

Chapter

1

Networking Concepts

**THE COMPTIA NETWORK+ EXAM N10-009
TOPICS COVERED IN THIS CHAPTER
INCLUDE THE FOLLOWING:**

✓ **1.1 Explain concepts related to the Open Systems Interconnection (OSI) reference model.**

- Layer 1 – Physical
- Layer 2 – Data link
- Layer 3 – Network
- Layer 4 – Transport
- Layer 5 – Session
- Layer 6 – Presentation
- Layer 7 – Application

✓ **1.2 Compare and contrast networking appliances, applications, and functions.**

- Physical and virtual appliances
 - Router
 - Switch
 - Firewall
 - Intrusion detection system (IDS)/intrusion prevention system (IPS)
 - Load balancer
 - Proxy
 - Network-attached storage (NAS)
 - Storage area network (SAN)
 - Wireless
 - Access point (AP)
 - Controller





- Applications
 - Content delivery network (CDN)
- Functions
 - Virtual private network (VPN)
 - Quality of service (QoS)
 - Time to live (TTL)

✓ **1.3 Summarize cloud concepts and connectivity options.**

- Network functions virtualization (NFV)
- Virtual private cloud (VPC)
- Network security groups
- Network security lists
- Cloud gateways
 - Internet gateway
 - Network address translation (NAT) gateway
- Cloud connectivity options
 - VPN
 - Direct Connect
- Deployment models
 - Public
 - Private
 - Hybrid
- Service models
 - Software as a service (SaaS)
 - Infrastructure as a service (IaaS)
 - Platform as a service (PaaS)
- Scalability
- Elasticity
- Multitenancy



✓ **1.4 Explain common networking ports, protocols, services, and traffic types.**

Protocols	Ports
File Transfer Protocol (FTP)	20/21
Secure File Transfer Protocol (SFTP)	22
Secure Shell (SSH)	22
Telnet	23
Simple Mail Transfer Protocol (SMTP)	25
Domain Name System (DNS)	53
Dynamic Host Configuration Protocol (DHCP)	67/68
Trivial File Transfer Protocol (TFTP)	69
Hypertext Transfer Protocol (HTTP)	80
Network Time Protocol (NTP)	123
Simple Network Management Protocol (SNMP)	161/162
Lightweight Directory Access Protocol (LDAP)	389
Hypertext Transfer Protocol Secure (HTTPS)	443
Server Message Block (SMB)	445
Syslog	514
Simple Mail Transfer Protocol Secure (SMTPS)	587
Lightweight Directory Access Protocol over SSL (LDAPS)	636
Structured Query Language (SQL) Server	1433
Remote Desktop Protocol (RDP)	3389
Session Initiation Protocol (SIP)	5060/5061

- Internet Protocol (IP) types
 - Internet Control Message Protocol (ICMP)
 - Transmission Control Protocol (TCP)
 - User Datagram Protocol (UDP)
 - Generic Routing Encapsulation (GRE)



- Internet Protocol Security (IPSec)
 - Authentication Header (AH)
 - Encapsulating Security Payload (ESP)
 - Internet Key Exchange (IKE)
- Traffic types
 - Unicast
 - Multicast
 - Anycast
 - Broadcast

✓ **1.5 Compare and contrast transmission media and transceivers.**

- Wireless
 - 802.11 standards
 - Cellular
 - Satellite
- Wired
 - 802.3 standards
 - Single-mode vs. multimode fiber
 - Direct attach copper (DAC) cable
 - Twinaxial cable
 - Coaxial cable
 - Cable speeds
 - Plenum vs. non-plenum cable
- Transceivers
 - Protocol
 - Ethernet
 - Fibre Channel (FC)
 - Form factors
 - Small form-factor pluggable (SFP)
 - Quad small form-factor pluggable (QSFP)



- Connector types
 - Subscriber connector (SC)
 - Local connector (LC)
 - Straight tip (ST)
 - Multi-fiber push on (MPO)
 - Registered jack (RJ)11
 - RJ45
 - F-type
 - Bayonet Neill–Concelman (BNC)

✓ **1.6 Compare and contrast network topologies, architectures, and types.**

- Mesh
- Hybrid
- Star/hub and spoke
- Spine and leaf
- Point to point
- Three-tier hierarchical model
 - Core
 - Distribution
 - Access
- Collapsed core
- Traffic flows
 - North-south
 - East-west

✓ **1.7 Given a scenario, use appropriate IPv4 network addressing.**

- Public vs. private
 - Automatic Private IP Addressing (APIPA)
 - RFC1918
 - Loopback/localhost



- Subnetting
 - Variable Length Subnet Mask (VLSM)
 - Classless Inter-domain Routing (CIDR)
- IPv4 address classes
 - Class A
 - Class B
 - Class C
 - Class D
 - Class E

✓ **1.8 Summarize evolving use cases for modern network environments.**

- Software-defined network (SDN) and software-defined wide area network (SD-WAN)
 - Application aware
 - Zero-touch provisioning
 - Transport agnostic
 - Central policy management
- Virtual Extensible Local Area Network (VXLAN)
 - Data center interconnect (DCI)
 - Layer 2 encapsulation
- Zero trust architecture (ZTA)
 - Policy-based authentication
 - Authorization
 - Least privilege access
- Secure Access Secure Edge (SASE)/Security Service Edge (SSE)
- Infrastructure as code (IaC)
 - Automation
 - Playbooks/templates/reusable tasks
 - Configuration drift/compliance
 - Upgrades
 - Dynamic inventories



- Source control
 - Version control
 - Central repository
 - Conflict identification
 - Branching
- IPv6 addressing
 - Mitigating address exhaustion
 - Compatibility requirements
 - Tunneling
 - Dual stack
 - NAT64

1.1 Explain concepts related to the Open Systems Interconnection (OSI) reference model.

1. At which of the following layers of the Open Systems Interconnection (OSI) model do the protocols on a typical local area network (LAN) use media access control (MAC) addresses to identify other computers on the network?
 - A. Physical
 - B. Data link
 - C. Network
 - D. Transport
2. Which of the following organizations developed the Open Systems Interconnection (OSI) model?
 - A. International Telecommunication Union (ITU-T)
 - B. Comité Consultatif International Télégraphique et Téléphonique (CCITT)
 - C. American National Standards Institute (ANSI)
 - D. Institute of Electrical and Electronics Engineers (IEEE)
 - E. International Organization for Standardization (ISO)
3. Which layer of the Open Systems Interconnection (OSI) model is responsible for the logical addressing of end systems and the routing of datagrams on a network?
 - A. Physical
 - B. Data link
 - C. Network
 - D. Transport
 - E. Session
 - F. Presentation
 - G. Application
4. On a TCP/IP network, which layers of the Open Systems Interconnection (OSI) model contain protocols that are responsible for encapsulating the data generated by an application, creating the payload for a packet that will be transmitted over a network? (Choose all that apply.)
 - A. Physical
 - B. Data link
 - C. Network

- D. Transport
 - E. Session
 - F. Presentation
 - G. Application
5. Which layer of the Open Systems Interconnection (OSI) model is responsible for translating and formatting information?
- A. Physical
 - B. Data link
 - C. Network
 - D. Transport
 - E. Session
 - F. Presentation
 - G. Application
6. Which of the following devices typically operates at the Network layer of the Open Systems Interconnection (OSI) model?
- A. Proxy server
 - B. Network interface adapter
 - C. Hub
 - D. Router
7. Which layer of the Open Systems Interconnection (OSI) model provides an entrance point to the protocol stack for applications?
- A. Physical
 - B. Data link
 - C. Network
 - D. Transport
 - E. Session
 - F. Presentation
 - G. Application
8. Which layer of the Open Systems Interconnection (OSI) model is responsible for dialogue control between two communicating end systems?
- A. Physical
 - B. Data link
 - C. Network
 - D. Transport
 - E. Session
 - F. Presentation
 - G. Application

9. Some switches can perform functions associated with two layers of the Open Systems Interconnection (OSI) model. Which two of the following layers are often associated with network switching? (Choose all that apply.)
- A. Physical
 - B. Data link
 - C. Network
 - D. Transport
 - E. Session
 - F. Presentation
 - G. Application
10. At which layer of the Open Systems Interconnection (OSI) model are there TCP/IP protocols that can provide either connectionless or connection-oriented services to applications?
- A. Physical
 - B. Data link
 - C. Network
 - D. Transport
 - E. Session
 - F. Presentation
 - G. Application
11. Which of the following layers of the Open Systems Interconnection (OSI) model typically have dedicated physical hardware devices associated with them? (Choose all that apply.)
- A. Physical
 - B. Data link
 - C. Network
 - D. Transport
 - E. Session
 - F. Presentation
 - G. Application
12. At which layer of the Open Systems Interconnection (OSI) model is there a protocol that adds both a header and a footer to the information that is passed down from an upper layer, thus creating a frame?
- A. Physical
 - B. Data link
 - C. Network
 - D. Transport
 - E. Session
 - F. Presentation
 - G. Application

- 13.** Identify the layer of the Open Systems Interconnection (OSI) model that controls the addressing, transmission, and reception of Ethernet frames, and also identify the media access control method that Ethernet uses.
- A.** Physical layer: Carrier Sense Multiple Access with Collision Detection (CSMA/CD)
 - B.** Physical layer: Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)
 - C.** Data link layer: CSMA/CD
 - D.** Data link layer: CSMA/CA
- 14.** At which layer of the OSI model do you find the protocol responsible for the delivery of data to its ultimate destination on an internetwork?
- A.** Data link
 - B.** Network
 - C.** Session
 - D.** Application
- 15.** Which of the following is not a protocol operating at the Network layer of the OSI model?
- A.** IP
 - B.** ICMP
 - C.** IGMP
 - D.** IMAP
- 16.** Ed is a software developer who has been given the task of creating an application that requires guaranteed delivery of information between end systems. At which layer of the Open Systems Interconnection (OSI) model does the protocol that provides the guaranteed delivery run, and what type of protocol must Ed use?
- A.** Data link layer; connectionless
 - B.** Network layer; connection-oriented
 - C.** Transport layer; connection-oriented
 - D.** Application layer; connectionless
- 17.** Alice is a network administrator designing a new local area network (LAN). She needs to determine the type of cabling and the network topology to implement. Which layers of the Open Systems Interconnection (OSI) model apply to cabling and topology elements?
- A.** Physical and Data link layers
 - B.** Data link and Network layers
 - C.** Network and Transport layers
 - D.** Transport and Application layers

