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Introduction

What Is This Book About?

Welcome to the *CCNA Practice Questions Exam Cram*! The sole purpose of this book is to provide you with practice questions complete with answers and explanations that will help you learn, drill, and review for the 640-802, 640-822, and 640-816 certification exams. The book offers a large number of questions to practice each exam objective and will help you assess your knowledge before you write the real exam. The detailed answers to every question will help reinforce your knowledge about different issues involving the design and configuration of Cisco networks.

Who Is This Book For?

If you have studied the content for the 640-802, 640-822, or 640-816 exams and feel you are ready to put your knowledge to the test, but you are not sure that you want to take the real exam yet, this book is for you! Maybe you have answered other practice questions or unsuccessfully taken the real exam, reviewed, and want to do more practice questions before retaking the real exam; this book is for you, too! Even when the exam is done and you have passed with flying colors and got the CCENT or CCNA certificate in your pocket, keep the book handy on your desktop to look for answers to your everyday Cisco configuration issues.

What Will You Find In This Book?

As mentioned earlier, this book is all about practice questions! The practice questions in the book, some easy and others containing more complicated problem scenarios, are all aimed at raising your confidence level before writing the real exam. You will find questions that, in fact, you will face in real life.

This book is organized according to the objectives published by Cisco for the following exams:

Exam 640-802: CCNA

Exam 640-822: ICND1

Exam 640-816: ICND2

The book has been organized to help direct your study to specific objectives. If you are studying only for the ICND1 exam (640-822), you only need to review Chapters 1–6. If you are studying for the ICND2 (640-816) exam, you should focus your studies on Chapters 7–11 (although, reviewing Chapters 1–6 may be helpful). If you are studying for the CCNA all-in-one exam, study through the whole book!

Each chapter corresponds to an exam objective, and in every chapter you find the following three elements:

▶ *Practice Questions*—These are the numerous questions that will help you learn, drill, and review exam objectives. Some of the questions are multiple choice, others are matching (simulating the drag-and-drop style questions on the exam), and others are entering configurations (simulating the simulation style questions on the exam). Choose the correct answer based on your knowledge of Cisco networks.

▶ *Quick Check Answer Key*—After you have finished answering the questions, you can quickly grade your exam from this section. Only correct answers are given in this section. No explanations are offered yet! Even if you have answered a question incorrectly, do not be discouraged. Just move on! Keep in mind that this is not the real exam. You can always review the topic and do the questions again.

▶ *Answers and Explanations*—This section provides correct answers as well as further explanations about the content posed in that question. Use this information to learn why an answer is correct and to reinforce the content in your mind for the exam day.

NOTE

It is not possible to reflect a real exam on a paper product. As mentioned earlier, the purpose of the book is to help you prepare for the exam and not provide you with real exam questions. Neither the author nor Que Publishing can guarantee that you will pass the exam only by memorizing the practice questions given in this book.

You will also find a *Cram Sheet* at the beginning of the book specifically written for the exam day. The Cram Sheet contains core knowledge that you need for the exam. The Cram Sheet condenses all the necessary facts found in the exam into an easy-to-handle tear card. It is something you can carry with you to the testing center and use as a last-second study aid. Be aware that you cannot take the Cram Sheet into the exam room, though!

Hints for Using This Book

Because this book is a paper practice product, you might want to complete your exams on a separate piece of paper so that you can reuse the exams over and over without having previous answers in your way. Also, a general rule of thumb across all practice question products is to make sure that you are scoring well into the high 80% to 90% range in all topics before attempting the real exam. The higher percentages you score on practice question products, the better your chances for passing the real exam. Of course, we cannot guarantee a passing score on the real exam, but we can offer you plenty of opportunities to practice and assess your knowledge levels before you enter the real exam.

When you have completed the exam on paper, use the companion MeasureUp CD to take a timed exam. This will further help you gain confidence and make a self-assessment in case you need more study. Your results will indicate the exam objectives in which you need further study or hands-on practice.

Need Further Study?

Are you having a hard time correctly answering these questions? If so, you probably need further review of all exam objectives. Be sure to see the following sister products to this book from Que Publishing:

▶ *CCNA Exam Prep (Exam 640-802) (2nd Edition)* by Jeremy Cioara, David Minutella, and Heather Stevenson (ISBN 0789737132).

▶ *CCNA Exam Cram (Exam 640-802) (3rd Edition)* by Michael Valentine and Andrew Whitaker (ISBN 0789737124).

8
C H A P T E R   E I G H T

Subnetting, VLSM, and IPv6

This chapter covers the following ICND2 objectives that fall under the content areas, **Implement an IP addressing scheme and IP Services to meet network requirements in a medium-size Enterprise branch office network:**

- ▶ Calculate and apply a VLSM IP addressing design to a network.

- ▶ Determine the appropriate classless addressing scheme using VLSM and summarization to satisfy addressing requirements in a LAN/WAN environment.

- ▶ Describe the technological requirements for running IPv6 (including protocols, dual stack, tunneling, and so on).

- ▶ Describe IPv6 addresses.

- ▶ Identify and correct common problems associated with IP addressing and host configurations.

1. Refer to Figure 8.1. The administrator wants to reduce the size of the Central router routing table. Which of the following summary routes would represent all the LANs in Tempe, with no additional subnets?

