but the subnets are smaller than the requirement.

If you take 3 bits for subnetting:

Number of subnets =  $2^3 = 8$

Number of hosts per subnet =  $2^5 - 2 = 30$

This results in a mask of 255.255.255.224 or /27. This would create more subnets, but the subnets are smaller than the requirement.

If you take 4 bits for subnetting:

Number of subnets =  $2^4 = 16$

Number of hosts per subnet =  $2^4 - 2 = 14$

This results in a mask of 255.255.255.240 or /28. This solution would create more subnets, but the subnets are smaller than the requirement.

If you take 6 bits for subnetting:

Number of subnets =  $2^6 = 64$

Number of hosts per subnet =  $2^2 - 2 = 2$

This mask, 255.255.255.252 or /30, yields only 2 IP addresses, but is quite commonly used on a point-to-point link, such as between two routers. This solution would create more subnets, but the subnets are smaller than the requirement.

You will always subtract 2 from the number of hosts (the formula of  $2^{\text{number-of-host-bits}} - 2$ ) because the all-zeros bit address is reserved for the network address and the all-ones bit address is reserved for the broadcast address.

Prior to Cisco IOS Software Release 12.0, it was common practice to subtract 2 from the networks formula ( $2^{\text{number-of-subnet-bits}}$ ) to exclude addresses of all 1s and all 0s (called the all-ones subnet and subnet zero). Today that range is usable, except with some legacy systems. On certain networks with legacy software, you may need to use the previous formula ( $2^n - 2$ ) to calculate the number of subnets.

Objective:

Network Fundamentals

Sub-Objective:

Apply troubleshooting methodologies to resolve problems

References:

[Cisco > Technology Support > IP > IP Routing > Design TechNotes > IP Addressing and Subnetting for New Users > Document ID: 13788 > Understanding IP Addresses](#)  
[Cisco > Technology Support > IP > IP Addressing Services > Design TechNotes > Subnet Zero and the All-Ones Subnet > Document ID: 13711](#)

**QUESTION 176**

On which of the following networks will OSPF elect a designated router (DR)? (Choose two.)

- A. Broadcast
- B. NBMA
- C. Point-to-point
- D. Point-to-multipoint

**Correct Answer:** AB

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

OSPF will perform an election for a designated router (DR) and backup designated router (BDR) on every multi-access network segment. Multi-access segments are defined as segments where more than two hosts can reach each other directly, such as a shared Ethernet segment (broadcast multi-access) or Frame Relay (non-broadcast multi-access, or NBMA).

DR and BDR elections do not occur on point-to-point or point-to-multipoint segments. Point-to-point and point-to-multipoint segments are not considered multi-access segments. OSPF routers on these network types will establish an adjacency without a DR/BDR election.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot single area and multi-area OSPFv2 for IPv4 (excluding authentication, filtering, manual summarization, redistribution, stub, virtual-link, and LSAs)

References:

[Cisco > Support > IP > IP Routing > Technology Information > Technology White Paper > OSPF Design Guide > Document ID: 7039 > DR Election](#)

**QUESTION 177**

Which media access control method is used by Ethernet technology to minimize collisions in the network?

- A. CSMA/CD
- B. token passing
- C. back-on algorithm
- D. full-duplex

**Correct Answer:** A

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

Carrier Sense Multiple Access - Collision Detection (CSMA/CD) is used by Ethernet technology to minimize collisions in the network. The CSMA/CD method uses a back-off algorithm to calculate random time for retransmission after a collision. When two stations start transmitting at the same time, their signals will collide. The CSMA/CD method detects the collision, and both stations hold the retransmission for a certain amount of time that is determined by the back-off algorithm. This is an effort to help ensure that the retransmitted frames do not collide.

Token passing is used by the token-ring network topology to control communication on the network.

Full-duplex is the Ethernet communication mode that allows workstation to send and receive simultaneously. With the use of full-duplex, the bandwidth of the station can effectively be doubled. Hubs are not capable of

handling full-duplex communication. You need dedicated switch ports to allow full-duplex communication.

The back-on algorithm is an invalid option. There is no such contention method.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Describe and verify switching concepts

References:

[Cisco Documentation > Internetworking Technology Handbook > Ethernet Technologies](#)

### QUESTION 178

What are the three types of Internet Protocol version 6 (IPv6) addresses? (Choose three.)

- A. Unicast
- B. Broadcast
- C. Dual-cast
- D. Anycast
- E. Multicast

**Correct Answer:** ADE

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

Unicast, multicast, and anycast are types of IPv6 addresses.

The following are the IPv6 address types:

- Unicast address: These types of addresses are used to define a single destination interface. A packet sent to a unicast address is delivered to the specific interface.
- Multicast address: These types of addresses are used to define a group of hosts. When a packet is sent to a multicast address, it is delivered to all the hosts identified by that address. Multicast addresses begin with the prefix FF00::/8 and the second octet identifies the range over which the multicast address is propagated. Some special case IPv6 multicast addresses:
  - FF01:0:0:0:0:0:0:1: Indicates all-nodes address for interface-local scope.
  - FF02:0:0:0:0:0:0:2: Indicates all-routers address for link-local.
- Anycast address: These types of addresses are used to identify a set of devices. These addresses are also assigned to more than one interface belonging to different nodes. A packet sent to an anycast address is delivered to just one of the interfaces, based on which one is closest. For example, if an anycast address is assigned to a set of routers, one in India and another in the U.S., the users in the U.S. will be routed to U.S. routers and the users in India will be routed to a server located in India.

The broadcast option is incorrect because these types of addresses are not supported by IPv6. Broadcast functionality is provided by multicast addressing.

The dual-cast option is incorrect because this is not a valid Cisco address type.

Objective:

Network Fundamentals

Sub-Objective:

Compare and contrast IPv6 address types

References:

### QUESTION 179

What is the purpose of using the show arp command?

- A. To view the ARP statistics only for a particular interface
- B. To view details regarding neighboring devices discovered by ARP
- C. To view global ARP information such as timer and hold time
- D. To view the Address Resolution Protocol (ARP) cache

**Correct Answer: D**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

The show arp command is used to view the Address Resolution Protocol (ARP) cache. ARP is used by the Internet Protocol (IP) to find the Media Access Control (MAC) address or the hardware address of a host. The main function of ARP is to translate IP addresses to MAC addresses. The process of obtaining the address of a computer in the network is known as address resolution. This process is accomplished by sending an ARP packet from a source to a destination host. The destination host responds to the ARP packet by replying back to the source and including its own MAC address. Once the source host receives the reply, it will update its ARP cache with the new MAC address.

The complete syntax of the show arp command is:

**show arp [ip-address [locationnode-id] | hardware-address [locationnode-id] | traffic [locationnode-id | interface-instance] | trace [error [locationnode-id] | dev [locationnode-id] | events [locationnode-id] | table [locationnode-id] packets [locationnode-id] | [locationnode-id]] | type instance| [locationnode-id]**

The following is a brief description of the parameters used with this command:

ip-address: An optional parameter that displays specific ARP entries.

locationnode-id: An optional parameter that displays the ARP entry for a specific location. The method for entering the node-id argument is rack/slot/module notation.

hardware-address: An optional parameter that displays ARP entries that match the 48-bit MAC address.

traffic: An optional parameter that displays ARP traffic statistics.

interface instance: Either a physical interface instance or a virtual interface instance:

Physical interface instance: the naming notation is rack/slot/module/port and a slash mark between values is required as part of the notation where:

rack refers to the chassis number of the rack.

slot refers to the physical slot number of the line card.

module refers to the module number. A physical layer interface module (PLIM) is always 0.

port refers to the physical port number of the interface.

Virtual interface instance: the number range is variable depending on the type of interface.

trace: An optional parameter that displays the ARP entries in the buffer.

error: An optional parameter that displays the ARP error logs.

dev: An optional parameter that displays the ARP internal logs.

events: An optional parameter that displays the ARP events logs.

table: An optional parameter that displays the ARP cache logs.

packets: An optional parameter that displays the ARP packet receive and reply logs.

type instance: An optional parameter that specifies the interface for which you want to view the ARP cache.

An example of the output of the show arp command is shown below along with a diagram of the network in which the router resides.