18. Which layers of the Open Systems Interconnection (OSI) model do not have protocols in the TCP/IP suite exclusively dedicated to them? (Choose all that apply.)
- A. Physical
 - B. Data link
 - C. Network
 - D. Transport
 - E. Session
 - F. Presentation
 - G. Application
19. The protocols at which layer of the Open Systems Interconnection (OSI) model use port numbers to identify the applications that are the source and the destination of the data in the packets?
- A. Application
 - B. Presentation
 - C. Transport
 - D. Network
20. Which of the following is a correct listing of the Open Systems Interconnection (OSI) model layers, in order, from top to bottom?
- A. Physical, Data link, Transport, Network, Session, Presentation, Application
 - B. Application, Session, Presentation, Transport, Network, Data link, physical
 - C. Presentation, Application, Transport, Session, Network, Physical, Data link
 - D. Session, Application, Presentation, Transport, Data link, Network, Physical
 - E. Application, Presentation, Session, Transport, Network, Data link, Physical
21. At which of the Open Systems Interconnection (OSI) model layers do switches and bridges perform their basic functions?
- A. Physical
 - B. Data link
 - C. Network
 - D. Transport
22. On a TCP/IP network, flow control is a function implemented in protocols operating at which layer of the Open Systems Interconnection (OSI) model?
- A. Presentation
 - B. Session
 - C. Transport
 - D. Network

- 23.** Which layer of the Open Systems Interconnection (OSI) model defines the medium, network interfaces, connecting hardware, and signaling methods used on a network?
- A.** Physical
 - B.** Data link
 - C.** Network
 - D.** Transport
 - E.** Session
 - F.** Presentation
 - G.** Application
- 24.** Which of the OSI model layers is responsible for syntax translation and compression or encryption?
- A.** Data link
 - B.** Network
 - C.** Session
 - D.** Presentation
 - E.** Application
- 25.** Which layer of the Open Systems Interconnection (OSI) model is responsible for transmitting signals over the network medium?
- A.** Physical
 - B.** Data link
 - C.** Network
 - D.** Transport
 - E.** Session
 - F.** Presentation
 - G.** Application
- 26.** Specify the layer of the Open Systems Interconnection (OSI) model at which the Internet Protocol (IP) operates and whether it is connection-oriented or connectionless.
- A.** Network; connection-oriented
 - B.** Network; connectionless
 - C.** Transport; connection-oriented
 - D.** Transport; connectionless
- 27.** An Ethernet network interface adapter provides functions that span which two layers of the Open Systems Interconnection (OSI) model?
- A.** Physical and Data link
 - B.** Data link and Network
 - C.** Network and Transport
 - D.** Transport and Application

- 28.** Which of the following protocols operate at the Application layer of the Open Systems Interconnection (OSI) model? (Choose all that apply.)
- A. HTTP
 - B. SNMP
 - C. ICMP
 - D. IGMP
 - E. UDP
- 29.** Which layer of the Open Systems Interconnection (OSI) model would be responsible for converting a text file encoded using EBCDIC on the sending system into ASCII code, when required by the receiving system?
- A. Application
 - B. Presentation
 - C. Session
 - D. Physical
- 30.** Which of the following protocols operates at the Network layer of the OSI model but does not encapsulate data generated by an upper layer protocol for transmission over the network?
- A. IP
 - B. UDP
 - C. ARP
 - D. ICMP
 - E. TCP
- 31.** Which of the following devices run exclusively at the Physical layer of the Open Systems Interconnection (OSI) model? (Choose all that apply.)
- A. Routers
 - B. Repeaters
 - C. Hubs
 - D. Switches
- 32.** Which of the following devices enables two computers to communicate when they are using different protocols at each layer of the Open Systems Interconnection (OSI) reference model?
- A. A router
 - B. A hub
 - C. A switch
 - D. A gateway

1.2 Compare and contrast networking appliances, applications, and functions.

- 33.** Which of the following best describes the function of a firewall?
- A.** A device located between two networks that enables administrators to restrict incoming and outgoing traffic
 - B.** A device that connects two networks together, forwarding traffic between them as needed
 - C.** A device that enables Internet network clients with private IP addresses to access the Internet
 - D.** A device that caches Internet data for subsequent use by internal network clients
- 34.** Which of the following terms is used to describe the method by which a firewall examines the port numbers in Transport layer protocol headers?
- A.** IP address filtering
 - B.** Service-dependent filtering
 - C.** Deep packet inspection (DPI)
 - D.** Next-generation firewall (NGFW)
- 35.** Which of the following physical network devices can conceivably be implemented as software in a computer's operating system? (Choose all that apply.)
- A.** Hub
 - B.** Switch
 - C.** Router
 - D.** Firewall
- 36.** Which of the following criteria does a firewall capable of service-dependent filtering use to block traffic?
- A.** Hardware addresses
 - B.** Protocol identifiers
 - C.** IP addresses
 - D.** Port numbers
- 37.** Ralph is a freelance network consultant installing a three-node small business network. The computers are all in the same room and use wired Ethernet to connect to the switched ports of a multifunction device. The device also functions as a network address translation (NAT) router for a cable modem connection to the Internet. NAT provides a measure of security, but Ralph wants to be sure that the network is protected from unauthorized Internet traffic and attacks against open ports. Which of the following solutions would enable Ralph to accomplish this goal with the minimum cost to the client?

- A. Install a hardware firewall between the multifunction device and the cable modem.
 - B. Install an intrusion prevention system (IPS) between the multifunction device and the cable modem.
 - C. Install a personal firewall on each of the computers.
 - D. Connect an intrusion detection system (IDS) to one of the switched ports in the multifunction device.
 - E. Use a port scanner to monitor the traffic entering the open ports on the computers.
38. Which of the following statements about hubs and switches are true? (Choose all that apply.)
- A. Hubs operate only at the Physical layer, whereas switches operate only at the Network layer.
 - B. All of the devices connected to a hub are part of a single collision domain, whereas each device connected to a switch has its own collision domain.
 - C. There are switches available with Network layer functionality, but there are no hubs with that capability.
 - D. Switches create a separate broadcast domain for each connected device, whereas hubs create a single broadcast domain for all of the connected devices.
39. Which of the following devices perform essentially the same function? (Choose two.)
- A. Hubs
 - B. Bridges
 - C. Switches
 - D. Routers
40. Which of the following switch types immediately forwards frames after looking at only the destination address?
- A. Cut-through
 - B. Source route
 - C. Store-and-forward
 - D. Destination
41. Which of the following is something that only a firewall capable of stateful packet inspection can do?
- A. Filter traffic-based port numbers
 - B. Block traffic destined for specific IP addresses
 - C. Scan Transport layer header fields for evidence of SYN floods
 - D. Block all TCP traffic from entering a network

- 42.** Which of the following are methods typically used by intrusion detection systems (IDSs) to analyze incoming network traffic? (Choose all that apply.)
- A.** Anomaly-based detection
 - B.** Behavior-based detection
 - C.** Signature-based detection
 - D.** Statistic-based detection
- 43.** Which of the following is another term for a multiport bridge?
- A.** Router
 - B.** Switch
 - C.** Hub
 - D.** Gateway
- 44.** Which of the following statements about switches and routers are true? (Choose all that apply.)
- A.** Routers operate at the Network layer, whereas switches operate at the Data link layer.
 - B.** All of the devices connected to a switch are part of a single broadcast domain, whereas the networks connected to a router form separate broadcast domains.
 - C.** Routers can communicate with each other and share information, but switches cannot.
 - D.** Switches forward packets based on their hardware addresses, whereas routers forward packets based on their IP addresses.
- 45.** Which of the following types of systems are frequently used to collect information from intrusion detection systems (IDSs)?
- A.** SIEM
 - B.** NAS
 - C.** RADIUS
 - D.** VoIP
- 46.** Which of the following explains why splitting a large, switched Ethernet LAN into two LANs by adding a router can help to alleviate traffic congestion and improve performance? (Choose all that apply.)
- A.** Adding a router reduces the amount of broadcast traffic on each of the two LANs.
 - B.** Adding a router reduces the amount of unicast traffic on each of the two LANs.
 - C.** Adding a router diverts traffic to an alternate path through the network.
 - D.** Adding a router prevents computers on one LAN from communicating with computers on another LAN.

47. Which of the following statements about traditional bridges and switches is true?
- A. Bridges and switches are Network layer devices that use logical addressing to forward frames.
 - B. Bridges and switches are Data link layer devices that use media access control (MAC) addresses to forward frames.
 - C. Bridges and switches build their internal tables based on destination addresses and forward packets based on source addresses.
 - D. Bridges and switches must support the Network layer protocol implemented on the local area network (LAN).
 - E. Each port on a bridge or switch defines a separate broadcast domain.
48. Which of the following is a correct term describing the function of a traditional switch?
- A. Layer 2 router
 - B. Ethernet hub
 - C. Multiport bridge
 - D. Layer 3 repeater
49. Which of the following is the primary reason why replacing hubs with layer 2 switches on an Ethernet local area network (LAN) improves its performance?
- A. Layer 2 switches forward packets faster than hubs.
 - B. Layer 2 switches do not forward broadcast transmissions.
 - C. Layer 2 switches reduce the number of collisions on the network.
 - D. Layer 2 switches read the IP addresses of packets, not the hardware addresses.
50. Which of the following statements about routers are true? (Choose all that apply.)
- A. Routers are Network layer devices that use IP addresses to forward frames.
 - B. Routers are Data link layer devices that use media access control (MAC) addresses to forward frames.
 - C. Routers build their internal tables based on destination MAC addresses and forward frames based on source MAC addresses.
 - D. Routers must support the Network layer protocol implemented on the local area network (LAN).
 - E. Each port on a router defines a separate broadcast domain.
51. Which of the following statements about routers is not true?
- A. Routers can connect two or more networks with dissimilar Data link layer protocols and media.
 - B. Routers can connect two or more networks with the same Data link layer protocols and media.
 - C. Routers store and maintain route information in a local text file.
 - D. Servers with multiple network interfaces can be configured to function as software routers.
 - E. Routers can learn and populate their routing tables through static and dynamic routing.