FIGURE 8.1 Network diagram.
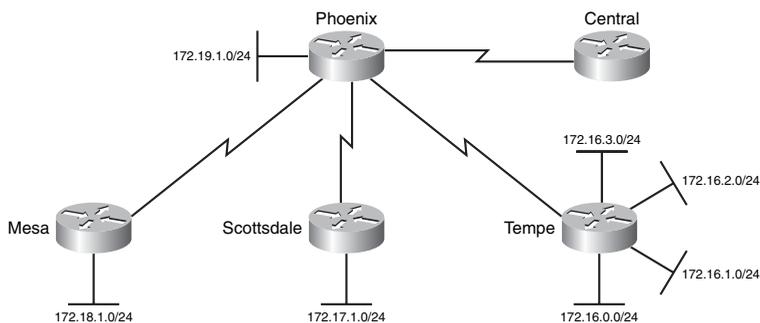
   - ○ **A.** 172.16.0.0/24
   - ○ **B.** 172.16.0.0/23
   - ○ **C.** 172.16.0.0/22
   - ○ **D.** 172.16.1.0/24
   - ○ **E.** 172.16.1.0/23
   - ○ **F.** 172.16.1.0/22

2. An Ethernet port on a router in your organization is assigned the IP address 10.65.64.1/21. What is the maximum number of hosts allowed on this subnet?

   - ○ **A.** 254
   - ○ **B.** 510
   - ○ **C.** 1022
   - ○ **D.** 2046
   - ○ **E.** 4094
   - ○ **F.** 4096

3. Refer to Figure 8.2. All routers in the network have been config-
ured with the **ip subnet-zero** command. Which subnet addresses
should be used for Network A and Network B? (Choose two.)

FIGURE 8.2   Network diagram.
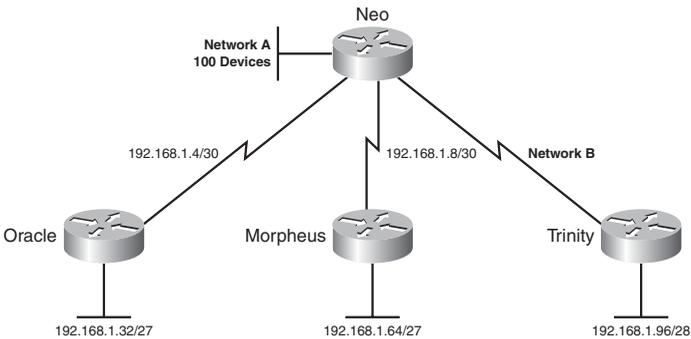
    ◯ **A.** Network A – 192.168.1.112/25

    ◯ **B.** Network A – 192.168.1.112/26

    ◯ **C.** Network A – 192.168.1.128/25

    ◯ **D.** Network B – 192.168.1.10/30

    ◯ **E.** Network B – 192.168.1.70/30

    ◯ **F.** Network B – 192.168.1.0/30

4. Which of the following are invalid IPv6 communication types?
(Choose two.)

    ◯ **A.** Unicast

    ◯ **B.** Multicast

    ◯ **C.** Broadcast

    ◯ **D.** Anycast

    ◯ **E.** Cryptocast

5. Which of the following are valid IPv6 addresses? (Choose three.)

❍ **A.** 2001:0db8:0000:0000:0000:0000:1428:57ab

❍ **B.** 2001:0db8::1428:57ab

❍ **C.** 2001::1685:2123::1428:57ab

❍ **D.** 2001:99:ab:1:99:2:1:9

❍ **E.** 2001:1428:57ab:1685:2123:1428:57ab

6. A router that is running both IPv4 and IPv6 addressing on the same interface is known as what type of router?

❍ **A.** 6to4

❍ **B.** 4to6

❍ **C.** NAT-PT

❍ **D.** 4to6 tunneling

❍ **E.** Dual-stack

7. RouterA is acting as an OSPF ABR between Area 1 and Area 0 as shown in Figure 8.3. Your organization wants to implement route summarization capabilities between these two areas. Which of the following describe the most efficient route summarization possibilities? (Choose two.)

FIGURE 8.3 Network diagram.
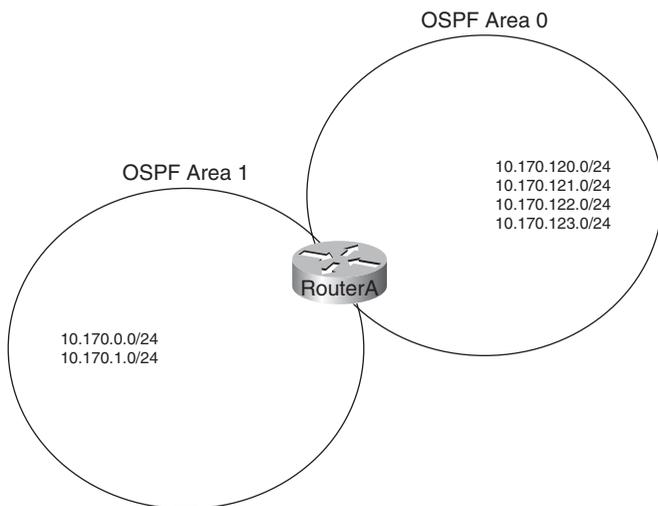
❍ **A.** OSPF Area 0 – 10.170.0.0/16

❍ **B.** OSPF Area 0 – 10.170.112.0/21

❍ **C.** OSPF Area 0 – 10.170.112.0/20

❍ **D.** OSPF Area 0 – 10.170.112.0/22

❍ **E.** OSPF Area 0 – 10.170.120.0/22

❍ **F.** OSPF Area 1 – 10.170.0.0/16

❍ **G.** OSPF Area 1 – 10.170.0.0/21

❍ **H.** OSPF Area 1 – 10.170.0.0/22

❍ **I.** OSPF Area 1 – 10.170.0.0/23

8. You are designing an IP address scheme for your new remote office. The vice president of IT calls to tell you that you will be in charge of the 192.168.1.64/26 subnetwork. This supplies you with a single subnetwork with 62 hosts. You need to have at least four subnets with 14 hosts in each subnet. What custom subnet mask should you use?