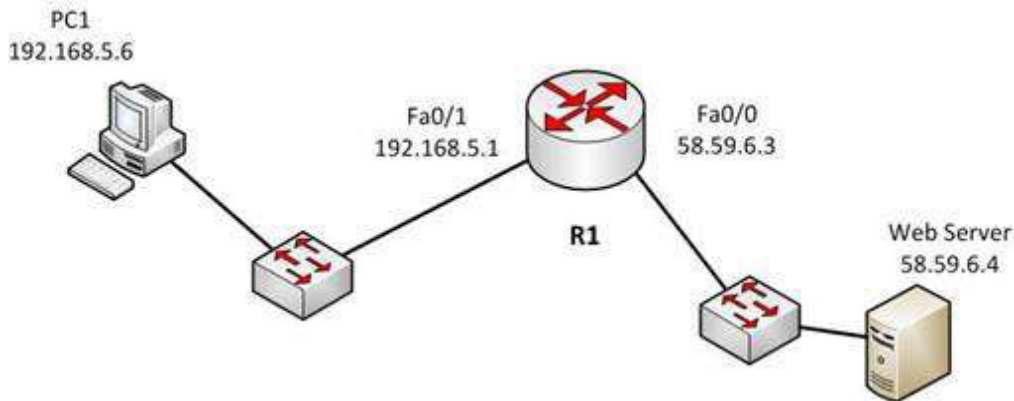
```
R1#show arp
Protocol Address Age (min) Hardware Addr Type Interface

Internet 192.0.5.1 120 0000.a710.4baf ARPA FastEthernet 0/1

Internet 192.0.5.6 105 0000.a710.859b ARPA FastEthernet 0/1
```

Internet 58.59.6.3 42 0000.a710.68cd ARPA FastEthernet 0/0

Internet 58.59.6.4 59 0000.0c01.7bbd ARPA FastEthernet 0/0



From the information above, we can make the following conclusions about the actions R1 will take when it receives data from PC1 destined for the Web server:

- The data frames will be forwarded out the Fa0/0 interface of R1
- R1 will place the MAC address of the Web Server (0000.0c01.7bbd) in the destination MAC address of the frames
- R1 will put the MAC address of the forwarding Fa0/0 interface (0000.a710.68cd) in the place of the source MAC address

The option stating that the show arp command is used to view the ARP statistics only for a particular interface is incorrect because this command is used to view the ARP cache. You can also view the information for a particular interface with the help of the interface instance parameter.

The options stating that the show arp command is used to view the details of neighboring devices discovered by the ARP or to view global ARP information, such as hold time and timer, are both incorrect because these are both Cisco Discovery protocol (CDP) functions, not ARP functions. The show cdp neighbors detail command is used to display details regarding the neighboring devices that are discovered by CDP, and the show cdp command displays global CDP information, such as timer and hold-time.

Objective:

Network Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot IPv4 addressing and subnetting

References:

#### QUESTION 180

Which of the following IP addresses are valid Class B host addresses if a default Class B mask is in use? (Choose all that apply.)

- A. 10.6.8.35
- B. 133.6.5.4
- C. 192.168.5.9
- D. 127.0.0.1
- E. 190.6.5.4

**Correct Answer:** BE

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The IP addresses 133.6.5.4 and 190.6.5.4 are both valid Class B addresses when a default mask is in use. The Class B default mask is 255.255.0.0 and the range of valid addresses is 128.0.0.0-191.255.255.255.

The IP address 10.6.8.35 is a Class A address. The Class A default mask is 255.0.0.0 and the range of valid addresses is 1.0.0.0 - 127.255.255.255, with the exception of the range 127.0.0.1 - 127.255.255.255, which is reserved and cannot be assigned.

The IP address 192.168.5.9 is a Class C address. The Class C default mask is 255.255.255.0 and the range of valid addresses is 192.0.0.0 - 223.255.255.255.

The IP address 127.0.0.1 is a Class A address, but it comes from a reserved portion that cannot be assigned. The range 127.0.0.1 - 127.255.255.255 is used for diagnostics, and although any address in the range will work as a diagnostic address, 127.0.0.1 is known as the loopback address. If you can ping this address, or any address in the 127.0.0.1 - 127.255.255.255 range, then the NIC is working and TCP/IP is installed. The Class A default mask is 255.0.0.0 and the range of valid addresses is 1.0.0.0 - 127.255.255.255, with the exception of the range 127.0.0.1 - 127.255.255.255, which is reserved and cannot be assigned.

Objective:

Network Fundamentals

Sub-Objective:

Compare and contrast IPv4 address types

References:

[Cisco > Design Tech Notes > IP Routing > IP Addressing and Subnetting for New Users > Understanding IP Addresses > Document ID: 13788](#)

**QUESTION 181**

Refer to the following sample output:



```
GigabitEthernet0/2 is up, line protocol is up
Internet address is 11.1.1.1/16
Broadcast address is 255.255.255.255
Address determined by setup command
MTU is 1500 bytes
Helper address is not set
Directed broadcast forwarding is disabled
Outgoing access list is not set
Inbound access list is not set
Proxy ARP is enabled
Local Proxy ARP is disabled
Security level is default
Split horizon is enabled
ICMP redirects are always sent
ICMP unreachable are always sent
ICMP mask replies are never sent
IP fast switching is enabled
IP fast switching on the same interface is disabled
IP Flow switching is disabled
IP CEF switching is enabled
IP Feature Fast switching turbo vector
IP VPN Flow CEF switching turbo vector
IP multicast fast switching is enabled
IP multicast distributed fast switching is disabled
IP route-cache flags are Fast, CEF
Router Discovery is disabled
IP output packet accounting is disabled
IP access violation accounting is disabled
TCP/IP header compression is disabled
RTP/IP header compression is disabled
Policy routing is enabled, using route map PBR
Network address translation is disabled
BGP Policy Mapping is disabled
IP Multi-Processor Forwarding is enabled <===== MPF information
IP Input features, "PBR",
are not supported by MPF and are IGNORED
IP Output features, "NetFlow",
are not supported by MPF and are IGNORED
```

Which Cisco Internetwork Operating System (IOS) command produces this output?

- A. show interfaces
- B. show interfaces summary
- C. show ip interface
- D. show interfaces serial

**Correct Answer: C**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

The show ip interface command will produce the displayed output. The show ip interface command is used to view the usability status of Internet Protocol (IP) interfaces. The complete syntax of this command is:

## **show ip interface [type number] [brief]**

Following is a brief description of the parameters used in this command:

type: An optional parameter that refers to the type of interface.

number: An optional parameter that refers to the interface number.

brief: An optional parameter used to view a summarized display of the usability status information for every interface

The show interfaces command does not generate the displayed output. This command is used to view information regarding statistics for specific interfaces.

The show interfaces summary command does not generate the displayed output. This command provides a summarized view of all interfaces configured on a device.

The show interfaces serial command does not generate the displayed output. This command is used to view information for a serial interface.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Troubleshoot interface and cable issues (collisions, errors, duplex, speed)

References:

### **QUESTION 182**

How many IP addresses are available for hosts in the 192.168.16.64 /26 subnet?

- A. 14
- B. 30
- C. 62
- D. 126

**Correct Answer: C**

**Section: (none)**

**Explanation**

#### **Explanation/Reference:**

Explanation:

There are 62 IP addresses available for hosts in the 192.168.16.64 /26 subnet.

The number of host addresses is calculated as  $2^n - 2$ , where n is the number of host bits and 2 is subtracted to exclude the network address and the broadcast address.

An IP address has 32 available bits divided into four octets. In the 192.168.16.66 /26 address, the /26 indicates that there are 26 masking bits, or that 26 bits are reserved for the network portion of the address. This leaves 6 bits for the host addresses ( $32 - 26 = 6$ ).

The following formula is used to calculate the number of IP addresses available for hosts:

Network address: 192.168.16.0

Subnet mask in decimal: 255.255.255.192

Subnet mask in binary: 11111111.11111111.11111111.11000000

Number of bits used for masking =  $2^6$

Number of hosts bits in the address = 6

Using the formula for calculating the number of hosts per subnet, we find:

Hosts formula:  $2^{\text{number-of-host-bits}} - 2$

Hosts:  $2^6 - 2 = 62$

For subnet 192.168.16.64, the valid host range starts from 192.168.16.65 and runs to 192.168.16.126. For subnet 192.168.16.128, the valid host range starts from 192.168.16.129 and runs to 192.168.16.190.

The options 14, 30, and 126 are incorrect because 62 IP addresses are available for hosts in the 192.168.16.64/26 subnet.

The correct mask for the size network desired is critical to proper network function. For example, assume a router has an interface Fa0/0 hosting a LAN with 20 computers configured as shown in the following output of show interfaces command:

```
Router# show interfaces
FastEthernet0 is up, line protocol is up
Hardware address is 000b.12bb.4587
Internet address 192.168.10.30/30
```

In this example, the computers will not be able to access anything beyond the LAN because the mask /30 only allows for 2 addresses when 21 (including the router interface) are required.