- 52.** The network administrator for a small business is installing a computer to function as a firewall protecting their internetwork from Internet intrusion. At which of the following locations should the administrator install the firewall system?
- A.** Anywhere on the private internetwork, as long as the Internet is accessible
 - B.** Between the Internet access router and the Internet service provider's (ISP's) network
 - C.** At the ISP's network site
 - D.** Between the Internet access router and the rest of the private internetwork
- 53.** Proxy servers operate at which layer of the OSI reference model?
- A.** Data link
 - B.** Network
 - C.** Transport
 - D.** Application
- 54.** Which of the following is a feature that is not found in a traditional firewall product, but which might be found in a next-generation firewall (NGFW)?
- A.** Stateful packet inspection
 - B.** Deep packet inspection (DPI)
 - C.** Network address translation (NAT)
 - D.** Virtual private network (VPN) support
- 55.** Which of the following statements about content filtering in firewalls is true?
- A.** Content filters examine the source IP addresses of packets to locate potential threats.
 - B.** Content filters enable switches to direct packets out through the correct port.
 - C.** Content filters examine the data carried within packets for potentially objectionable materials.
 - D.** Content filters use frequently updated signatures to locate packets containing malware.
- 56.** Which of the following is not one of the criteria typically used by load balancers to direct incoming traffic to one of a group of servers?
- A.** Which server has the lightest load
 - B.** Which server has the fastest response time
 - C.** Which server is next in an even rotation
 - D.** Which server has the fastest processor
- 57.** Which of the following devices enables administrators of enterprise wireless networks to manage multiple access points (APs) from a central location?
- A.** Hypervisor
 - B.** Wireless controller
 - C.** Wireless endpoint
 - D.** Demarcation point

58. A load balancer is a type of which of the following devices?
- A. Switch
 - B. Router
 - C. Gateway
 - D. Firewall
59. Which of the following devices expands on the capabilities of the traditional firewall by adding features like deep packet inspection (DPI) and an intrusion prevention system (IPS)?
- A. RADIUS server
 - B. CSU/DSU
 - C. NGFW
 - D. Proxy server
60. Which of the following statements about Internet access through a proxy server accounts for the security against outside intrusion that a proxy provides?
- A. The proxy server uses a public IP address, and the client computers use private addresses.
 - B. The proxy server uses a private IP address, and the client computers use public addresses.
 - C. Both the proxy server and the client computers use private IP addresses.
 - D. Both the proxy server and the client computers use public IP addresses.
61. Which of the following devices can an administrator use to monitor a network for abnormal or malicious traffic?
- A. IDS
 - B. UPS
 - C. RADIUS
 - D. DoS
 - E. RAS
62. Which of the following features enables an intrusion detection system (IDS) to monitor all of the traffic on a switched network?
- A. Stateful packet inspection
 - B. Port mirroring
 - C. Trunking
 - D. Service-dependent filtering
63. Which of the following storage area network (SAN) protocols are capable of sharing a network medium with standard local area network (LAN) traffic? (Choose all that apply.)
- A. iSCSI
 - B. Fibre Channel
 - C. FCoE
 - D. InfiniBand

64. Which of the following protocols is not used for storage area networks (SANs)?
- A. iSCSI
 - B. FCoE
 - C. VoIP
 - D. Fibre Channel
65. Which of the following storage area network (SAN) technologies do iSCSI initiators use to locate iSCSI targets on the network?
- A. Active Directory
 - B. ICMP
 - C. DNS
 - D. iWINS
 - E. iSNS
66. What is the highest possible data transfer rate on a storage area network (SAN) using Fibre Channel?
- A. 8 Gbps
 - B. 16 Gbps
 - C. 32 Gbps
 - D. 128 Gbps
67. In its primary functionality, a network-attached storage (NAS) device is most closely associated with which of the following devices?
- A. Failover cluster
 - B. File server
 - C. JBOD
 - D. RAID
68. Which of the following statements about the differences between network-attached storage (NAS) and storage area networks (SANs) are true? (Choose all that apply.)
- A. NAS provides file-level storage access, whereas SAN provides block-level storage access.
 - B. NAS devices typically contain integrated iSCSI targets.
 - C. SAN devices have an operating system, whereas NAS devices do not.
 - D. NAS devices typically provide a filesystem, whereas SAN devices do not.
69. Which of the following statements specify advantages of FCoE over the original Fibre Channel standard? (Choose all that apply.)
- A. FCoE is less expensive to implement than Fibre Channel.
 - B. FCoE can share a network with standard IP traffic, whereas Fibre Channel cannot.
 - C. FCoE is routable over IP networks, whereas Fibre Channel is not.
 - D. FCoE uses standard Ethernet networking hardware.

- 70.** Which of the following are Application layer protocols that network-attached storage (NAS) devices can use to serve shared files to clients on the network? (Choose all that apply.)
- A.** CIFS
 - B.** NFS
 - C.** RDMA
 - D.** HTTP
- 71.** Which of the following is not one of the advantages of iSCSI over Fibre Channel?
- A.** iSCSI is routable, whereas Fibre Channel is not.
 - B.** iSCSI is less expensive to implement than Fibre Channel.
 - C.** iSCSI includes its own internal flow control mechanism, whereas Fibre Channel does not.
 - D.** iSCSI can share the same network as standard local area network traffic, whereas Fibre Channel cannot.
- 72.** Which of the following is the term for the client that accesses an iSCSI device on a storage area network?
- A.** Initiator
 - B.** Target
 - C.** Controller
 - D.** Adapter
- 73.** Which of the following protocols are included in an iSCSI packet on a storage area network (SAN)? (Choose all that apply.)
- A.** Ethernet
 - B.** IP
 - C.** TCP
 - D.** UDP
 - E.** None of the above
- 74.** Which of the following protocols are included in a Fibre Channel packet?
- A.** Ethernet
 - B.** IP
 - C.** TCP
 - D.** UDP
 - E.** None of the above

- 75.** Which of the following protocol standards defines a layered implementation that does not correspond to the layers of the Open Systems Interconnection (OSI) model?
- A.** iSCSI
 - B.** Fibre Channel
 - C.** PPP
 - D.** RDMA
- 76.** Which of the following protocols are included in an FCoE packet?
- A.** Ethernet
 - B.** IP
 - C.** TCP
 - D.** UDP
 - E.** None of the above
- 77.** Ralph, the administrator of a 500-node private internetwork, is devising a plan to connect the network to the Internet. The primary objective of the project is to provide all of the network users with access to web and email services while keeping the client computers safe from unauthorized users on the Internet. The secondary objectives of the project are to avoid having to manually configure IP addresses on each one of the client computers individually and to provide a means of monitoring and regulating the users' access to the Internet. Ralph submits a proposal calling for the use of private IP addresses on the client computers and a series of proxy servers with public, registered IP addresses, connected to the Internet using multiple T-1 lines. Which of the following statements about Ralph's proposed Internet access solution is true?
- A.** The proposal fails to satisfy both the primary and secondary objectives.
 - B.** The proposal satisfies the primary objective but neither of the secondary objectives.
 - C.** The proposal satisfies the primary objective and one of the secondary objectives.
 - D.** The proposal satisfies the primary objective and both of the secondary objectives.
- 78.** Which of the following is not a mechanism for distributing incoming network traffic among multiple servers?
- A.** Load balancer
 - B.** Round-robin DNS
 - C.** NLB cluster
 - D.** VPN headend
- 79.** Which of the following is not a function that is typically provided by a unified threat management (UTM) appliance?
- A.** Virtual private networking
 - B.** Network firewall
 - C.** Network-attached storage
 - D.** Antivirus/antimalware protection

- 80.** A multilayer switch can operate at which layers of the Open Systems Interconnection (OSI) model? (Choose all that apply.)
- A.** Physical
 - B.** Data link
 - C.** Network
 - D.** Transport
 - E.** Session
 - F.** Presentation
 - G.** Application
- 81.** Control plane policing (CPP or CoPP) is a feature on some routers and switches that limits the rate of traffic on the device's processor to prevent denial-of-service (DoS) and reconnaissance attacks, using which of the following technologies?
- A.** IPsec
 - B.** 802.1X
 - C.** RA guard
 - D.** QoS
 - E.** VLAN hopping
- 82.** Which of the following is a device that switches calls between endpoints on the local IP network and provides access to external Internet lines?
- A.** VoIP PBX
 - B.** VoIP gateway
 - C.** VoIP endpoint
 - D.** Multilayer switch
- 83.** Which of the following is the true definition of the term *modem*?
- A.** A device that connects a computer to the public switched telephone network (PSTN)
 - B.** A device that connects a local area network (LAN) to the Internet
 - C.** A device that converts analog signals to digital signals and back again
 - D.** A device that connects a local area network (LAN) to a wide area network (WAN)
- 84.** Which of the following terms are used to describe the device used to place calls on a Voice over Internet Protocol (VoIP) installation? (Choose all that apply.)
- A.** Terminal
 - B.** Gateway
 - C.** Endpoint
 - D.** PBX