❍ **A.** 255.255.255.128

❍ **B.** 255.255.255.192

❍ **C.** 255.255.255.224

❍ **D.** 255.255.255.240

❍ **E.** 255.255.255.248

9. Identify three valid host addresses in any subnet of the 201.168.27.0 network, assuming a fixed subnet mask of 255.255.255.240. (Choose three.)

❍ **A.** 201.168.27.33

❍ **B.** 201.168.27.112

❍ **C.** 201.168.27.119

❍ **D.** 201.168.27.126

❍ **E.** 201.168.27.175

❍ **F.** 201.168.27.208

10. A new network is being designed for your company, Acme, Inc. If you use a Class C IP network, which subnet masks will provide one usable subnet per department while allowing enough usable host addresses for each department specified in the table? (Choose three.)

Department	Number of Users
Corporate	117
Customer Support	15
Financial	25
HR	5
Engineering	5

❍ **A.** 255.255.255.0
❍ **B.** 255.255.255.128
❍ **C.** 255.255.255.192
❍ **D.** 255.255.255.224
❍ **E.** 255.255.255.240
❍ **F.** 255.255.255.248
❍ **G.** 255.255.255.252

11. You are troubleshooting your router's interfaces. For some reason, the Ethernet interface will not accept the IP address of 192.168.5.95/27 that you've assigned. Which of the following explains the router's refusal to take the IP address?

❍ **A.** Class C addresses cannot be assigned to Ethernet interfaces.
❍ **B.** The /27 is an invalid mask.
❍ **C.** It is a broadcast address.
❍ **D.** It is a network address.
❍ **E.** It is a public address.
❍ **F.** It is a private address.

12. Your organization has moved to IPv6 addressing. The corporate office is connected to the two branch offices through the Internet, as shown in Figure 8.4. What tunneling type is this organization using?

FIGURE 8.4 Network diagram.

Corporate HQ, IPv6

Tunnel

Internet, IPv4

Tunnel

Branch, IPv6

Branch, IPv6
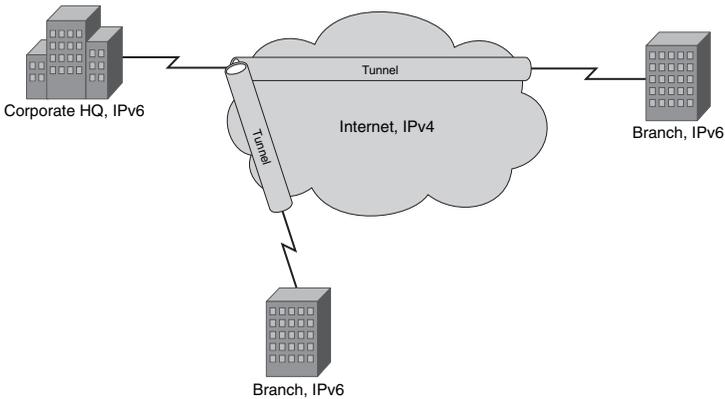
- ❍ **A.** IPv6 VPN
- ❍ **B.** 6to4 tunneling
- ❍ **C.** 4to6 tunneling
- ❍ **D.** NAT-PT, VPN based

13. Your organization has opened a new branch office, as shown in Figure 8.5. The corporation uses 10.0.0.0/8 addressing and wants to use 172.16.X.X/24 address blocks for the branch offices. The new branch office will be large enough to require two of these blocks. Which two blocks will be easily summarizable to a single routing table entry? (Choose two.)

FIGURE 8.5   Network diagram.

Corporate HQ
10.0.0.0/8 Addressing

Branch
172.16.x.x Addressing
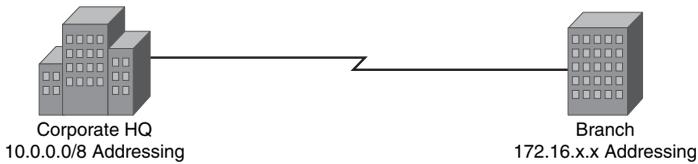
- ❍ **A.** 172.16.111.0/24
- ❍ **B.** 172.16.112.0/24
- ❍ **C.** 172.16.113.0/24
- ❍ **D.** 172.16.165.0/24
- ❍ **E.** 172.16.166.0/24

14. Widget, Inc., uses the Class B address 172.30.0.0/16 to address its organization. The western region of the organization (shown in Figure 8.6) has been allocated the 172.30.32.0/20 block. As the administrator of the Phoenix office, you are required to allocate valid subnets to the HQ and three branch offices shown in Figure 8.6. Draw lines showing the subnet that should be assigned to each office. All answers will not be used.