Objective:

Network Fundamentals

Sub-Objective:

Apply troubleshooting methodologies to resolve problems

References:

[Cisco > Technology Support > IP > IP Routing > Design TechNotes > IP Addressing and Subnetting for New Users > Document ID: 13788 > Understanding IP Addresses](#)

### QUESTION 183

You have the following configuration on your router:

```
ip dhcp pool POOLNAME
network 10.1.0.0 255.255.255.0
default-router 10.1.0.254
dns-server 10.1.0.200
```

What command would you run to prevent the last available IP address in the scope from being allocated to a host via DHCP?

- A. ip dhcp restrict 10.1.0.254
- B. ip dhcp excluded-address 10.1.0.253
- C. ip dhcp excluded-address 10.1.0.254
- D. ip dhcp 10.1.0.253 excluded-address

**Correct Answer:** B

**Section:** (none)

**Explanation**

#### Explanation/Reference:

Explanation:

In this scenario, you would run the ip dhcp excluded-address 10.1.0.253 command in global configuration mode to prevent DHCP allocation of the last available IP address in the scope. The ip dhcp excluded-address command is used to prevent DHCP from handing out IP addresses that are already statically configured on your network. The command can include a single IP address to exclude, or an entire range, such as:

```
Router(config)# ip dhcp excluded-address 10.1.0.100 10.1.0.125
```

The command above would block the entire range of 10.1.0.100 through 10.1.0.125 from being allocated by DHCP. If the next IP address in sequence to be assigned would have been 10.1.0.100, DHCP will skip the range and assign 10.1.0.126 as the next host address.

You would not execute `ip dhcp excluded-address 10.1.0.254`. This is the address of the router and it will automatically be excluded.

The other commands are incorrect because they are not valid Cisco IOS commands.

Objective:

Infrastructure Services

Sub-Objective:

Configure and verify DHCP on a router (excluding static reservations)

References:

[Cisco > Support > Cisco IOS Software > Configuring the Cisco IOS DHCP Server > Excluding IP Addresses](#)

### QUESTION 184

Which of the following is a classful routing protocol?

- A. RIPv1
- B. EIGRP
- C. BGPv4
- D. RIPv2

**Correct Answer:** A

**Section:** (none)

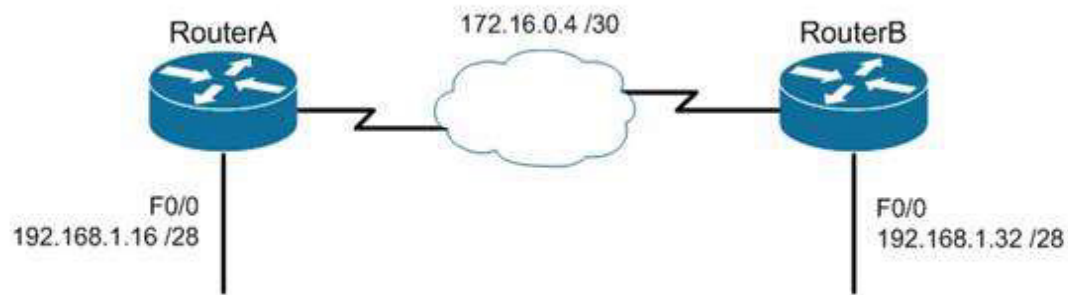
**Explanation**

#### **Explanation/Reference:**

Explanation:

The Routing Information Protocol version 1 (RIPv1) is a classful routing protocol, which exchanges routes without including any subnet masking information. IP addresses in the routing table should have the same subnet mask. Because classful routing protocols may not fully utilize the available IP address range, all router interfaces within the same network must have the same subnet mask.

Open Shortest Path First (OSPF), Routing Information Protocol version 2 (RIPv2), Enhanced Interior Gateway Routing Protocol (EIGRP), and Border Gateway Protocol version 4 (BGPv4) are classless routing protocols. These protocols include the subnet mask in the route advertisement and support variable length subnet masks (VLSM). Intermediate System-to-Intermediate System (IS-IS) is also a classless routing protocol. An example of a network using VLSM is shown below. Note the different masks used, indicated with CIDR notation.



Objective:

Routing Fundamentals

Sub-Objective:

Compare and contrast distance vector and link-state routing protocols

References:

[Cisco > Articles > Cisco Networking Academy > CCNP 1: Advanced IP Addressing Management](#)

[Cisco > Internetworking Technology Handbook > Routing Information Protocol \(RIP\)](#)

### QUESTION 185

What port types are available for Rapid Spanning Tree Protocol (RSTP) but NOT available in Spanning Tree Protocol (STP)? (Choose two.)

- A. Root port
- B. Backup port
- C. Alternate port
- D. Designated port
- E. Learning port

**Correct Answer:** BC

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

RSTP was developed to reduce the high convergence times required in STP, and introduces the alternate port and backup port roles. RSTP is an Institute of Electrical and Electronics Engineers (IEEE) standard, 802.1w, and is interoperable with 802.1d (STP). It operates on the Data Link layer of the OSI model.

An alternate port is a port that has an alternative path or paths to the root bridge, but is currently in a discarding state. A backup port is a port on a segment that could be used to reach the root port, but there is already an active designated port for the segment. An alternate port can also be described as a secondary, unused root port, and a backup port as a secondary, unused designated port.

A root port is a port on non-root switches used to reach the root switch. There can be only one root port on a switch, and it is determined by the least path cost to the root switch. Root ports are used in STP and RSTP.

A designated port is the port used by a network segment to reach the root switch. Designated ports lead away (downstream) from the root switch, and are determined by the lowest path cost to the root switch. While a

switch can only have one root port, every other port could potentially be a designated port. Whenever a network segment could be serviced by more than one switch, STP will elect one switch as designated for the segment, and the other(s) will be blocking. This is a core function of the STP protocol, in that only one active Layer 2 path can exist between any two network segments. This port type is available in STP.

A learning port is not a valid port type in STP or RSTP. Learning is one of the possible port states in STP and RSTP. STP has five port states; blocked, listening, learning, forwarding, and disabled. There are only three port states in RSTP; discarding, learning, and forwarding.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot STP-related optional features

References:

[Cisco > Technology Support > LAN Switching > Spanning Tree Protocol > Technology White Paper > Understanding Rapid Spanning Tree Protocol \(802.1w\)](#)

### QUESTION 186

You have executed the following commands on switch55:

```
switchA(config)# dot1x system-auth-control
switchA(config)# aaa new-model
switchA(config)# radius-server host 192.168.105.67 key firstKey111
switchA(config)# aaa authentication dot1x default group radius
switchA(config)# interface range Fa 0/1 - 11
switchA(config-if)# switchport mode access
switchA(config-if)# dot1x port-control auto
```

What is the result of executing the given commands? (Choose two.)

- A. Only the listed RADIUS server is used for authentication
- B. 802.1X authentication is enabled on the Fa0/1 interface only
- C. The key for the RADIUS server is firstKey111
- D. AAA is not enabled on the switch

**Correct Answer:** AC

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

As a result of executing these commands, the default list is used for the RADIUS server for authentication, and the key for the RADIUS server is firstKey111.

A RADIUS server combines the authentication and authorization processes. Before you configure the RADIUS server, you should enable AAA by using the `aaa new-model` command in global configuration mode. Then, you can specify the location of the RADIUS server and the key using the `radius-server host` command. In this case, the RADIUS server is located at the IP address 192.168.105.67 and requires the key firstKey111 as the encryption key. This key must be mutually agreed upon by the server and the clients.

The `aaa authentication dot1x default group radius` command creates a method list for 802.1X authentication. The default group radius keywords specify that the default method will be to use all listed RADIUS servers to authenticate clients. Since only one is listed, it will be the only one used.

It is incorrect to state that 802.1X authentication is enabled only on the Fa0/1 interface. The interface range `Fa 0/1 - 11` and the `dot1x port-control auto` commands specify that 802.1X authentication is enabled on the interfaces Fa0/1 to Fa0/11.

It is incorrect to state that AAA is not enabled on the switch. The `aaa new-model` command enables AAA globally on the switch.

Objective:

Infrastructure Security

Sub-Objective:

Describe device security using AAA with TACACS+ and RADIUS

References:

[Cisco > Support > Cisco IOS Security Command Reference: Commands A to C > aaa new-model](#)

[Cisco > Support > Cisco IOS Security Command Reference: Commands D to L > dot1x port-control](#)

[Cisco > Support > Cisco IOS Security Command Reference: Commands M to R > radius-server host](#)

### QUESTION 187

Which of the following statements best describes the result of issuing the command `standby 44 timers 3 1` on an HSRP router?