- 85.** Which of the following devices enables you to use a standard analog telephone to place calls using the Internet instead of the public switched telephone network (PSTN)?
- A.** Proxy server
 - B.** VPN headend
 - C.** VoIP gateway
 - D.** UTM appliance
- 86.** Which of the following prevents packets on a TCP/IP internetwork from being transmitted endlessly from router to router?
- A.** Open Shortest Path First (OSPF)
 - B.** Maximum transmission unit (MTU)
 - C.** Administrative distance
 - D.** Time to live (TTL)
- 87.** Which of the following is the abbreviation for a network of Internet datacenters supplying end users with localized access to their data?
- A.** CDN
 - B.** QoS
 - C.** NAS
 - D.** SAN

1.3 Summarize cloud concepts and connectivity options.

- 88.** Which of the following cloud service models enables you to perform a new installation of an operating system of your choice?
- A.** IaaS
 - B.** PaaS
 - C.** SaaS
 - D.** DaaS
 - E.** All of the above
- 89.** When you contract with a provider to obtain email services for your company using their servers in the public cloud, which of the following service models are you using?
- A.** IaaS
 - B.** PaaS
 - C.** SaaS
 - D.** DaaS
 - E.** None of the above

90. Which of the following cloud service models provides the consumer with the most control over the cloud resources?
- A. IaaS
 - B. PaaS
 - C. SaaS
 - D. DaaS
 - E. IaaS, PaaS, SaaS, and DaaS all provide the same degree of control.
91. Alice has just created a new Windows Server virtual machine using remote controls provided by a cloud service provider on the Internet. Which of the following cloud architectures is she using? (Choose all that apply.)
- A. IaaS
 - B. PaaS
 - C. SaaS
 - D. Public cloud
 - E. Private cloud
 - F. Hybrid cloud
 - G. Virtual private cloud
92. In which of the following cloud models can a single organization function as both the provider and the consumer of all cloud services?
- A. Public cloud
 - B. Private cloud
 - C. Hybrid cloud
 - D. Multicloud
93. Ed is the overnight manager of his company's datacenter, and he is responsible for both private and public resources in the company's hybrid cloud. Due to a new TV commercial shown that night, the company's website experiences a massive upsurge in traffic. The web server farm on the private cloud is being overwhelmed, so Ed configures some virtual machines in the public cloud to take up the slack. Which of the following is a common term for what Ed has done?
- A. Cloud busting
 - B. Cloud bursting
 - C. Cloud splitting
 - D. Cloud migrating
94. Microsoft's Outlook.com email service is an example of which of the following cloud service models?
- A. IaaS
 - B. PaaS

- C. SaaS
 - D. DaaS
 - E. None of the above
95. Which of the following statements about cloud delivery models is true?
- A. A public cloud is inherently insecure because anyone can access it.
 - B. A private cloud consists of hardware that is all located in a single datacenter.
 - C. A hybrid cloud enables administrators to migrate services between public and private resources.
 - D. Public, private, and hybrid clouds all utilize the same hardware resources.
96. Ed has just created a new Windows application for his company and wants to deploy it in the public cloud. He is looking for a provider that will furnish his company with a fully installed and configured Windows server on which he can install and run his application. Which of the following service models is he seeking to use?
- A. IaaS
 - B. PaaS
 - C. SaaS
 - D. DaaS
 - E. None of the above
97. Which of the following are valid advantages or disadvantages of multitenancy in a public cloud datacenter? (Choose all that apply.)
- A. Multitenancy presents a potential security risk because other tenants are utilizing the same hardware.
 - B. Multitenancy reduces the cost of utilities and other overhead.
 - C. Multitenancy introduces the possibility of competition for bandwidth with other tenants.
 - D. Multitenancy separates tenants by assigning each one its own virtual machine.
98. Ralph is designing a hybrid deployment for a corporate client that will require a connection between the client's private network and a public cloud provider. The client is concerned about this connection becoming a speed bottleneck at times of heavy user traffic. Which of the following options can Ralph offer the client that will best address this potential problem?
- A. Use a different ISP for the cloud connection.
 - B. Use a VPN for the cloud connection.
 - C. Use a cloud direct connection for the hybrid link.
 - D. Use a leased line connection to the ISP.
99. Which of the following is not one of the primary components of the network functions virtualization (NFV) framework?
- A. VNF
 - B. NFV ISG
 - C. NFVI
 - D. NFV-MANO

- 100.** Ralph is designing the datacenter for his company's new branch office. He is considering various options, including building a new datacenter at the branch office facility, using a collocated datacenter, and creating a virtual datacenter using a public cloud provider. Which of the following statements about the differences between these options are true? (Choose all that apply.)
- A.** A collocated datacenter would be less expensive to implement than a branch office or public cloud datacenter.
 - B.** In a branch office or collocated datacenter, Ralph's company would own the hardware.
 - C.** In all three datacenter options, the administrators in Ralph's company would be responsible for setting up and managing the hardware.
 - D.** In a branch office or collocated datacenter, Ralph's company would be responsible for all utility costs, including heating, cooling, and power.
 - E.** A public cloud datacenter would have greater physical security than the other two options.
 - F.** A public cloud datacenter is easier to expand than a collocated or branch office datacenter.
- 101.** Alice's company regularly hires a large number of operators for its phone center. The operators require access to a customer database and an order entry system. Because this is a high-turnover position, Alice has streamlined the onboarding process by creating a security group with the appropriate permissions needed to access the necessary software. This way, she can simply add each new user to the group, rather than assigning the permissions individually. This is an example of which of the following security concepts?
- A.** Least privilege
 - B.** Zero trust
 - C.** Role-based access control
 - D.** Defense in depth
- 102.** Which of the following statements about the differences between network security groups and security lists is true?
- A.** Security lists contain ingress and egress rules that apply to all of the virtual network interface cards (VNICs) in a subnet.
 - B.** Network security groups can have no more than five member VNICs.
 - C.** A VNIC can be added to no more than five security lists.
 - D.** Network security groups can only contain members from their assigned subnet.
- 103.** Which of the following statements about the differences between a NAT gateway and an Internet gateway in a virtual cloud network (VNC) are true? (Choose all that apply.)
- A.** A NAT gateway allows traffic from the VNC to reach the Internet but does not allow Internet traffic into the VNC.
 - B.** A NAT gateway allows VNC traffic both to and from the Internet.
 - C.** An Internet gateway allows traffic from the VNC to reach the Internet but does not allow Internet traffic into the VNC.
 - D.** An Internet gateway allows VNC traffic both to and from the Internet.

1.4 Explain common networking ports, protocols, services, and traffic types.

- 104.** Which of the following pairs of well-known ports are the default values you would use to configure a POP3 email client?
- A.** 110 and 25
 - B.** 143 and 25
 - C.** 110 and 143
 - D.** 80 and 110
 - E.** 25 and 80
- 105.** Which of the following server applications use two well-known port numbers during a typical transaction?
- A.** NTP
 - B.** SNMP
 - C.** HTTP
 - D.** FTP
- 106.** Which of the following protocols does the Ping utility use to exchange messages with another system?
- A.** UDP
 - B.** TCP
 - C.** ICMP
 - D.** IGMP
- 107.** Which of the following components does the port number in a Transport layer protocol header identify?
- A.** A Transport layer protocol
 - B.** An application
 - C.** A gateway
 - D.** A proxy server
- 108.** Which of the following organizations is responsible for assigning the well-known port numbers used in Transport layer protocol headers?
- A.** Institute for Electronic and Electrical Engineers (IEEE)
 - B.** Internet Assigned Numbers Authority (IANA)
 - C.** Internet Engineering Task Force (IETF)
 - D.** International Organization for Standardization (ISO)

- 109.** Which of the following is the default well-known port number for the Hypertext Transfer Protocol (HTTP) used for web client/server communications?
- A. 22
 - B. 20
 - C. 80
 - D. 443
- 110.** The secured version of the Hypertext Transfer Protocol Secure (HTTPS) uses a different well-known port from the unsecured version. Which of the following ports is used by HTTPS by default?
- A. 25
 - B. 80
 - C. 110
 - D. 443
- 111.** What field in the Transmission Control Protocol (TCP) Option subheader specifies the size of the largest segment a system can receive?
- A. MSS
 - B. Window
 - C. MMS
 - D. WinMS
- 112.** What is the term for the combination of an IPv4 address and a port number, as in the following example: 192.168.1.3:23?
- A. Socket
 - B. OUI
 - C. Well-known port
 - D. Network address
 - E. Domain
- 113.** Which of the following protocols generate messages that are carried directly within Internet Protocol (IPv4) datagrams, with no intervening Transport layer protocol? (Choose all that apply.)
- A. ICMP
 - B. IGMP
 - C. SMTP
 - D. SNMP
- 114.** Which of the following protocols is used to exchange directory service information?
- A. RDP
 - B. LDAP
 - C. SNMP
 - D. SMB

- 115.** Ralph is configuring a new email client on a workstation to use the Simple Mail Transfer Protocol (SMTP) and Post Office Protocol (POP3) email protocols. He wants SMTP to use encryption when communicating with the email server. Which of the following port numbers should Ralph use to create the POP3 connection and secure the SMTP connection with Transport Layer Security (TLS)? (Choose all that apply.)
- A. 110
 - B. 25
 - C. 587
 - D. 443
- 116.** Which of the following is not a port number used for Structured Query Language (SQL) communications?
- A. 1433
 - B. 1521
 - C. 3306
 - D. 3389
- 117.** Which of the following port numbers is assigned to a Unix/Linux logging services program?
- A. 389
 - B. 514
 - C. 636
 - D. 993
- 118.** Which of the following is the primary Application layer protocol used by web browsers to communicate with web servers?
- A. HTTPS
 - B. HTML
 - C. SMTP
 - D. FTP
- 119.** Which of the following protocols appears on the network as a service that client computers use to resolve names into IP addresses?
- A. DHCP
 - B. BOOTP
 - C. DNS
 - D. SNMP
- 120.** Which of the following protocols use the term *datagram* to describe the data transfer unit they create? (Choose all that apply.)
- A. Ethernet
 - B. IP
 - C. TCP
 - D. UDP