FIGURE 8.6 Network diagram.

172.30.35.192/27	172.30.32.0/23	172.30.34.0/24
172.30.33.0/24	172.30.35.128/26	172.30.34.160/27
172.30.33.0/23	172.30.33.128/25	172.30.35.0/25
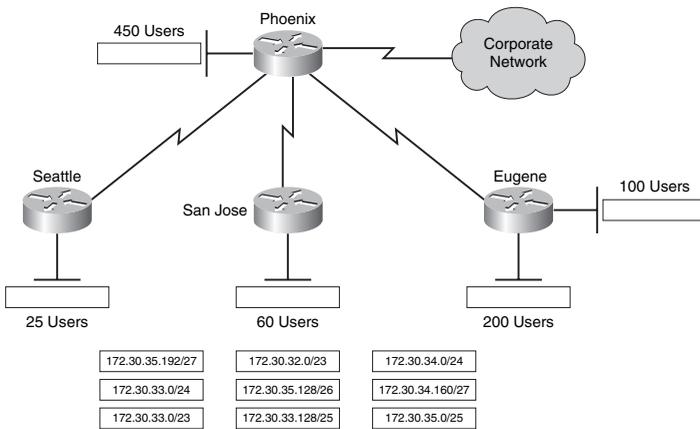
15. Which of the following routing protocols support VLSM capabilities? (Choose three.)

　　❍　**A.** RIP

　　❍　**B.** RIPv2

　　❍　**C.** EIGRP

　　❍　**D.** IGRP

　　❍　**E.** OSPF

16. XYZ Company has constructed the network shown in Figure 8.7. The company currently is using EIGRP with auto-summarization features enabled. How will routers in the corporate network see the 172.16.x.x networks behind R1?

FIGURE 8.7 Network diagram.
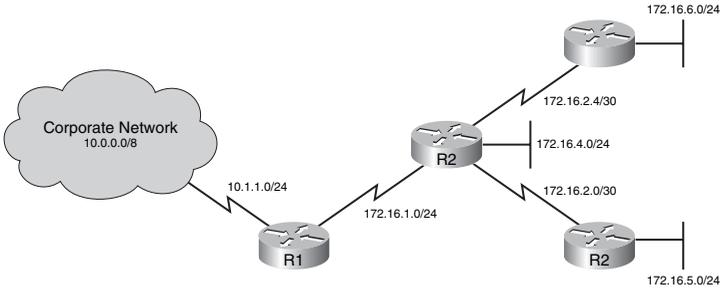
- ○ **A.** Networks behind R1 will be summarized into a single 172.16.0.0/16 entry.
- ○ **B.** Networks behind R1 will be summarized into a single 172.16.0.0/21 entry.
- ○ **C.** The /24 networks behind R1 will be auto-summarized into a single 172.16.0.0/16 entry. The /30 WAN link networks will be auto-summarized into a single 172.16.2.0/24 entry.
- ○ **D.** The /24 networks behind R1 will be auto-summarized into a single 172.16.0.0/21 entry. The /30 WAN link networks will be auto-summarized into a single 172.16.2.0/24 entry.
- ○ **E.** EIGRP cannot handle VLSM configurations with auto-summarization enabled. This network will experience connectivity issues.

17. An IPv6 address is a _____-bit address.

- ❍ **A.** 16
- ❍ **B.** 32
- ❍ **C.** 64
- ❍ **D.** 128
- ❍ **E.** 256

18. In IPv6, Internet-valid addresses are known by what name?

- ❍ **A.** Private
- ❍ **B.** Public
- ❍ **C.** Unique
- ❍ **D.** Unspecified
- ❍ **E.** Global

19. In IPv6, a _____ address is used to communicate with hosts on the directly attached network and will never forward beyond the first router hop.

- ❍ **A.** Global
- ❍ **B.** Private
- ❍ **C.** Link local
- ❍ **D.** Private restricted
- ❍ **E.** Auto-generated

20. Which of the following commands could you use to assign an IPv6 address to your router?

- ❍ **A.** Router(config-if)#**ip address fe01:3112:abcd::0001 255.255.255.0**
- ❍ **B.** Router(config-if)#**ip address fe01:3112:abcd::0001/48**
- ❍ **C.** Router(config-if)#**ip address 6 fe01:3112:abcd::0001 255.255.255.0**
- ❍ **D.** Router(config-if)#**ip address 6 fe01:3112:abcd::0001/48**
- ❍ **E.** Router(config-if)#**ipv6 address fe01:3112:abcd::0001 255.255.255.0**
- ❍ **F.** Router(config-if)#**ipv6 address fe01:3112:abcd::0001/48**

21. Which of the following commands could you use to start a RIPng process on your router?

- ❍ **A.** Router(config)#**router RIPng**
- ❍ **B.** Router(config)#**ipv6 router rip RIPng**
- ❍ **C.** Router(config)#**routerv6 RIP**
- ❍ **D.** Router(config)#**ripv6**

22. TooCow University has acquired the 150.60.130.0/24 public address from the local ISP to use in its campus network. Each building has a specific number of devices that are required to be publicly accessible, as shown in Figure 8.8. Which of the following subnets would accommodate the network shown? (Choose four.)

FIGURE 8.8   Network diagram.