- A. The holdtime will be set to a value of 3, and the hellotime will be set to a value of 1.
- B. The status of the standby router will be displayed as unknown expired.
- C. The role of active router will be passed repeatedly from one router to another.
- D. The router will be configured to reassume the role of active router in the event that the router fails and is subsequently restarted.

**Correct Answer:** C

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

When the command `standby 44 timers 3 1` is issued on a Hot Standby Routing Protocol (HSRP) router, the role of active router will be passed repeatedly from one router to another. This behavior occurs when the timers are set incorrectly. The syntax for the standby timers command is `standby [group-number] timers [hellotime holdtime]`.

The hellotime variable is the number of seconds between hello messages and is set to a value of 3 by default.

The holdtime variable is the number of seconds that the HSRP standby router will wait before assuming that the active router is down; if the standby router believes the active router to be down, it will assume the role of active router.

The holdtime is set to a value of 10 by default. The holdtime should be set to a value at least three times the value of the hellotime. Otherwise, the active router might not be able to respond before the standby router assumes that the active router is down and becomes the new active router.

Because the command `standby 44 timers 3 1` sets the hellotime to a value of 3 and the holdtime to a value of 1, the role of active router will be passed from one standby router to the next. To set the holdtime to a value of 3 and the hellotime to a value of 1, the command `standby 44 timers 1 3` should be issued. To reset the timer values to their default values, the command `no standby group-number timers` should be issued.

The status of the standby router will be displayed as unknown expired if a Physical layer problem exists. The unknown expired status can also be displayed if only one HSRP router is configured for the subnet.

To configure an HSRP router to reassume the role of active router in the event that the router fails and is subsequently restarted, the command `standby group-number preempt` should be issued. When the HSRP active router fails or is shut down, the standby router assumes the role of active router. By default, when the original HSRP active router is restarted, it does not take the role of active router away from the original standby router, even if the original active router has a higher priority value. The command `standby group-number preempt` changes this default behavior.



The holdtime will not be set to a value of 3, and the hellotime will not be set to a value of 1. On the contrary, the hellotime will be set to a value of 3 and the holdtime will be set to a value of 1.

Objective:

Infrastructure Services

Sub-Objective:

Configure, verify, and troubleshoot basic HSRP

References:

[Cisco IOS IP Application Services Command Reference > show vrrp through synguard \(virtual server\) > standby timers](#)

[Cisco > Cisco IOS IP Application Services Configuration Guide, Release 12.4 > Part 1: First Hop Redundancy Protocols > Configuring HSRP](#)

### QUESTION 188

Which Cisco IOS command can be issued on a router to test the connectivity of one interface from another interface on the same router?

- A. ping (with no address specified)
- B. ping (with an address specified)
- C. tracert
- D. traceroute

**Correct Answer:** A

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

The extended ping Cisco IOS utility, which is issued with no address specified, can be issued on a router to test connectivity between two remote routers. The ping utility uses Internet Control Messaging Protocol (ICMP) packets. An ICMP echo request is sent to the destination host. Upon its receipt, the destination host responds to the sending host with an ICMP echo reply. When the echo reply is received, the connectivity is verified. Below is sample output of the extended ping command:

```
Router R#ping
Protocol [ip]:
Target IP address: 10.10.10.1
Repeat count [5]:
Datagram size [100]:
Timeout in seconds [2]:
Extended commands [n]: y
Source address or interface: 12.1.10.2
Type of service [0]:
Set DF bit in IP header? [no]:
Validate reply data? [no]:
Data pattern [0xABCD]:
Loose, Strict, Record, Timestamp, Verbose[none]:
Sweep range of sizes [n]:
Type escape sequence to abort.
```

The ping command with an address specified is incorrect because you when you issue this command you will either receive a reply from the destination or a destination unreachable message. It will not prompt for additional information as shown which is what allows you to specify the endpoints for the ping.



The traceroute command is not correct for this scenario because this command traces the path between the host issuing the command and the target network.

The tracert command is not a Cisco IOS command, but a Microsoft command.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot IPv4 and IPv6 static routing

References:

[Cisco > Tech Notes > Using the Extended ping and Extended traceroute Commands > Document ID: 13730 > The Extended ping Command](#)

[Cisco > Cisco IOS Command Fundamentals Reference, Release 12.4 > ping](#)

### QUESTION 189

Examine the following output from SwitchD.

```
switch# show interfaces fastethernet0/1 switchport
Name: Fa0/1
Switchport: Enabled
Administrative Mode: static access
Operational Mode: static access
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: dot1q
Negotiation of Trunking: Off
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 1 (default)
<<output omitted>>
```

Based on this output, what command MUST be executed for an 802.1q trunk to be created on port Fa0/1?

- A. switchport mode trunk
- B. switchport mode nonegotiate
- C. switchport trunk encapsulation 802.1q
- D. switchport trunk native VLAN

**Correct Answer:** A

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The command switchport mode trunk must be executed for a trunk to form. The output indicates that the Administrative Mode of the port is "static access," which means the port has been configured as a static (fixed) access port. Access mode disables trunking on an access port.

Below is a sample of the configuration required to allow a router to provide inter-VLAN routing between two VLANs residing on the switch:

```

Router(config)#interface fa0/0
Router(config)#no shut down
Router(config)#interface fa0/0.1
Router(config-subif)#encapsulation dot1q
Router(config-subif)#ip address 192.168.10.1 255.255.255.0
Router(config)#interface fa0/0.2
Router(config-subif)#encapsulation dot1q
Router(config-subif)#ip address 192.168.20.1 255.255.255.0

Switch(config)#interface fa0/1
Switch(config-if)#switchport mode trunk

```

For this example, the following statements are true:

- The trunk link connects to Fa0/0 on the router and Fa0/1 on the switch.
- The physical interface F0/0 on the router has been divided into two subinterfaces, Fa0/0.1 and Fa0/0.2.
- The encapsulation type of 802.1q has been specified on the two subinterfaces of the router.
- The physical interface on the switch has been specified as a trunk link.
- The IP addresses 192.168.10.1 and 192.168.20.1 should be the default gateways of the computers located in VLANs 1 and 2, respectively.

The switchport mode nonegotiate command does not need to be executed because the switch is already configured for non-negotiation, as indicated by the output Negotiation of Trunking: Off. Trunk negotiation using the Dynamic Trunking Protocol (DTP) does not need to be enabled for a trunk to form.

The switchport trunk encapsulation 802.1q command does not need to be executed for a trunk to form. Also, the output Operational Trunking Encapsulation: dot1q indicates that 802.1q encapsulation is already configured.

The switchport trunk native VLAN command does not need to be executed. This command is used to change the native VLAN from its default of 1, but leaving it set to the default of 1 will not prevent the trunk from forming.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot inter-VLAN routing

References:

[Cisco > Catalyst 3560 Switch Software Configuration Guide, Rel. 12.2\(25\)SEE > Configuring VLANs > Configuring VLAN Trunks > Trunking Overview](#)

### QUESTION 190

Enhanced Interior Gateway Routing Protocol (EIGRP) uses which algorithm to select the best path to the destination?

- A. Diffusing Update Algorithm (DUAL)
- B. Dijkstra algorithm
- C. Bellman-Ford algorithm
- D. Shortest Path First (SPF) algorithm

**Correct Answer: A**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

EIGRP uses the Diffusing Update Algorithm (DUAL) to select the best path to the destination. EIGRP is a classless protocol that allows the use of variable length subnet masks (VLSM), and supports classless interdomain routing (CIDR) for the allocation of IP addresses.

EIGRP is characterized by these components:

- DUAL: EIGRP implements DUAL to select paths free of routing loops. DUAL selects the best path and the second best path to the destination. The terminology used in DUAL is as follows:
  - Successor: Best path selected by DUAL.
  - Feasible successor: Second best path selected by DUAL. This is a backup route stored in the topology table.
  - Feasible distance: The lowest calculated metric of a path to destination.
- Protocol-dependent modules: Different modules are used by EIGRP to independently support Internet Protocol (IP), Internetwork Packet Exchange (IPX), and AppleTalk routed protocols. These modules act as a logical interface between DUAL and routing protocols.
- Neighbor discovery and recovery: Neighbors are discovered and information about neighbors is maintained by EIGRP. A hello packet is multicast on 224.0.0.10 every five seconds and the router builds a table with the information. EIGRP also enables proper operation over a Non-Broadcast Multiple Access (NBMA) point-to-multipoint network. EIGRP multicasts a hello packet every 60 seconds on the multipoint Wide Area Network (WAN) interfaces (X.25, frame relay, or Asynchronous Transfer Mode).
- Reliable Transport Protocol (RTP): RTP is used by EIGRP to manage EIGRP packets. Reliable and ordered delivery of route updates is ensured using RTP.