- 121.** What is the native file sharing protocol used on all Microsoft Windows operating systems?
- A.** Hypertext Transfer Protocol Secure (HTTPS)
 - B.** Network File System (NFS)
 - C.** File Transfer Protocol (FTP)
 - D.** Server Message Block (SMB)
 - E.** Lightweight Directory Access Protocol (LDAP)
- 122.** When analyzing captured TCP/IP packets, which of the following control bits must you look for in the Transmission Control Protocol (TCP) header to determine whether the receiving host has successfully received the sending host's data?
- A.** ACK
 - B.** FIN
 - C.** PSH
 - D.** SYN
 - E.** URG
- 123.** Which of the following terms describes the Transmission Control Protocol (TCP) exchange that establishes a connection prior to the transmission of any data?
- A.** Synchronization
 - B.** Initialization exchange
 - C.** Connection establishment
 - D.** Three-way handshake
- 124.** Alice has been instructed to install 100 Windows workstations, and she is working on automating the process by configuring the workstations to use PXE boots. Each workstation therefore must obtain an IP address from a DHCP server and download a boot image file from a TFTP server. Which of the following well-known ports must Alice open on the firewall separating the workstations from the servers? (Choose all that apply.)
- A.** 65
 - B.** 66
 - C.** 67
 - D.** 68
 - E.** 69
- 125.** Which of the following explanations best describes the function of a Transmission Control Protocol (TCP) or User Datagram Protocol (UDP) port number?
- A.** The port number indicates to the receiver that the sender can activate a specific port only.
 - B.** The port number is used by both the sender and the receiver to identify the application that generated the information in the datagram.

- C. The port number is used only by the receiver, to indicate the application process running on the sender.
 - D. The port number is used by both the sender and the receiver to negotiate a well-known server port for the communicating processes.
- 126.** What is the valid range of numbers for the ephemeral client ports used by the Transmission Control Protocol (TCP) and User Datagram Protocol (UDP)?
- A. 1023 through 65,534
 - B. 0 through 1023
 - C. 49,152 through 65,535
 - D. 1024 through 49,151
- 127.** Which of the following statements about the User Datagram Protocol (UDP) are true? (Choose all that apply.)
- A. UDP does not use packet sequencing and acknowledgments.
 - B. UDP uses packet sequencing and acknowledgments.
 - C. UDP is a connection-oriented protocol.
 - D. UDP is a connectionless protocol.
 - E. UDP has an 8-byte header.
 - F. UDP has a 20-byte header.
- 128.** Which of the following port values are used by the File Transfer Protocol (FTP)? (Choose all that apply.)
- A. 21
 - B. 23
 - C. 20
 - D. 53
 - E. 69
- 129.** Which of the following protocols provides connectionless delivery service at the Transport layer of the Open Systems Interconnection (OSI) model?
- A. TCP
 - B. HTTP
 - C. UDP
 - D. ARP
- 130.** What is the valid range of numbers for the well-known Transmission Control Protocol (TCP) and User Datagram Protocol (UDP) ports used by servers?
- A. 1024 through 49151
 - B. 1 through 49151
 - C. 49152 through 65534
 - D. 1 through 1023

- 131.** Ralph is a network administrator who has just installed a new open-source email server for the users at his company. The server is configured to send and receive Internet email and create a mailbox for each user that will permanently store the user's mail on the server. Ralph next uses a protocol analyzer to examine the network traffic resulting from the new server installation. Which of the following new protocols should Ralph expect to see in his network traffic analysis? (Choose all that apply.)
- A.** SNMP
 - B.** SMTP
 - C.** POP3
 - D.** IMAP
 - E.** RIP
- 132.** Which of the following values could a web client use as an ephemeral port number when communicating with a web server?
- A.** 1
 - B.** 23
 - C.** 80
 - D.** 1024
 - E.** 1999
 - F.** 50134
- 133.** Which of the following protocols provides connection-oriented service with guaranteed delivery at the Transport layer of the OSI model?
- A.** TCP
 - B.** UDP
 - C.** HTTP
 - D.** IP
- 134.** Which of the following protocols is limited to use on the local subnet only?
- A.** Address Resolution Protocol (ARP)
 - B.** Dynamic Host Configuration Protocol (DHCP)
 - C.** Domain Name System (DNS)
 - D.** Simple Mail Transfer Protocol (SMTP)
 - E.** Generic Routing Encapsulation (GRE)
- 135.** Which of the following prefixes must you use in the URL you type into a web browser when the website you want to access has been secured with Transport Layer Security (TLS)?
- A.** TLS://
 - B.** HTTPS://
 - C.** HTTP://
 - D.** HTLS://

- 136.** What is the difference when you specify the HTTPS:// prefix in a Uniform Resource Locator (URL) instead of HTTP://? (Choose all that apply.)
- A.** The connection between the web browser and the server is encrypted.
 - B.** The browser uses a different port number to connect to the server.
 - C.** The connection uses SSL or TLS instead of HTTP.
 - D.** The browser uses a different IP address to connect to the server.
- 137.** You are a consultant installing a web server application for a client called Adatum. The domain name Adatum.com has been registered in the DNS, and the server has one public IP address, so the new website will be accessible to users on the Internet. You want to be able to access the web server application's administrative site from your remote office, so you configure that site to be encrypted and to use the port number 12354 instead of the default. Which of the following URLs will you have to use to access the administrative website?
- A.** www.adatum.com
 - B.** www.adatum.com:12354
 - C.** www.adatum.com:80
 - D.** www.adatum.com:12354
- 138.** Which of the following protocols does IPsec use to digitally encrypt packets before transmitting them over the network?
- A.** ESP
 - B.** SSL
 - C.** AH
 - D.** IKE
- 139.** Which of the following are the protocols that IPsec uses to secure network traffic? (Choose all that apply.)
- A.** SSH
 - B.** AH
 - C.** ESP
 - D.** SSL
- 140.** What is the primary shortcoming of the File Transfer Protocol (FTP) that is addressed by FTPS and SFTP?
- A.** Lack of security
 - B.** Slow file transfers
 - C.** File size limitations
 - D.** Lack of authentication

- 141.** Which of the following File Transfer Protocol (FTP) variants do not transmit authentication passwords over the network in cleartext?
- A. FTP
 - B. FTPS
 - C. SFTP
 - D. TFTP
- 142.** Which of the following File Transfer Protocol (FTP) variants is typically used to download boot image files during Preboot Execution Environment (PXE) startup sequences?
- A. FTP
 - B. FTPS
 - C. SFTP
 - D. TFTP
- 143.** Which of the following protocols does IPsec use to digitally sign packets before transmitting them over the network?
- A. ESP
 - B. SSL
 - C. AH
 - D. IKE
- 144.** Which of the following security protocols used to protect traffic exchanged by web browsers and servers was created first?
- A. SSL
 - B. TLS
 - C. SSH
 - D. DTLS
- 145.** Which of the following security protocols for web servers or browsers was deprecated in 2015 in favor of Transport Layer Security (TLS) and Datagram Transport Layer Security (DTLS)?
- A. SSH
 - B. SSL
 - C. RDP
 - D. IPsec
- 146.** What must you do to configure a firewall to admit File Transfer Protocol (FTP) traffic to the internal network using its default port settings? (Choose all that apply.)
- A. Open port 20
 - B. Open port 21
 - C. Open port 22
 - D. Open port 23
 - E. Open port 24

- 147.** Which of the following protocols uses a form of flow control called the sliding window technique?
- A.** UDP
 - B.** HTTP
 - C.** TCP
 - D.** SIP
- 148.** Which of the following Transmission Control Protocol (TCP) control bits is set to 1 to initiate the termination of a session?
- A.** SYN
 - B.** URG
 - C.** FIN
 - D.** END
 - E.** PSH
- 149.** A client on a TCP/IP network is attempting to establish a session with a server. Which of the following correctly lists the order of the TCP flags raised in the Transmission Control Protocol (TCP) session establishment messages?
- A.** SYN, ACK, SYN, ACK
 - B.** SYN, SYN, ACK, ACK
 - C.** SYN/ACK, SYN/ACK
 - D.** SYN, SYN/ACK, ACK
- 150.** Which of the following traffic types is used exclusively on IPv6 networks?
- A.** Unicast
 - B.** Broadcast
 - C.** Multicast
 - D.** Anycast

1.5 Compare and contrast transmission media and transceivers.

- 151.** Which of the following best describes the function of the network medium?
- A.** The network medium provides the physical connection between networked computers.
 - B.** The network medium provides the protocol used to transmit data between end systems.
 - C.** The network medium passes data packets between two routers.
 - D.** The network medium processes electrical or light signals and converts them to data.