Server Farm
100 Hosts

Administration
10 Hosts

College of Business
20 Hosts

College of Education
25 Hosts

- ❍ **A.** 150.60.130.128/26
- ❍ **B.** 150.60.130.128/27
- ❍ **C.** 150.60.130.96/27
- ❍ **D.** 150.60.130.192/28
- ❍ **E.** 150.60.130.32/27
- ❍ **F.** 150.60.130.160/27
- ❍ **G.** 150.60.130.16/28
- ❍ **H.** 150.60.130.0/25

23. Choose the most efficient summary address to encompass the following subnets:

192.168.112.0/24

192.168.113.0/24

192.168.114.0/24

192.168.115.0/24

192.168.116.0/24

192.168.117.0/24

192.168.118.0/24

192.168.119.0/24

- ❍ **A.** 192.168.110.0/20
- ❍ **B.** 192.168.110.0/21
- ❍ **C.** 192.168.110.0/22
- ❍ **D.** 192.168.112.0/20
- ❍ **E.** 192.168.112.0/21
- ❍ **F.** 192.168.112.0/22

24. Choose the most efficient summary address to encompass the following subnets:

172.16.4.0/24

172.16.5.0/24

172.16.6.0/24

172.16.128.0/24

- ❍ **A.** 172.16.0.0/21
- ❍ **B.** 172.16.4.0/21
- ❍ **C.** 172.16.4.0/22
- ❍ **D.** 172.16.0.0/16

25. Is 172.20.2.255/23 a valid IP address?

- ❍ **A.** No, it is the broadcast address for the 172.16.2.0/24 subnet.
- ❍ **B.** No, it is the broadcast address for the 172.16.2.0/23 subnet.
- ❍ **C.** Yes, but you cannot assign the IP address to a host.
- ❍ **D.** Yes, and you can assign the IP address to a host.

26. Given the subnet 10.5.12.0/22, which of the following IP address-es are valid host addresses residing within the network? (Choose three.)

- ❍ **A.** 10.5.14.253
- ❍ **B.** 10.5.14.255
- ❍ **C.** 10.5.13.0
- ❍ **D.** 10.5.16.1
- ❍ **E.** 10.5.16.2

27. Which of the following is a valid equivalent of the IPv6 address 2001:0ab9:0000:0000:0003:0000:59ff:1ac5?

- ❍ **A.** 2001:0ab9::3::59ff:1ac5
- ❍ **B.** 2001:ab9:0:0:3::59ff:1ac5
- ❍ **C.** 2001:ab9::359ff:1ac5
- ❍ **D.** 2001:0ab9:__:3:_:59ff:1ac5

28. Your organization has decided to move forward with a complete readdressing of the entire network. Using Figure 8.9 as a guide, break the 172.18.0.0/16 network into initial allocations for the regions. Draw lines connecting the correct allocations to the regions.

FIGURE 8.9 Network diagram.

Central Region
5500 Addresses

West Coast
2000 Addresses

East Coast
1000 Addresses

172.18.20.0/19	172.18.8.0/20
172.18.40.0/22	172.18.32.0/21
172.18.0.0/19	172.18.16.0/21
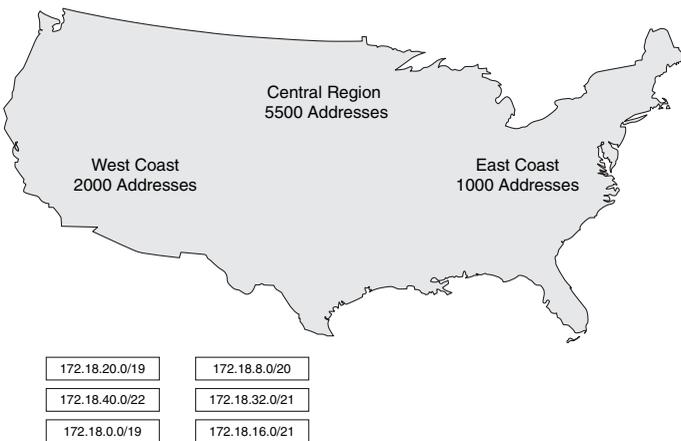
29. Observe the following output from the **show run** command:

```
Current configuration : 104 bytes
!
interface FastEthernet0/0
 ip address 172.30.2.1 255.255.252.0
 no ip route-cache
 no ip mroute-cache
end
```

How many host IP addresses are able to be used from the network to which this FastEthernet interface is connected?

○ **A.** 255

○ **B.** 1022

○ **C.** 1024

○ **D.** 2046

○ **E.** 2048

30. Which of the following commands enables the IPv6 protocol on a router?

- ❍ **A.** Router(config)#**ipv6 unicast-routing**
- ❍ **B.** Router(config)#**ipv6 enable**
- ❍ **C.** Router(config)#**enable ipv6**
- ❍ **D.** Router(config)#**ipv6**
- ❍ **E.** Router(config)#**router ipv6**

Quick Check Answer Key

1. C
2. D
3. C, F
4. C, E
5. A, B, D
6. E
7. E, I
8. D
9. A, C, D
10. B, D, F
11. C

12. B
13. B, C
14. See detailed answer
15. B, C, E
16. A
17. D
18. E
19. C
20. F
21. B

22. B, D, F, H
23. E
24. D
25. D
26. A, B, C
27. B
28. See detailed answer
29. B
30. A

Answers and Explanations

1. **C.** 172.16.0-3.0/22 breaks down into the following binary equivalents:

   172.16.0.0 = 10101100.00010000.00000000.00000000

   172.16.1.0 = 10101100.00010000.00000001.00000000

   172.16.2.0 = 10101100.00010000.00000010.00000000

   172.16.3.0 = 10101100.00010000.00000011.00000000

   Based on these binary values, you can see that the first 22 bits on each one of these IP addresses are the same. This makes the accurate summary address 172.16.0.0/22. All other answers are not valid.