EIGRP updates about routes can contain five metrics: minimum bandwidth, delay, load, reliability, and maximum transmission unit (MTU). Of these five metrics, by default, only minimum bandwidth and delay are used to compute the best path.

The Dijkstra algorithm and Shortest Path First (SPF) algorithm are used by the Open Shortest Path First (OSPF) routing protocol for selecting the best path to the destination, not by EIGRP.

The Bellman-Ford algorithm is used by Routing Information Protocol (RIP).

Objective:

Routing Fundamentals

Sub-Objective:

Compare and contrast interior and exterior routing protocols

References:

[Cisco > Internetworking Technology Handbook > Enhanced Interior Gateway Routing Protocol \(EIGRP\)](#)

### QUESTION 191

Why is it recommended to use Spanning Tree Protocol (STP) in Local Area Networks (LANs) with redundant paths?

- A. To prevent loops
- B. To manage VLANs
- C. To load balance across different paths
- D. To prevent forwarding of unnecessary broadcast traffic on trunk links

**Correct Answer:** A

**Section:** (none)

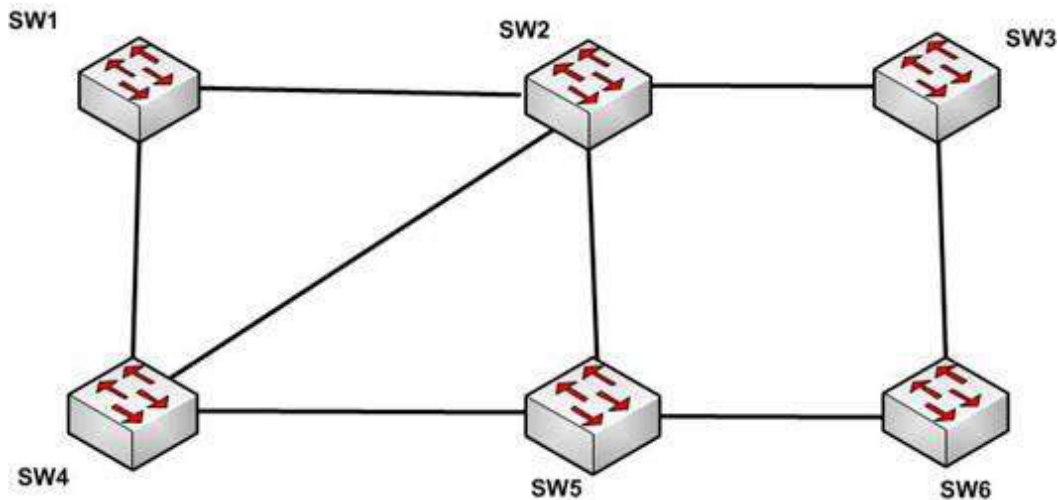
**Explanation**

#### **Explanation/Reference:**

Explanation:

Spanning Tree Protocol (STP) is a Layer 2 protocol used in LANs to maintain a loop-free network topology by recognizing physical redundancy in the network and logically blocking one or more redundant ports.

An example of switch redundancy is shown in the diagram below. The connection from SW4 to SW2, while providing beneficial redundancy, introduces the possibility of a switching loop.



STP probes the network at regular intervals to identify the failure or addition of a link, switch, or bridge. In the case of any topology changes, STP reconfigures switch ports to prevent loops. The end result is one active Layer 2 path through the switch network.

STP is not used for management of Virtual Local Area Networks (VLANs). VLAN Trunking Protocol (VTP) simplifies the management of VLANs by propagating configuration information throughout the switching fabric whenever changes are made. In the absence of VTP, switch VLAN information would have to be configured manually.

STP is not used to load-balance traffic across different redundant paths available in a topology. Load balancing allows a router to use multiple paths to a destination network. Routing protocols, Routing Information Protocol (RIP), RIPv2, Interior Gateway Routing Protocol (IGRP), Enhanced IGRP (EIGRP), and Open Shortest Path First (OSPF) support load balancing. Similarly, multiple links can be combined in a faster single link in switches. This can be achieved with the Fast EtherChannel or Gigabit EtherChannel features of Cisco switches.

STP does not prevent forwarding of unnecessary broadcast traffic on trunk links. This is achieved by manually configuring VLANs allowed on the trunk, or through VTP pruning.

Objective:

LAN Switching Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot STP protocols

References:

[Cisco > Support > Configuring Spanning Tree-Protocol > How STP Works](#)

### QUESTION 192

Which Cisco IOS command can be used to troubleshoot switch startup problems on a Cisco Catalyst 2950 switch?

- A. show test
- B. show diagnostic
- C. show post
- D. show switchstartup

**Correct Answer:** C

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The Cisco IOS command show post is used on the 2900/3500XL, 2950/2955, 3550, 2970, and 3750 series switches to view and troubleshoot issues related to the Power On Self-Test (POST) on the switch. This command will find the POST test that failed on startup.

The show test command is incorrect because it is a CatOS command, not a Cisco IOS command. The Cisco 2950 uses a Cisco IOS operating system and not the Catalyst operating system. The show test command is used on a switch to view any hardware errors that occurred at startup. It also provides information on the errors returned from the diagnostic tests. The following parameters can be used with this command:

- mod: An optional parameter used to specify the module number.
- diaglevel: Used to view the diagnostic level.
- diagfail-action: Used to view information on the action taken by the supervisor engine after the failure of a diagnostics test.

The following code is a sample output of this command for module 2:

```
Module 2 : 2-port 1000BaseX Supervisor
Network Management Processor (NMP) Status: (. = Pass, F = Fail, U = Unknown)
ROM: . Flash-EEPROM: . Ser-EEPROM: . NVRAM: . EOBC Comm: .
Line Card Firmware Status for Module 2 : PASS
Port Status :
Ports 1 2
-----
. .
Line Card Diag Status for Module 2 (. = Pass, F = Fail, N = N/A)
Module 2
Cafe II Status :
NewLearnTest: .
IndexLearnTest: .
DontForwardTest: .
DontLearnTest: .
ConditionalLearnTest: .
BadBpduTest: .
TrapTest: .
Loopback Status [Reported by Module 2] :
Ports 1 2
-----
. .
Channel Status :
Ports 1 2
-----
```

The show diagnostic command is incorrect because this command is used on the Catalyst 6000 series, not the 2950. A variant of the command, show diagnostics, is used for the Catalyst 4000 series. These commands can be used on the relevant switches to view any hardware errors that occurred on startup. This command displays the Power-On Self-Test (POST) results.

The show switchstartup command is not a valid Cisco IOS command.

Objective:

Infrastructure Management

Sub-Objective:

Use Cisco IOS tools to troubleshoot and resolve problems

References:

[Cisco>Home>Support>Product Support>End-of-Sale and End-of-Life Products>Cisco Catalyst 6000 Series Switches>Troubleshoot and Alerts> Troubleshooting TechNotes> Troubleshooting Switch Port and Interface Problems> Most Common Port and Interface Troubleshooting Commands for CatOS and Cisco IOS](#)

#### QUESTION 193

You have connected two routers in a lab using a Data Terminal Equipment (DTE)-to-Data Circuit-terminating Equipment (DCE) cable.

Which command must be issued on the DCE end for the connection to function?

- A. bandwidth
- B. no clock rate
- C. clock rate
- D. no bandwidth

**Correct Answer:** C

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

You should issue the clock rate command on the DCE end for the connection to function. The clock rate is set on the Data Circuit-terminating Equipment (DCE) device. DCE is also known as Data Communications Equipment.

The DCE terminates a physical WAN connection, provides clocking and synchronization of a connection between two locations, and connects to a DTE. The DCE category includes equipment such as CSU/DSUs, NT1s, and modems. In the real world, the clock rate is provided by the CSU/DSU end at the telcom provider. In a lab, you must instruct the DCE end to provide a clock rate.

The DTE is an end user device, such as a router or a PC, which connects to the WAN via the DCE device.

You would not issue the bandwidth command. This command is used to inform the router of the bandwidth of the connection for purposes of calculating best routes to locations where multiple routes exist. It is not necessary for the link described to function.

You should not issue the no clock rate command. This command is used to remove any previous settings implemented with the clock rate command.