- 152.** Which of the following signal types is carried by copper cable?
- A. Fiber-optic
 - B. Microwave
 - C. Infrared
 - D. Electrical
- 153.** Identify the organizations that developed the general cable type standards for voice and data communications that are currently in use and identify their document names.
- A. ANSI/TVA, document C568
 - B. TWA/ANSI/EIA, document T530-A
 - C. EIA/ANSI/TWA, document 802.2
 - D. TDA/EIA/TIA, document 802.11
 - E. ANSI/TIA/EIA, document T568b
- 154.** Which of the following cable types and connectors are used to attach a television set to a cable television (CATV) network?
- A. A multimode fiber-optic cable and a Straight Tip (ST) connector
 - B. A coaxial cable and a Bayonet-Neill-Concelman (BNC) connector
 - C. A twisted-pair cable and an RJ-45 connector
 - D. A coaxial cable and an F-type connector
 - E. An AUI cable and a vampire tap connector
 - F. A twinaxial cable and a Bayonet-Neill-Concelman (BNC) connector
- 155.** Which of the following cable types is used for Thick Ethernet network segments?
- A. RG-8
 - B. RG-58
 - C. RJ-45
 - D. RJ-11
- 156.** Which of the following cable types is used for Thin Ethernet network segments?
- A. RG-8
 - B. RG-58
 - C. RJ-45
 - D. RJ-11
- 157.** Which of the following coaxial cable types are still in general use? (Choose all that apply.)
- A. RG-6
 - B. RG-8
 - C. RG-58
 - D. RG-59

- 158.** Which of the following statements about the differences between fiber-optic Angled Physical Contact (APC) and Ultra Physical Contact (UPC) connectors are true? (Choose all that apply.)
- A.** APCs should only be joined to other APCs.
 - B.** APCs generate more insertion loss than UPCs.
 - C.** UPCs generate more return loss than APCs.
 - D.** UPCs use a green connector boot or body.
- 159.** Which of the following is not a type of fiber-optic connector?
- A.** SC
 - B.** MT-RJ
 - C.** ST
 - D.** BNC
 - E.** LC
- 160.** Which of the following Physical layer transceiver module standards is the oldest and therefore the most obsolete?
- A.** SFP
 - B.** SFP+
 - C.** GBIC
 - D.** QSFP
 - E.** QSFP+
- 161.** Which of the following cable types is typically configured in a star/hub and spoke topology, uses eight copper conductors arranged in four pairs, and uses RJ-45 connectors?
- A.** RG-8
 - B.** Twisted-pair
 - C.** RG-58
 - D.** Fiber-optic
- 162.** Which of the following statements explains the purpose of the twists in twisted-pair cabling?
- A.** The twists prevent collisions.
 - B.** The twists completely eliminate crosstalk and electromagnetic interference (EMI) in adjacent wire pairs.
 - C.** The twists prevent crosstalk in adjacent wire pairs and limit the effects of EMI on the signals carried over the cable.
 - D.** The twists extend the bend radius allowance of the cable.

- 163.** Which of the following combinations of attributes describes the cable used for a Thin Ethernet network?
- A.** RJ-45, 50-ohm, 0.270-inch, coaxial cable with BNC connectors
 - B.** RG-59, 75-ohm, 0.242-inch, coaxial cable with F connectors
 - C.** RG-58, 50-ohm, 0.195-inch, coaxial cable with BNC connectors
 - D.** RG-8, 50-ohm, 0.405-inch, coaxial cable with N connectors
 - E.** RJ-6, 75-ohm, 0.242-inch, coaxial cable with BNC connectors
- 164.** Which of the following connector types are typically associated with Ethernet networks? (Choose all that apply.)
- A.** F-type
 - B.** BNC
 - C.** DB-9
 - D.** RJ-45
- 165.** Which of the following connector types was typically associated with a T-connector attached to the computer?
- A.** RJ-45
 - B.** MT-RJ
 - C.** 8P8C
 - D.** BNC
 - E.** F
- 166.** Which of the following connector types are associated with fiber-optic cables? (Choose all that apply.)
- A.** RJ-11
 - B.** ST
 - C.** F
 - D.** LC
 - E.** MT-RJ
 - F.** MPO
- 167.** Which of the following types of cable, when installed, sometimes employed a device called a vampire tap?
- A.** Unshielded twisted-pair
 - B.** Shielded twisted-pair
 - C.** Multimode fiber-optic
 - D.** Single-mode fiber-optic
 - E.** Coaxial

- 168.** Which of the following statements about single-mode and multimode fiber-optic cables are true? (Choose all that apply.)
- A.** Single-mode cables can span longer distances than multimode cables.
 - B.** Single-mode cables are more resistant to electromagnetic interference than multimode cables.
 - C.** Single-mode cables are more difficult to install than multimode cables.
 - D.** Single-mode cables have a much larger core diameter than multimode cables.
- 169.** Which of the following components are typically used only for telephone cable installations, and not for data networking? (Choose all that apply.)
- A.** 66 blocks
 - B.** 110 blocks
 - C.** 25 pair UTP cables
 - D.** 100 pair UTP cables
- 170.** Which of the following statements about single-mode fiber-optic cable are true? (Choose all that apply.)
- A.** Single-mode cables use an LED light source, whereas multimode cables use a laser.
 - B.** Single-mode cables can span longer distances than multimode cables.
 - C.** Single-mode cables have a smaller core filament than multimode cables.
 - D.** Single-mode cables have a smaller bend radius than multimode cables, making them easier to install.
 - E.** Single-mode fiber-optic cables require a ground, whereas multimode cables do not.
- 171.** Which of the following tools do cable installers use to connect bulk cable runs to wall plates and patch panels?
- A.** A crimper
 - B.** A splicer
 - C.** A pigtail
 - D.** A punchdown block tool
- 172.** Ralph has been hired by a client to install cabling to connect two existing networks. The two networks are in different buildings approximately 1,000 feet apart. The cable type must support Gigabit Ethernet data rates of 1,000 megabits per second (Mbps) and provide a high level of resistance to electromagnetic interference (EMI). Your client wants the most economical cabling solution that meets their needs. Which of the following cable types best meets the needs of this client?
- A.** Multimode fiber-optic cable
 - B.** Shielded twisted-pair (STP) cable
 - C.** Unshielded twisted-pair (UTP) cable
 - D.** Thin coaxial cable
 - E.** Single-mode fiber-optic cable

- 173.** Which of the following are connector types used with coaxial cables? (Choose all that apply.)
- A. BNC
 - B. F-type
 - C. N-type
 - D. ST
 - E. RJ-11
- 174.** In the punchdown process for unshielded twisted-pair (UTP) cable, which of the following is the last step that you perform when connecting bulk cables to jacks in wall plates and patch panels?
- A. Cut off the excess wire that protrudes past the contacts.
 - B. Press the bare wire down between the two metal contacts that hold it in place.
 - C. Strip some of the insulating sheath off the cable end to expose the wires.
 - D. Insert the wires into the appropriate contacts in the jack.
 - E. Strip a small amount of insulation off each wire.
 - F. Separate the twisted wire pairs at the ends.
- 175.** Which of the following cable connector types is not used with fiber-optic cable?
- A. Straight Tip (ST)
 - B. Subscriber Connector (SC)
 - C. Mechanical Transfer-Registered Jack (MT-RJ)
 - D. F-type
 - E. Fiber Local Connector (LC)
- 176.** Which of the following cable connector types have been rendered nearly obsolete by Universal Serial Bus (USB) connections? (Choose all that apply.)
- A. BNC
 - B. RJ-11
 - C. DB-9
 - D. DB-25
- 177.** Which of the following cable types are typically used in newly constructed local area network (LAN) installations? (Choose all that apply.)
- A. Single-mode fiber-optic
 - B. Multimode fiber-optic
 - C. Coaxial
 - D. Unshielded twisted-pair

- 178.** Which of the following statements are true about coaxial cable? (Choose all that apply.)
- A.** Coaxial cable has three conductors within the same sheath.
 - B.** Coaxial cable has two conductors within the same sheath.
 - C.** Coaxial cable has a copper core that carries light pulse signals.
 - D.** Coaxial cable has a copper core that carries electrical signals.
 - E.** Coaxial cable has an insulating outer sheath made of braided strands.
 - F.** Coaxial cable has an insulating sheath made of either PVC or Teflon.
- 179.** Which of the following statements about fiber-optic cabling are true? (Choose all that apply.)
- A.** There are two main fiber-optic cable types: single-mode and multimode.
 - B.** Fiber-optic cable is typically used to span long distances.
 - C.** Fiber-optic cables use IBM Data Connector (IDC) connectors.
 - D.** Fiber-optic cables often use Straight Tip (ST) and Subscriber Connector (SC) connectors.
 - E.** Single-mode fiber-optic cable uses a laser light source and a glass core.
 - F.** Multimode fiber-optic cable uses a light-emitting diode (LED) light source.
- 180.** Which of the following are characteristics of an internal cable installation? (Choose all that apply.)
- A.** An internal cable installation uses bulk spools of cabling with no connectors attached for most cable runs.
 - B.** An internal cable installation uses only prefabricated cables with connectors attached for all cable runs.
 - C.** An internal cable installation uses solid wire conductors for all cable runs, regardless of distance.
 - D.** An internal cable installation uses stranded wire conductors for short cable runs and solid core for longer cable runs.
 - E.** In an internal cable installation, cables are typically not run through walls or ceilings.
 - F.** In an internal cable installation, cables are typically run through walls or ceilings.
- 181.** Which of the following IEEE 802.3 specifications calls for CAT8 UTP cable exclusively?
- A.** 10GBase-T
 - B.** 40GBase-T
 - C.** 100Base-TX
 - D.** 1000Base-SX

- 182.** Ralph has been hired to connect three local area networks (LANs) together with redundant paths that form a fault-tolerant backbone. The LANs reside on different floors in the same building and are approximately 600 meters apart. Each LAN is currently configured in a star/hub and spoke topology using twisted-pair cabling. Each LAN includes wall plates and rack-mounted patch panels and switches. Building and fire codes allow cables to run through existing risers, ceilings, and walls, but a 50,000-watt radio station occupies one of the floors between the LANs. Which topology, cable type, and installation method are best suited for this network?
- A. Star/hub and spoke topology, fiber-optic cabling, and internal installation
 - B. Star/hub and spoke topology, coaxial cabling, and external installation
 - C. Mesh topology, fiber-optic cabling, and external installation
 - D. Bus topology, twisted-pair cabling, and internal installation
 - E. Mesh topology, fiber-optic cabling, and internal installation
 - F. Star/hub and spoke topology, twisted-pair cabling, and external installation
- 183.** Alice is a network consultant who has been contracted to evaluate a network design created many years ago, to determine if the design is still viable. The network will support 20 workstations, scattered throughout the building, to run an inventory database application. The two most distant computers are 150 meters apart. The primary goal for the network design is to connect all 20 workstations to a single LAN running at 1 gigabit per second (Gbps). The two secondary goals are to provide sufficient fault tolerance for a single cable break to occur without affecting the entire network and to provide resistance to the electromagnetic interference (EMI) generated by machinery in the building. The earlier design calls for a CAT 6 UTP Ethernet LAN in a star/hub and spoke topology with all of the computers connected to a single switch. Which of the following statements about the old proposal is true?
- A. The solution achieves neither the primary goal nor either of the secondary goals.
 - B. The solution achieves the primary goal but neither of the secondary goals.
 - C. The solution achieves the primary goal and one of the secondary goals.
 - D. The solution achieves the primary goal and both of the secondary goals.
- 184.** Ed is a network consultant who has been contracted to design the network for a new manufacturing plant. The plant consists of two buildings 150 meters apart: an office with 20 computers and a manufacturing facility that has 30 computers. The two most distant computers at the site are 225 meters apart. Ed's design calls for a Gigabit Ethernet network using fiber-optic cable. On receiving the proposal, the client asks Ed to justify the additional labor and expense of installing fiber-optic cable instead of unshielded twisted-pair (UTP). Which of the following is not a valid reason for choosing fiber-optic over UTP for this project?
- A. The 225-meter distance between the two most distant computers exceeds Ethernet's maximum cable segment length for UTP.
 - B. Only fiber-optic cable can keep the two buildings electrically isolated.
 - C. Fiber-optic cable is completely resistant to any electromagnetic interference generated by the equipment in the manufacturing plant.
 - D. Fiber-optic cable provides a greater degree of tolerance to cable breaks than UTP.