2. **D.** To find the valid number of hosts on a subnet, use the formula $(2^x) - 2$, where "x" is the number of host bits in the subnet mask. A /21 (255.255.248.0) subnet mask has 11 host bits. $(2^{11}) - 2 = 2046$. All other answers are not valid.

3. **C, F.** These styles of VLSM are common on the ICND2/CCNA exam. It's usually best to reverse-engineer the given subnets to see what ranges are in use and then compare the answers to fill in what's left over. In this case, the given ranges are:

   192.168.1.32-63/27 (Behind the Oracle router)

   192.168.1.64-95/27 (Behind the Morpheus router)

   192.168.1.96-111/28 (Behind the Trinity router)

   192.168.1.4-7/30 (Neo-Oracle WAN link)

   192.168.1.8-11/30 (Neo-Morpheus WAN link)

   With that given information, answer C (192.168.1.128-255/25) and answer F (192.168.1.0-3/30) best fit the scenario. Answers A, D, and E are incorrect because these are invalid subnet addresses. Answer B is incorrect because the /26 mask will only provide 64 IP addresses, which is not sufficient for the size of Network A. These addresses also overlap with the other office subnets.

4. **C, E.** IPv6 uses three types of communication: Unicast (one-to-one), Multicast (one-to-many), and Anycast (one-to-closest). Answer C is incorrect because the concept of Broadcast messaging is tied with the IPv4 protocol and is no longer valid in IPv6. Answer E is incorrect because there is no such thing as Cryptocast messaging.

5. **A, B, D.** An IPv6 address consists of eight octets that can be four hexadecimal characters each. Consecutive sets of zeros can be abbreviated with a double colon (::), but this can only be used once in each IP address. Leading zeros can also be dropped. Based on these rules, addresses from the question can be described as:

   2001:0db8:0000:0000:0000:0000:1428:57ab (Valid, eight octets)

   2001:0db8::1428:57ab (Valid, same address as above with abbreviation)

   2001::1685:2123::1428:57ab (Invalid use of double colon)

   2001:99:ab:1:99:2:1:9 (Valid, dropped leading zeros)

   2001:1428:57ab:1685:2123: 1428:57ab (Invalid, only seven octets)

6. **E.** A dual-stack router can receive requests from both IPv4 and IPv6 clients on the same interface. This provides a smoother transition between the two protocols. Answers A, B, and D are incorrect because these all describe tunneling methods (IPv4 tunneled through an IPv6 network = 4to6). Answer C is incorrect because this describes a newer form of NAT that is able to translate between IPv4 and IPv6 addressing.

7. **E, I.** 10.170.120-123.0/24 breaks into the following binary equivalents:

> 10.170.120.0 = 00001010.10101010.01111000.00000000
>
> 10.170.121.0 = 00001010.10101010.01111001.00000000
>
> 10.170.122.0 = 00001010.10101010.01111010.00000000
>
> 10.170.123.0 = 00001010.10101010.01111011.00000000

Based on this, we can see that the first 22 bits of each subnet are the same, thus the summary address is 10.170.120.0/22 for Area 0 (answer E). 10.170.0-1.0/24 breaks into the following binary equivalents:

> 10.170.0.0 = 00001010.10101010. 00000000.00000000
>
> 10.170.1.0 = 00001010.10101010. 00000001.00000000

Based on this, we can see that the first 23 bits of each subnet are the same, thus the summary address is 10.170.0.0/23 (answer I). All other answers are not valid.

8. **D.** This subnet mask gives you four additional subnets using VLSM, with up to 14 hosts per subnetwork. Answer A is incorrect, as it is a higher subnet mask than your original /26, which is actually called *supernetting*. Answer B is incorrect because it is your original subnet mask. Answer C is incorrect, as it does not give you enough subnets. Answer E is incorrect, as it gives you enough subnets (six), but you would have only six hosts.

9. **A, C,** and **D.** A subnet mask of 255.255.255.240 divides the fourth octet into subnet parts: the highest four bits and a host port (the lowest four bits). You simply check the fourth octet to ensure that all subnet and host parts are okay. The host bit portion cannot be 0000 or 1111. Answers A, C, and D are correct because 33 in decimal is 00100001, 119 in decimal is 01110111, and 126 in decimal is 1111110. Answer B is incorrect, as 112 in decimal is 1110000 in binary. This is not a valid host address in this network. All its host bits are zero. Answer E is incorrect, as 175 in decimal is 10101111 in binary. All host bits are ones. This is the local broadcast address and cannot be used as a host address. Answer F is incorrect, as 208 in decimal is 11010000 in binary. This is not a valid host address in this network, and all its host bits are zero.