You would not issue the no bandwidth command. This command is used to remove any previous settings implemented with the bandwidth command

Objective:

WAN Technologies

Sub-Objective:

Describe WAN access connectivity options

References:

[Cisco > Support > Product Support > End-of-Sale and End-of-Life Products > Cisco IOS Software Releases 11.1 > Configure > Feature Guides > Clock Rate Command Enhancements Feature Module](#)

CCNA ICND2 Official Exam Certification Guide (Cisco Press, ISBN 1-58720-181-X), Chapter 12: Point-to-Point WANs, pp. 446-447.

#### QUESTION 194

Which is the shortest possible notation of the following Internet Protocol version 6 (IPv6) address?

2001:0DB8:0000:0001:0000:0000:0000:F00D

- A. 2001:DB8::1::F00D

- B. 2001:DB8:0:1::F00D
- C. 2001:DB8:0:1:0:0:0:F00D
- D. 2001:0DB8:0:1::F00D

**Correct Answer:** B

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The shortest possible notation of the IPv6 address 2001:0DB8:0000:0001:0000:0000:0000:F00D is 2001:DB8:0:1::F00D. The address is shortened according to the following rules:

- Remove leading zeros.
- Remove the consecutive fields of zeros with double colon (::).
- The double colon (::) can be used only once.

The option 2001:DB8::1::F00D is incorrect because the double colon (::) can be used only once in the process of shortening an IPv6 address.

The option 2001:DB8:0:1:0:0:0:F00D is incorrect because 2001:DB8:0:1:0:0:0:F00D can be further shortened to 2001:DB8:0:1::F00D.

The option 2001:0DB8:0:1::F00D is incorrect because 2001:0DB8:0:1::F00D can be further shortened to 2001:DB8:0:1::F00D.

Objective:

Network Fundamentals

Sub-Objective:

Compare and contrast IPv6 address types

References:

**QUESTION 195**

**DRAG DROP**

Click and drag the OSI layer, on the left, to the commands at which they test functionality. If a command can test more than one layer, choose the highest layer for which it can test. (It may be necessary to use an OSI layer multiple times.)

**Select and Place:**



## Layers:

Layer 1
Layer 2
Layer 3
Layer 4
Layer 5
Layer 6
Layer 7

## Command-Line Tool:

	ping
	show interface
	telnet
	show cdp neighbor
	ftp

Correct Answer:

## Layers:

Layer 1
Layer 2
Layer 3
Layer 4
Layer 5
Layer 6
Layer 7

## Command-Line Tool:

Layer 3	ping
Layer 2	show interface
Layer 7	telnet
Layer 2	show cdp neighbor
Layer 7	ftp

Section: (none)

Explanation

### Explanation/Reference:

Explanation:

Telnet operates at the application layer, which is Layer 7 of the OSI model. File transfer Protocol (FTP) is a generic command that is also used by some high-end Cisco routers but in a different format. FTP also operates at Layer 7. The ping command operates at the network layer, which is Layer 3 of OSI reference model. Therefore, it is used to test the connectivity up to Layer 3. The show interface command will display the status

of line protocol. If it displays the message interface up, line protocol up it means that Layer 2 is functioning correctly.

The show cdp neighbor command also operates at Layer 2, which is the data link layer.

Objective:

Infrastructure Management

Sub-Objective:

Perform device maintenance

References:

[Cisco Documentation > Internetworking Technology Handbook > Internetworking Basics > OSI model](#)

### QUESTION 196

A device has an address of 192.168.144.21 and a mask of 255.255.255.240.

What will be the broadcast address for the subnet to which this device is attached?

- A. 192.168.144.23
- B. 192.168.144.28
- C. 192.168.144.31
- D. 192.168.144.32

**Correct Answer:** C

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The broadcast address for the subnet to which this device is attached will be 192.168.144.31.

To determine the broadcast address of a network where a specific address resides, you must first determine the network ID of the subnetwork where the address resides. The network ID can be obtained by determining the interval between subnet IDs. With a 28-bit mask, the decimal equivalent of the mask will be 255.255.255.240. The interval between subnets can be derived by subtracting the value of the last octet of the mask from 256. In this case, that operation would be  $256 - 240$ . Therefore, the interval is 16.

The first network ID will always be the classful network you started with (in this case 192.168.144.0). Then each subnetwork ID in this network will fall at 16-bit intervals as follows:

192.168.144.0  
192.168.144.16  
192.168.144.32  
192.168.144.48

At 192.168.144.48 we can stop, because the address that we are given as a guide is in the network with a subnet ID of 192.168.144.16. Therefore, since the broadcast address for this network will be 1 less than the next subnet ID (192.168.144.32), the broadcast address for the subnet to which this device is attached is 192.168.144.31.

All the other options are incorrect because none of these will be the broadcast address for the subnet to which this device is attached.

Objective:

Network Fundamentals

Sub-Objective:

Apply troubleshooting methodologies to resolve problems

References:

[Cisco > Technology Support > IP > IP Routing > Design TechNotes > IP Addressing and Subnetting for New Users > Document ID: 13788 > Understanding IP Addresses](#)

### QUESTION 197

Which of the following values will be used by a router to make a routing decision when two routes have been learned from OSPF?

- A. cost
- B. administrative distance
- C. composite metric
- D. hop count

**Correct Answer:** A

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

When two routes have been learned by OSPF to same network, the best route will be chosen based on lowest cost. Cost is the metric used in OSPF to choose the best route from all candidate routes learned through OSPF.

Administrative distance is a measure of the trustworthiness of the routing information source. It is a value used by a router to choose between multiple known routes that have been learned from different routing sources, such as different routing protocols. When routes are learned from the same routing protocol, their administrative distance will be equal, and the router will then choose the route with the lowest metric value of the routing protocol. In this case, that metric is the OSPF cost.

The composite metric is the metric used by EIGRP to choose a route when multiple routes have been learned by EIGRP.

Hop count is the metric used by RIP to choose a route when multiple routes have been learned by RIP.

Objective:

Routing Fundamentals

Sub-Objective:

Describe how a routing table is populated by different routing information sources

References:

[Support > Technology Support > IP > IP Routing > Troubleshoot and Alerts > Troubleshooting TechNotes > Route Selection in Cisco Routers](#)

### QUESTION 198

Which of the following statements are NOT true, based on the output below?

```

Access1#show spanning-tree vlan 10

VLAN0010

Spanning tree enabled protocol rstp
Root ID Priority 24586
Address 0015.63f6.b700
Cost 19
Port 107 (FastEthernet3/0/1)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32778 (priority 32768 sys-id-ext 10)
Address 000f.f794.3d00
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 300

Interface Role Sts Cost Prio.Nbr Type
-----
Fa3/0/1 Root FWD 19 128.107 P2p
Fa3/0/2 Altn BLK 19 128.108 P2p
-----

```

- A. This switch is the root bridge.
- B. This switch has a priority of 32778.
- C. This switch has a MAC address of 0015.63f6.b700.
- D. All ports will be in a state of discarding, learning, or forwarding.
- E. All designated ports are in a forwarding state.
- F. This switch is using the default priority for STP

**Correct Answer:** AC

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The upper half of the output provides information about the root bridge. It indicates that the root bridge has a bridge priority of 24586 and a MAC address of 0015.63f6.b700. The bottom half of the output pertains to the current switch, and indicates that this switch has a bridge priority of 32778 and a MAC address of 000f.f794.3d00.

The value of the switch bridge priority is arrived at by adding the configured priority of 32768, which is indicated by the line priority 32768 sys-id-ext 10, to the VLAN ID of 10. Because 32768 is the default bridge priority for STP, this switch is set to the default priority for STP.

The priority of this switch is 32778. The bridge priority is arrived at by adding the configured priority of 32768 to the VLAN ID of 10.

This switch is not the root bridge, as indicated by the differences in priorities and MAC addresses between the root ID and the bridge ID output. If this were the root bridge, the MAC addresses and priority values would be the same in both the Root ID and the Bridge ID sections.

Finally, when a switch is using RSTP, as indicated by the output Spanning tree enabled protocol rstp, all ports will be in a state of discarding, learning, or forwarding, with all designated ports in a forwarding state. When RSTP has converged, all ports will be in either the discarding or forwarding states.