- 185.** Which of the following 802.3 10 Gigabit Ethernet specifications calls for the use of copper cable?
- A.** 10GBase-LR
 - B.** 10GBase-CX4
 - C.** 10GBase-ER
 - D.** 10GBase-LX4
 - E.** 10GBase-SR
- 186.** Alice is a network consultant who has been contracted to upgrade an existing Ethernet network to Gigabit Ethernet. The network consists of 20 workstations with integrated 100Base-TX/1000Base-T network interface adapters. The network cabling is Category 6 (CAT6) unshielded twisted-pair (UTP), installed when the building was constructed. All of the workstations are connected to a single 100Base-TX switch. Which of the following options would Alice find to be a valid upgrade path to Gigabit Ethernet?
- A.** Replace the CAT6 cable with at least Category 6a (CAT6a) and leave the existing network interface adapters and switch in place.
 - B.** Install a 1000Base-T network interface card in each computer and leave the existing cables and switch in place.
 - C.** Replace the CAT6 cable with at least CAT6a and replace the 100Base-T switch with a 1000Base-T switch.
 - D.** Replace the 100Base-TX switch with a 1000Base-T switch and leave the existing cables and network interface adapters in place.
- 187.** Ralph is a network consultant with a client who wants him to design the local area network (LAN) for his company's new branch office. The site consists of a building with unshielded twisted-pair (UTP) cable already installed, which the client considered a major selling point when selecting the property. He wants Ralph to install the fastest possible LAN using the existing cable. After examining the site, Ralph notes that the cable is Category 6 (CAT6), installed using a star/hub and spoke topology, and that the individual cable runs are all 90 to 100 meters long. Which of the following Ethernet Physical layer specifications can Ralph use for the new network to provide the fastest transmission speeds without replacing the cable?
- A.** 10GBase-T
 - B.** 100Base-TX
 - C.** 1000Base-T
 - D.** 1000Base-LX
 - E.** 1000Base-SX
- 188.** Which Institute of Electrical and Electronics Engineers (IEEE) 802.3 standards for Ethernet support 10-megabit-per-second (Mbps) communications, and what are the correct segment limitations for each standard? (Choose all that apply.)
- A.** 10Base2; segment maximum is 100 meters
 - B.** 10Base2; segment maximum is 185 meters
 - C.** 10Base5; segment maximum is 500 meters

- D. 100Base5; segment maximum is 500 meters
 - E. 10Base-T; segment maximum is 100 meters
 - F. 10Base-T segment maximum is 328 meters
- 189.** Which of the following are Ethernet cable types that must be configured in a bus topology? (Choose all that apply.)
- A. RG-8
 - B. RG-10
 - C. RG-14
 - D. RG-58
- 190.** Wavelength-division multiplexing is a fiber-optic technique for carrying multiple signals on a single network medium. There are several types of this technique, including coarse wavelength-division multiplexing (CWDM), dense wavelength-division multiplexing (DWDM), and bidirectional wavelength-division multiplexing (BWDM, or just WDM). Which of the following is not one of the ways in which these types of multiplexing differ?
- A. They use different wavelength spacings.
 - B. They carry different numbers of channels on a single medium.
 - C. They provide different amounts of signal amplification.
 - D. None of the above.
- 191.** Ralph is installing an Ethernet local area network (LAN) for a small business with two offices on opposite sides of a courtyard. Ralph plans to run a multimode fiber-optic cable across the courtyard, but the budget is limited, and he cannot use fiber for the whole network. Therefore, he installs unshielded twisted-pair (UTP) cable in the two offices, which have 10 and 12 workstations, respectively. Which of the following devices should Ralph use to join the two UTP installations together into one LAN using the fiber-optic run across the courtyard, while keeping the cost to a minimum?
- A. Media converters
 - B. Hubs
 - C. Switches
 - D. Routers
- 192.** Under which of the following conditions is a cable installer required to use plenum cable?
- A. When cables run close to sources of electromagnetic interference (EMI)
 - B. When cables are running through building air flow spaces
 - C. When data and voice traffic will be running over the same cable
 - D. When cables are running through areas of low temperature
- 193.** Which of the following wireless networking standards is capable of supporting speeds over 72 Mbps and is also backward compatible with IEEE 802.11b and 802.11g?
- A. IEEE 802.11
 - B. IEEE 802.11a

- C. IEEE 802.11n
 - D. IEEE 802.11ac
 - E. IEEE 802.11ax
- 194.** Which of the following is a cellular communication technology that is virtually obsolete in the United States?
- A. GSM
 - B. CDMA
 - C. TDMA
 - D. LTE
- 195.** Ralph is planning a wireless LAN installation for a warehouse with two offices, one at either end of the building, approximately 300 feet apart. If he installs a single access point (AP) in the center of the warehouse, equidistant from the two offices, which of the following standards should he look for when purchasing hardware so that workstations in both offices will be able to connect to the network at the best possible speed?
- A. IEEE 802.11a
 - B. IEEE 802.11g
 - C. IEEE 802.11n
 - D. IEEE 802.11ac
 - E. IEEE 802.11ax
- 196.** Which of the following broadband WAN services provides equal amounts of upstream and downstream bandwidth?
- A. ADSL
 - B. SDSL
 - C. Satellite
 - D. Cable
- 197.** Ralph's company has expanded to include an additional building on the far end of the corporate campus, approximately 4 kilometers away from the building housing the datacenter. A single-mode fiber-optic cable connection has been installed between the new building and the datacenter for a 1000Base-BX10 connection, but the cable is not yet connected to a transceiver at the datacenter end. Noticing that there is a 1000Base-SX Ethernet transceiver module in the datacenter storeroom, Ralph is wondering if he could use this on the new cable run. Which of the following are reasons why this might not work? (Choose all that apply.)
- A. Transceiver mismatch
 - B. Incorrect cable type
 - C. Excessive cable length
 - D. Wavelength mismatch

- 198.** A Small Form-factor Pluggable (SFP) Ethernet implementation uses direct-attach copper (DAC) connections for short distance runs within the datacenter. Which of the following cable types do the DAC connections use?
- A. Unshielded twisted-pair
 - B. Shielded twisted-pair
 - C. Fiber-optic
 - D. Coaxial
 - E. Twinaxial

1.6 Compare and contrast network topologies, architectures, and types.

- 199.** An electrician installing a new light fixture accidentally severs one of the LAN cables running through the dropped ceiling space. With which topology would the severed cable cause the greatest amount of disturbance to the network?
- A. Bus
 - B. Star/hub and spoke
 - C. Logical ring
 - D. Mesh
- 200.** Which of the following statements about a wired local area network (LAN) is true?
- A. Wired LANs support only the star/hub and spoke topology.
 - B. Wired LANs support only the star/hub and spoke and bus topologies.
 - C. Wired LANs support only the star/hub and spoke and ring topologies.
 - D. Wired LANs can support ring, bus, or star/hub and spoke topologies.
- 201.** Which of the following is an example of a hybrid LAN topology?
- A. A workstation with two network interface cards, one of which is connected to a star/hub and spoke network and one to a bus network
 - B. Four Ethernet switches connected using a bus topology
 - C. Four workstations, each with a separate network connection to each of the other three
 - D. Four Ethernet switches, each with a separate network connection to each of the other three
- 202.** Which type of network connects local area networks (LANs) in distant locations?
- A. WAN
 - B. LAN
 - C. MAN
 - D. CAN

- 203.** Which of the following topologies is used by the majority of new Ethernet networks installed today?
- A.** Bus
 - B.** Point-to-point
 - C.** Mesh
 - D.** Star/hub and spoke
- 204.** Alice has constructed a five-node failover cluster in which all five servers are connected to a hard disk array using a dedicated Fibre Channel network. Which of the following terms describes this network arrangement?
- A.** SAN
 - B.** PAN
 - C.** WAN
 - D.** MAN
- 205.** Which of the following network topologies are used by wireless local area networks (WLANs)? (Choose all that apply.)
- A.** Ad hoc
 - B.** Bus
 - C.** Infrastructure
 - D.** Star/hub and spoke
- 206.** On an Ethernet network using the star/hub and spoke topology, which of the following devices can function as the cabling nexus that forms the figurative center of the star?
- A.** Firewall
 - B.** Router
 - C.** Switch
 - D.** Access point
- 207.** Which of the following cabling topologies provides the greatest number of redundant paths through the network?
- A.** Star/hub and spoke
 - B.** Ring
 - C.** Mesh
 - D.** Bus
- 208.** Which of the following Ethernet Physical layer options does not use the star/hub and spoke topology?
- A.** 10Base2
 - B.** 10Base-T
 - C.** 100Base-TX
 - D.** 1000Base-T