10. B, D, F. The departments will use the following subnet masks:

Department	Number of Users	Subnet Mask
Corporate	117	255.255.255.128 (126 hosts)
Customer Support	15	255.255.255.224 (30 hosts)
Financial	25	255.255.255.224 (30 hosts)
HR	5	255.255.255.248 (6 hosts)
Engineering	5	255.255.255.248 (6 hosts)

All other answers are invalid.

11. C. It is not a valid host address; 192.168.5.95/27 is a directed broadcast address for the 192.168.5.64 network. Answer A is incorrect, as you can certainly assign Class C addresses to any type of interface. Answer B is incorrect, as the /27 mask is the 255.255.255.224 subnet mask, which is perfectly valid. Answer D is incorrect because 192.168.5.95/27 represents a broadcast address rather than a network address. Answer E is incorrect because it is a private IP address. Answer F is incorrect, as the fact that it is a private IP address will not cause it to be refused by an interface.

12. B. One of the IPv6 transition schemes includes an IPv6 to IPv4 (6to4) tunneling method. This allows you to tunnel your IPv6 networks through an IPv4 network. Answer A is incorrect because the VPN is actually using the IPv4 Internet as its connection point. Answer C is incorrect because 4to6 tunnels involve IPv4 networks tunneling through an IPv6 network. Answer D is incorrect because NAT-PT is a form of NAT that can handle translations between protocol suites. It is not related to VPN technology.

13. B, C. 172.16.112.0/24 and 172.16.113.0/24 can be summarized into the single entry 172.16.112.0/23. Answers A, D, and E represent addresses that cannot be summarized into a single routing entry that only encompasses two of the /24 network ranges.

14.

FIGURE 8.10   Network diagram.
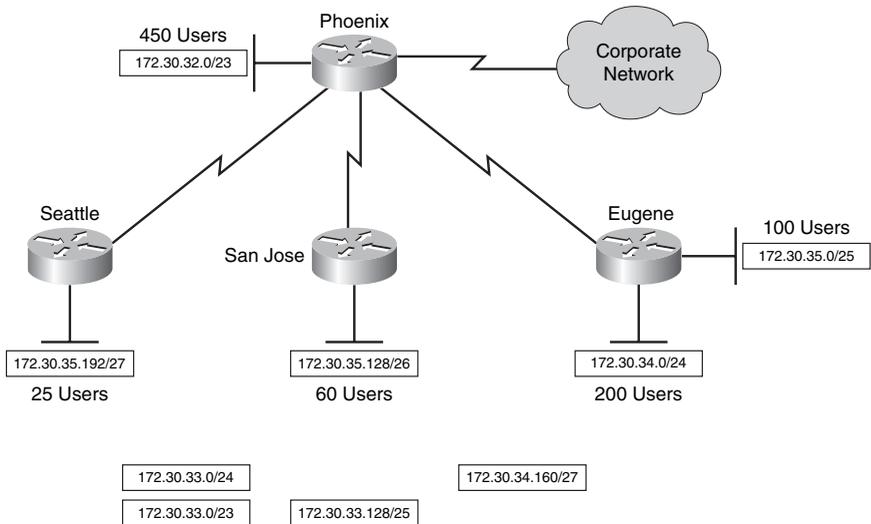
15. B, C, E. RIPv2, EIGRP, and OSPF all support Variable Length Subnet Mask (VLSM) capabilities. Answers A and D are incorrect because RIPv1 and IGRP are classful routing protocols and do not support VLSM.

16. A. When auto-summarization is enabled, EIGRP will summarize networks back to their classful boundary anytime a discontiguous network is reached (such as the transition from 10.0.0.0/8 networks to 172.16.0.0/16 networks). In this case, R1 will summarize the corporate network back to 10.0.0.0/8 as it passes the routing update to R2. It will also summarize all the 172.16.x.x networks back to 172.16.0.0/16 as it passes the routing update into the corporate network. Answers B, C, and D are incorrect because auto-summarization only summarizes back to a classful boundary rather than to more specific subnet masks. Answer E is incorrect because EIGRP can handle VLSM with auto-summarization enabled.

17. D. IPv6 addresses have been expanded to 128-bit addressing from the 32-bit addressing of IPv4. This provides a virtually inexhaustible number of addresses (although, I'm sure many thought the same of the IPv4 address space). All other answers do not apply.

18. E. The Internet-valid addresses are considered "global" addresses in IPv6. They are specified to begin with 2000::/3. Answer A is incorrect because private addresses are for use in a private network, as it currently happens in IPv4 addressing. Answer B is incorrect because global addresses have replaced public addresses. Answers C and D do not apply directly to IPv6 addressing.

19. C. Link-local addressing is a new concept when moving from IPv4 to IPv6. Link-local addresses are used to communicate directly on a link. This is used for communication such as establishing OSPF neighbor relationships or sending RIP routes. Answer A is incorrect because global addresses can access the Internet directly. Answer B is incorrect because private IPv6 addresses can route through an organization. The addresses shown in answers D and E do not exist in the IPv6 environment.

20. F. IPv6 addresses are assigned using the **ipv6 address** command. In IPv6, there is no decimal version of the subnet mask; all subnet masks are written in bit-notation. Answers A, C, and E are incorrect because they use the decimal version of the subnet mask. Answers B and D are incorrect because they use the incorrect command.

21. B. The exact syntax to enable the RIPng (RIP for IPv6) routing protocol is **ipv6 router rip** *<tag>*. The tag can be anything from a number to a name; in this question, the tag was "RIPng". This tag must be used when enabling RIP on an interface-by-interface basis. Answers A, C, and D will produce invalid syntax messages.