**Objective:**

LAN Switching Fundamentals

Sub-Objective:  
Configure, verify, and troubleshoot STP protocols

References:  
[Cisco > Cisco IOS Bridging Command Reference > show spanning-tree](#)

### QUESTION 199

Examine the output of the show ip route command below:

```
Gateway of last resort is not set

 20.0.0.0/24 is subnetted, 1 subnets
O E2   20.20.20.0 [110/20] via 192.168.1.2, 00:05:10, FastEthernet0/0
O IA 172.16.0.0/16 [50/21] via 192.168.4.1, 00:05:10, FastEthernet0/1
        [50/21] via 192.168.1.2, 00:05:10, FastEthernet0/0
C     192.168.4.0/24 is directly connected, FastEthernet0/1
 10.0.0.0/32 is subnetted, 1 subnets
C     10.10.10.10 is directly connected, Loopback0
C     192.168.1.0/24 is directly connected, FastEthernet0/0
O     192.168.2.0/24 [110/20] via 192.168.1.2, 00:05:10, FastEthernet0/0
O     192.168.3.0/24 [110/20] via 192.168.4.1, 00:05:10, FastEthernet0/1
 30.0.0.0/32 is subnetted, 1 subnets
O     30.30.30.30 [50/21] via 192.168.4.1, 00:05:10, FastEthernet0/1
        [50/21] via 192.168.1.2, 00:05:10, FastEthernet0/0
```

Which of the following statements is FALSE?

- A. The route to 30.30.30.30 uses a cost of 21
- B. The command ip route 192.168.2.0 255.255.255.0 172.16.14.2 200 will replace the current route to 192.168.2.0/24
- C. The route to 192.168.2.0/24 uses the default administrative distance
- D. Traffic will be load balanced across two routes to 30.30.30.30

**Correct Answer: B**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

The command ip route 10.10.10.0 255.255.255.0 172.16.14.2 200 will NOT replace the current route to 10.0.0.0/24.

When you execute the ip route command to enter a static route, the administrative distance can be altered by adding the desired distance value to the end of the command. In this scenario, the administrative distance value was set to 200. The route to the 10.10.10.0/24 network that is currently in the table was learned by OSPF and is using the default administrative distance of 110. Since 110 is lower than 200, the new static route will not be added to the routing table UNLESS the current route becomes unavailable.

The route to 30.30.30.30 does use a cost of 21, as is indicated by the value on the right side of the forward slash within the brackets found in the route entry, [50/21].

The route to 192.168.2.0/24 uses the default administrative distance. It was learned from OSPF, which has a default distance of 110. Its administrative distance is indicated by the value on the left side of the forward slash within the brackets found in the route entry, [110/20].

Traffic will be load balanced across two routes to 30.30.30.30 because they have equal cost of 21. This cost is indicated by the value on the right side of the forward slash within the brackets found in the route entry, [50/21].

Objective:

Routing Fundamentals

Sub-Objective:

Describe how a routing table is populated by different routing information sources

References:

[Cisco > Support > Cisco IOS IP Routing: Protocol-Independent Command Reference > ip route](#)  
[Cisco Press > Articles > Cisco Network Technology > General Networking > Cisco Networking Academy's Introduction to Routing Dynamically](#)

### QUESTION 200

What will an EIGRP router do if the successor route fails and there is no feasible successor?

- A. EIGRP will mark the route as passive until a new successor route is determined.
- B. EIGRP will redistribute routes into RIP or OSPF.
- C. EIGRP will query neighboring routers until a new successor route is determined.
- D. EIGRP will forward traffic to the neighbor with the lowest administrative distance.

**Correct Answer: C**

**Section: (none)**

**Explanation**

#### **Explanation/Reference:**

Explanation:

Feasible successors are backup routes for the successor (active) route to a remote network. If a successor route fails, and a feasible successor is available, the feasible successor will immediately become the successor and be installed in the routing table. This provides EIGRP with virtually instantaneous convergence. If no feasible successor is available, then the router must send out query packets to neighboring EIGRP routers to find an alternate path to the remote network.

EIGRP routes are marked as active when the network is converging. Passive routes are stable, converged routes.

EIGRP will not redistribute routes into RIP or OSPF. Redistribution allows information learned from one routing protocol to be converted into routes for injection into the autonomous system of another routing protocol. This allows networks learned via EIGRP, for example, to be visible and reachable from hosts in a RIP routing domain. Redistribution has nothing to do with EIGRP convergence or with the determination of a new successor route.

Administrative distance is used to determine which source of routing information is considered more trustworthy when multiple routing protocols have been implemented. Administrative distance has no effect on EIGRP convergence or the determination of a new successor route.

Objective:

Routing Fundamentals

Sub-Objective:

Configure, verify, and troubleshoot EIGRP for IPv4 (excluding authentication, filtering, manual summarization, redistribution, stub)

References:

[Cisco > Support > IP > IP Routing > Technology Information > Technology White Paper > Enhanced Interior Gateway Routing Protocol > Document ID: 16406 > Feasible Distance, Reported Distance, and Feasible Successor](#)

### QUESTION 201

You have been asked to troubleshoot the NTP configuration of a router named R70. After executing the show run command, you receive the following partial output of the command that shows the configuration relevant to NTP:

```
clock timezone PST -8
clock summer-time PDT recurring
ntp update-calendar
ntp server 192.168.13.57
ntp server 192.168.11.58
interface Ethernet 0/0
ntp broadcast
```

Based on this output, which of the following statements is true?

- A. the time zone is set to 8 hours less than Pacific Standard time
- B. the router will listen for NTP broadcasts on interface E0/0
- C. the router will send NTP broadcasts on interface E0/0
- D. the router will periodically update its software clock

**Correct Answer: C**

**Section: (none)**

**Explanation**

**Explanation/Reference:**

Explanation:

The router will send NTP broadcast on its E0/0 interface. The command `ntp broadcast`, when executed under an interface, instructs the router to send NTP broadcast packets on the interface. Any devices on the network that are set with the `ntp broadcast client` command on any interface will be listening for these NTP broadcasts. While the clients will not respond in any way, they will use the information in the NTP broadcast packets to synchronize their clocks with the information.

The time zone is not set to 8 hours less than Pacific Standard Time. The value `-8` in the command `clock timezone PST -8` represents the number of hours of offset from UTC time, not from the time zone stated in the `clock timezone` command.

The router will not listen for NTP broadcasts on the interface E0/0. The `ntp broadcast` command, when executed under an interface, instructs the router to send NTP broadcast packets on the interface. To set the interface to listen and use NTP broadcasts, you would execute the `ntp broadcast client` command on the interface.

The router will not periodically update its software clock. The command `ntp update-calendar` configures the system to update its hardware clock from the software clock at periodic intervals.

Objective:

Infrastructure Services

Sub-Objective:

Configure and verify NTP operating in a client/server mode

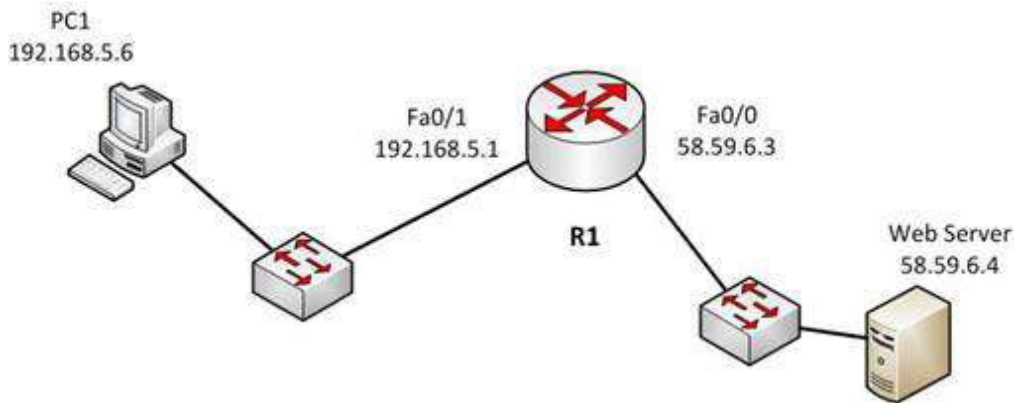
References:

[Basic System Management > Setting Time and Calendar Services > Configuring NTP](#)

**QUESTION 202**

Examine the diagram below:





You attempt to make a Telnet connection from PC1 to the switch connected to the Web server, but the connection fails. After making a console connection to the switch connected to the Web server and executing the show run command, you see the following information:

<output omitted>

```
interface vlan 1
ip address 58.59.6.2 255.0.0.0
!
ip default gateway 192.168.5.1
!
line vty 04
password ajax
login
```

Which value is NOT correct?

- A. the default gateway
- B. the VLAN number
- C. the password
- D. the login command

**Correct Answer:** A

**Section:** (none)

**Explanation**

**Explanation/Reference:**

Explanation:

The switch is connected to the Fa0/0 interface on the router R1. The address of Fa0/0 should be the default gateway for the switch. This means it should be 58.59.6.4 rather than 192.168.5.1.

The VLAN number is correct. The IP address of a switch is set on the VLAN 1 interface of the switch.

The password can be anything you desire, so that is correct.