22. B, D, F, H. To perform the most efficient VLSM, always begin with the biggest subnet first. The ranges that will properly address the network in Figure 8.8 are as follows:

> ▶ Server Farm: 150.60.130.0-127/25 (answer H)
>
> ▶ College of Education: 150.60.130.128-159/27 (answer B)
>
> ▶ College of Business: 150.60.130.160-191/27 (answer F)
>
> ▶ Administration: 150.60.130.192-207/28 (answer D)

Answers A, C, E, and G are incorrect because they would each address a portion of the network but would not function correctly with the other given subnets.

23. The binary equivalents of the shown addresses are as follows, reflected in answer E:

192.168.112.0 = <u>11000000.10101000.01110000.00000000</u>

192.168.113.0 = <u>11000000.10101000.01110001.00000000</u>

192.168.114.0 = <u>11000000.10101000.01110010.00000000</u>

192.168.115.0 = <u>11000000.10101000.01110011.00000000</u>

192.168.116.0 = <u>11000000.10101000.01110100.00000000</u>

192.168.117.0 = <u>11000000.10101000.01110101.00000000</u>

192.168.118.0 = <u>11000000.10101000.01110110.00000000</u>

192.168.119.0 = <u>11000000.10101000.01110111.00000000</u>

This shows that the first 21 bits of all these addresses are the same making the summary address 192.168.112.0/21. Answers A, B, and C are incorrect because 192.168.110.0 is an inaccurate starting point for the subnets. Answers D and F assume the wrong subnet mask.

24. The binary equivalents of the shown addresses are as follows, reflected in answer D:

172.16.4.0 =   10101100.00010000.00000100.00000000

172.16.5.0 =   10101100.00010000.00000101.00000000

172.16.6.0 =   10101100.00010000.00000110.00000000

172.16.128.0 = 10101100.00010000.10000000.00000000

Because of the last subnet (172.16.128.0/24), a good summarization is not possible with these subnets. We must drop back to the classful summarization of 172.16.0.0/16. This helps demonstrate why discontiguous network addressing can destroy your network summarization efficiency. Answers A, B, and C are incorrect because the summarization addresses fail to encompass the 172.16.128.0/24 subnet.

25. D. The IP address 172.20.2.255/23 comes from the range of 172.20.2.0 through 172.30.3.255. The network ID 172.20.2.0 cannot be assigned to a host. The broadcast ID 172.20.3.255 cannot be assigned to a host. Everything in the middle of the range will function just fine. The other answers do not apply.

26. A, B, C. Given the 10.5.12.0/22 subnet, we can find the range of addresses to be 10.5.12.0 to 10.5.15.255. This makes Answers A, B, and C correct. Answers D and E are incorrect because they belong to the next subnet.

27. B. There are two ways of shortening an IPv6 address: removing a single group of consecutive zeros by using the double colon (::) and removing leading zeros from an octet. Answer B (2001:ab9:0:0:3::59ff:1ac5) shortens the octets by removing leading zeros and abbreviates the second group of consecutive zeros by using the ::. Answer A incorrectly uses a :: twice in the IPv6 address. Answer C has too many characters in one of the octets. Answer D uses the underscore character, which is invalid.

28.

FIGURE 8.11 Network diagram.
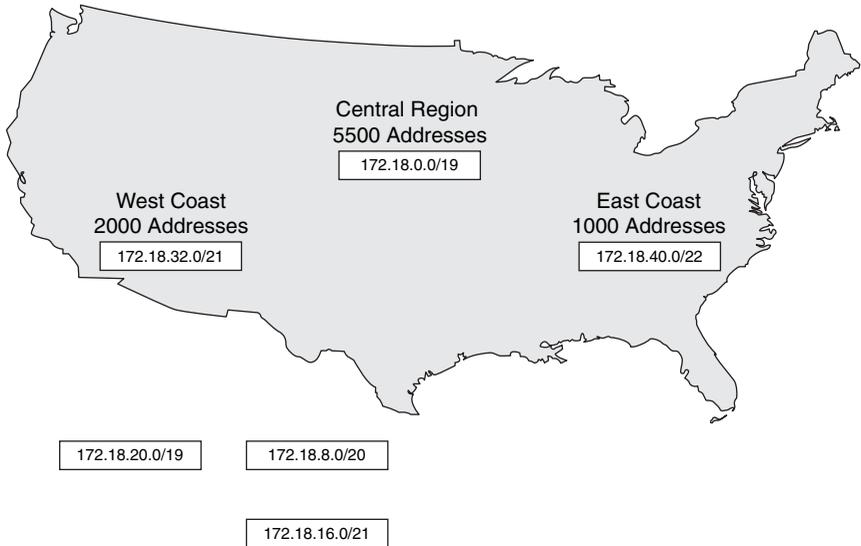
29. **B.** To find the number of valid host IP addresses, use the formula $(2^x) - 2$, where "x" represents the number of host bits. In this case, the FastEthernet interface has the subnet mask 255.255.252.0, which uses 10 hosts bits. $(2^{10}) - 2 = 1022$. The other answers are not valid.

30. **A.** To enable the IPv6 protocol, use the command **ipv6 unicast-routing** from global configuration mode. All other answers produce an invalid syntax or incomplete command message.