The login command is correct. This command instructs the switch to prompt for a password. Since there is a password configured, this will not prevent a connection to the switch.

Objective:

Infrastructure Management

Sub-Objective:  
Configure and verify device management

References:

### QUESTION 203

What command can be used on a Cisco switch to display the virtual MAC address for the HSRP groups of which the switch is a member?

- A. switch# show standby mac
- B. switch# show hsrp mac
- C. switch# show standby
- D. switch# show standby brief

**Correct Answer:** C

**Section:** (none)

**Explanation**

#### **Explanation/Reference:**

Explanation:

The command show standby can be used to display the virtual MAC address for HSRP groups of which a switch is a member. This command displays information about HSRP on all configured interfaces and for all HSRP groups. It also displays hello timer information and the expiration timer for the standby switch. The standby switch will take over as the active switch if the timer expires before it hears a heartbeat from the active switch. Below is an example of the show standby command for the HSRP group 1:

```
Tacoma# show standby

FastEthernet0/1 - group 1
  State is active
    3 state changes, last state change 00:22:49
  Virtual IP address is 192.168.5.3
    Secondary virtual ip address 192.168.5.3
  Active virtual MAC address is 0006.6b45.5801
    Local virtual MAC address is 0006.6b45.5812 (bia)
  Hello time is 4 sec, hold time 12 sec
    Next hello sent in 1.664 sec
  Preemption enabled, min delay 50 sec, sync delay 40 sec
  Active router is local
  Standby router is unknown expired
  Priority 95 (configured 120)
    Tracking 2 objects, 0 up
      Down Interface FastEthernet0/2, pri 15
      Down Interface FastEthernet0/3
  IP redundancy name is "HSRP1", advertisement interval is 34 sec
```

In the above output, the following can be determined:

- The router is currently active for the group, as can be seen in line 2. The Active Virtual MAC address is 0006.6b45.5801, which includes the group number (1) in the last two positions, which is why the address is different from the routers actual MAC address shown on the next line. Special Note: Some router models (Cisco 2500, 4000 and 4500) WILL NOT use this altered MAC address format, but will instead use the real MAC address for the virtual MAC address and will display that MAC address as the virtual MAC address in the output of the show standby command. An example of the output of the show standby command on an older router such as the 2500 would be as follows:

```

Router# show standby

Ethernet0/1 - Group 1

State is Active

2 state changes, last state change 00:30:59

Virtual IP address is 10.1.0.20

Secondary virtual IP address 10.1.0.21

Active virtual MAC address is 0004.4d82.7981

Local virtual MAC address is 0004.4d82.7981 (bia)

```

These routers have Ethernet hardware that only recognize a single MAC address. In either case, if for some reason this router becomes the standby router, such as due to loss of interfaces, then when the interfaces come back up it will be able to recover the active role because it is set for preemption, as shown on line 10.

- The router is tracking two of its own interfaces. Because both interfaces are down, the router's priority has been reduced by 25 (15 for Fastethernet0/2 and 10 for Fastethernet0/3), from the configured value of 120 to 95. This data is shown on lines 13-16. The default is 10 if not otherwise specified, as is the case for Fastethernet0/3.
- If either of the two interfaces comes back up, the priority will be increased by the amount assigned to the interface. For example, if Fastethernet0/3 comes back up, the priority will become 105 (95 + 10).
- The standby router is unreachable, which can be determined because it is marked unknown expired in line 12. This could be due to either a physical layer issue or an HSRP misconfiguration.

The command `show standby brief` can be used to view summary information about HSRP groups of which the switch is a member. This information includes the group number, priority, state, active device address, standby address, and group address. It does not include the virtual MAC address.

The commands `show standby mac` and `show hsrp mac` are invalid due to incorrect syntax.

Objective:

Infrastructure Services

Sub-Objective:

Configure, verify, and troubleshoot basic HSRP

References:

[Cisco > Cisco IOS IP Application Services Command Reference > show standby](#)

[Cisco > Cisco IOS IP Application Services Configuration Guide, Release 12.4 > Part 1: First Hop Redundancy Protocols > Configuring HSRP](#)

## QUESTION 204

As you are training a new junior technician, the trainee is examining the routing table. He tells you that there are four different routes to the same network in different routing databases. He asks you which of the routes will be used to populate the routing table.

What will your answer be, assuming that all routing protocols are set at the default administrative distance?

- A. The route with an R next to it
- B. The route with an S next to it
- C. The route with a C next to it
- D. The route with an I next to it

**Correct Answer: C**

## Section: (none)

### Explanation

#### Explanation/Reference:

##### Explanation:

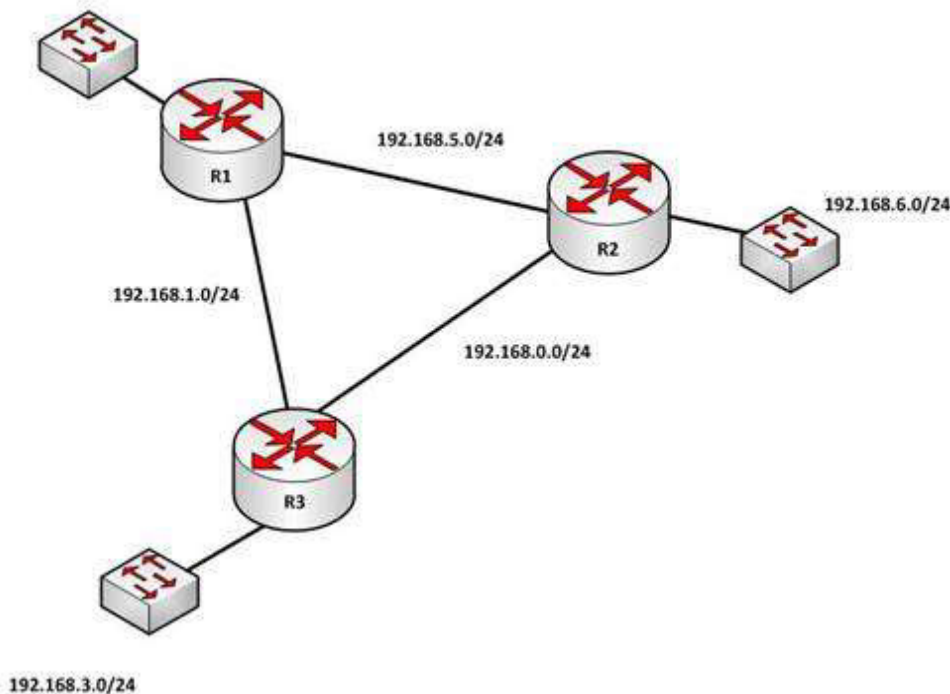
The route with a C next to it is a directly connected route and has an administrative distance of 0, which means it will be preferred over any routes with a larger value for administrative distance. Each routing protocol has a default administrative distance assigned. Administrative distance is used by the router to determine the preferred route when a route is learned from different routing protocols. This process can be manipulated by the administrator by using the distance command to alter the default assignments.

It is significant to note that routers with no static routes and no routing protocols enabled will populate all directly connected routes to the routing table with no action on the part of the administrator. Routes that are NOT directly connected will not be in the routing table unless one of two things occurs:

- A static route is created by the administrator
- A routing protocol is enabled that allows the router to learn about the network and its route from another router running the same routing protocol

For example, in the diagram below, R3 will have routes to the 192.168.3.0/24, 192.168.1.0/24 and the 192.168.0.0/24 networks in its routing table by default. It will only have routes to the 192.168.2.0/24, 192.168.5.0/24, and 192.168.6.0/24 networks if a routing protocol is used or if an administrator creates static routes for each network.

192.168.2.0/24



When a packet is received by a router interface, the router de-encapsulates the frame or removes the layer two information (MAC data for Ethernet or DLCIs for frame relay) and then performs a lookup for the network ID of the network in which the destination IP address resides. When multiple routes exist, it will choose the one with the lowest administrative distance. The router only places the route with the lowest distance in the table.

The route with an R next to it is a route learned from Routing Information Protocol (RIP). It has a default administrative distance of 120, so it will not prefer over a directly connected route.

The route with an S next to it is a static route or one configured manually. It has an administrative distance of 1, so it will not be preferred over a directly connected route.

The route with an I next to it is a route learned from Internal Gateway Routing Protocol (IGRP). It has an administrative distance of 100, so it will not be preferred over a directly connected route.

Objective:

Routing Fundamentals

Sub-Objective:

Interpret the components of routing table

References:

[Cisco > Support > IP > IP Addressing Services > Design Technotes > What Is Administrative Distance? > Document ID: 15986](#)