- 209.** Which of the following statements is true about the differences between a peer-to-peer network and a client-server network?
- A.** Peer-to-peer networks are inherently less secure than client-server networks.
 - B.** Peer-to-peer networks are illegal, while client-server networks are legal.
 - C.** On peer-to-peer networks, every workstation is capable of authenticating users.
 - D.** On a peer-to-peer network, all workstations must share their resources.
- 210.** Ed has been hired by a private company to connect two remote sites with a wide area network (WAN). Each of these sites has more than 200 users, and they all need to constantly transfer files across the WAN. One of the sites has a customer database that is accessed by both sites at all hours of the day. Access to the database and other information is time sensitive and constant. The company estimates that their aggregate bandwidth needs to be approximately 40 Mbps. Management says that they need to guarantee access to this information and that money is not a factor in the WAN implementation. Which WAN technology should Ed recommend for this scenario?
- A.** A standard modem-to-modem connection
 - B.** A T-3 dedicated leased line
 - C.** A cable television (CATV) connection
 - D.** An ADSL (asymmetrical digital subscriber line) connection
- 211.** Ralph is an employee of a company that offers the option to telecommute from home. As a telecommuting employee, he needs to connect to the company network to access client information, transfer files, and send email through a virtual private network (VPN) connection. Ralph is investigating the different wide area network (WAN) services available for the remote connection before he implements one. His home is over 30 years old; the existing telephone wiring was not run through conduit, and the wiring seems to be deteriorating. Ralph has cable television (CATV) service, and his home is also approximately 20,000 feet from the nearest telephone central office. He wants to implement the fastest remote connection service possible, but cost is a factor in the decision. Which WAN technology should Ralph implement?
- A.** A dedicated leased line (fractional T-1)
 - B.** A standard modem-to-modem connection
 - C.** A DSL (digital subscriber line) connection
 - D.** A broadband CATV connection
- 212.** Which two of the following constructs provide roughly the same function? (Choose two that apply.)
- A.** SIP trunk
 - B.** CSU/DSU
 - C.** VoIP gateway
 - D.** Smartjack
 - E.** VPN concentrator

- 213.** Which of the following wide area network (WAN) services typically uses a switched fabric that was called a cloud long before the term came into general use?
- A.** ATM
 - B.** Fractional T-1
 - C.** SONET
 - D.** Frame Relay
- 214.** Ralph has been contracted to consult for a company that wants to update its legacy Ethernet network to Gigabit Ethernet. When examining the site, he discovers that the network is still using coaxial-based Thin Ethernet. What change in network topology must occur to upgrade the existing network to Gigabit Ethernet using unshielded twisted-pair (UTP) cable?
- A.** Bus to mesh
 - B.** Mesh to star/hub and spoke
 - C.** Star/hub and spoke to bus
 - D.** Bus to star/hub and spoke
 - E.** Star/hub and spoke to mesh
- 215.** Which of the following best describes the function of a vSwitch (or virtual switch)?
- A.** A vSwitch is a software product that enables a computer with multiple network adapters to function as a switch.
 - B.** A vSwitch is a feature in layer 3 switches that enables VLANs on the same switch to communicate with each other.
 - C.** A vSwitch is a feature in layer 3 switches that enables VLANs on different switches to communicate with each other.
 - D.** A vSwitch enables virtual machines (VMs) running on the same hypervisor to communicate with each other internally.
- 216.** On which of the following virtual networking components can you create VLANs?
- A.** Virtual NIC
 - B.** Virtual switch
 - C.** Virtual router
 - D.** Virtual firewall
- 217.** Which of the following components is responsible for providing a virtualized hardware environment and running virtual machines?
- A.** Hypervisor
 - B.** Virtual server
 - C.** vSwitch (virtual switch)
 - D.** VPN concentrator

- 218.** Which of the following is the proper term for a computer with a hypervisor on which you can create virtual machines and other virtual components?
- A. Guest
 - B. NAS
 - C. Host
 - D. SAN
- 219.** In which of the following components can a virtual firewall be implemented?
- A. On a host operating system
 - B. On a guest operating system
 - C. In a dedicated virtual machine
 - D. In a virtual switch
 - E. All of the above
- 220.** Which of the following is not a protocol that uses tunneling to establish secured links between TCP/IP systems?
- A. L2TP
 - B. IPsec
 - C. MGRE
 - D. NAT
- 221.** Which of the following is not the name of one of the layers in the three-tier datacenter architecture?
- A. Core
 - B. Intermediate
 - C. Distribution
 - D. Access
- 222.** Which of the following is not a reason why the spine and leaf datacenter topology is superior to the standard three-tier topology?
- A. The spine and leaf arrangement uses a full mesh switching topology.
 - B. In a spine and leaf topology, all data flows require the same number of hops.
 - C. The spine and leaf topology is less expensive to implement than the three-tier topology.
 - D. The spine and leaf topology uses software-defined networking to direct traffic, rather than blocking ports using the spanning tree protocol.
- 223.** Which of the following best describes the difference between east-west and north-south traffic in a datacenter?
- A. East-west describes traffic between devices at the same layer of the OSI model, while north-south describes traffic between OSI model layers.
 - B. East-west is switch-to-switch traffic, while north-south is switch-to-router traffic.

- C. East-west traffic stays within the datacenter, while north-south traffic does not.
 - D. East-west is backbone traffic among switches and routers, while north-south is traffic to end systems, such as servers.
- 224.** Top-of-rack switches most commonly form which layer of the datacenter topology?
- A. Leaf
 - B. Backbone
 - C. Spine
 - D. Core
- 225.** Which of the following statements about switches is not true?
- A. Switches are Data link layer devices that connect network devices in a star/hub and spoke topology.
 - B. Switches amplify and repeat signals received through one port out all other ports regardless of the destination.
 - C. Switches use MAC addresses to identify the devices connected to specific ports.
 - D. Switches provide internal crossover circuits and use uplink ports to form a hierarchical star/hub and spoke topology.
- 226.** A collapsed core network is one in which the standard three-tier hierarchical model is compressed into two tiers. Which of the following two tiers are combined to form this architectural model?
- A. Core and distribution
 - B. Distribution and access
 - C. Core and access
 - D. Distribution and intermediate

1.7 Given a scenario, use appropriate IPv4 network addressing.

- 227.** Which of the following services enables computers on a private IPv4 network to access the Internet using a registered IP address?
- A. DHCP
 - B. NAT
 - C. DNS
 - D. NTP

- 228.** Which of the following is the most accurate description of the subnetting process on an IPv4 network?
- A.** You extend the IP address by adding bits for a subnet identifier.
 - B.** You borrow bits from the network identifier to create a subnet identifier.
 - C.** You borrow bits from the host identifier to create a subnet identifier.
 - D.** You create a subnet identifier by borrowing half of the bits from the network identifier and half from the host identifier.
- 229.** Which of the following IPv4 addresses are you unable to assign to a network host? (Choose all that apply.)
- A.** 1.1.1.1
 - B.** 229.6.87.3
 - C.** 103.256.77.4
 - D.** 9.34.0.1
- 230.** How many bits are allocated to the host identifier in an IPv4 address on the 10.72.0.0/17 network?
- A.** 8
 - B.** 15
 - C.** 16
 - D.** 17
- 231.** Which of the following are not valid IPv4 addresses in the private address space defined by RFC 1918? (Choose all that apply.)
- A.** 10.16.225.1
 - B.** 172:33:19:7
 - C.** 192.168.254.77
 - D.** 10.255.255.255
 - E.** 172.15.2.9
- 232.** Alice has been instructed to create an IPv4 network with 8 subnets and 30 hosts per subnet. She has been assigned a Class C network address. Which of the following subnet masks will she have to 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
 - F.** 255.255.255.252

- 233.** Which of the following is the default subnet mask for an IPv4 Class A network?
- A. 255.0.0.0
 - B. 255.255.0.0
 - C. 255.255.255.0
 - D. 255.255.255.255
- 234.** Which of the following is the range of IPv4 addresses that Automatic Private IP Addressing (APIPA) assigns to DHCP clients that cannot access a DHCP server?
- A. 10.0.0.0 to 10.0.255.255
 - B. 169.254.0.0 to 169.254.255.255
 - C. 192.168.0.0 to 192.168.0.255
 - D. 224.0.0.0 to 224.0.255.255
- 235.** In which IPv4 class is the address 127.0.0.1 found?
- A. Class A
 - B. Class B
 - C. Class C
 - D. None of the above
- 236.** To which class does the following IPv4 address belong: 190.126.14.251?
- A. Class A
 - B. Class B
 - C. Class C
 - D. Class D
 - E. Class E
- 237.** Classless Inter-Domain Routing (CIDR) is a standard for IPv4 addressing that includes the capability to create subnets using any number of IP address bits, rather than using 8-bit blocks. Which of the following terms describes this ability?
- A. VLSM
 - B. APIPA
 - C. VLAN
 - D. EUI-64
- 238.** Ralph has been instructed to use the network address 10.12.0.0/14 for the new network he is installing. What subnet mask value should he use when configuring his computers?
- A. 255.248.0.0
 - B. 255.252.0.0
 - C. 255.254.0.0
 - D. 255.255.248.0
 - E. 255.255.252.0
 - F. 255.255.254.0

- 239.** Ed has been hired to design a company's network. The company has an assigned Class C network address of 192.168.30.0. Ed's client wants the network to be configured with 10 subnets, each with 14 hosts. Is this configuration possible with the given address, and if so, how many subnets and hosts can Ed create on the network?
- A.** Yes, this will work. By using 4 subnet bits, it is possible for Ed to create up to 16 subnets. He can then use the remaining 4 host bits to create 14 hosts on each subnet.
 - B.** No, this will not work. A Class C address cannot be subnetted to create 8 subnets.
 - C.** No, this will not work. Although there are sufficient bits available to create 10 subnets, there are not enough bits left over for Ed to create 14 hosts per subnet.
 - D.** Yes, this will work. Ed can create 10 subnets with 14 hosts per subnet. By using 3 subnet bits, he can create 10 subnets, which leaves 5 bits to create up to 30 hosts per subnet.
- 240.** What is the greatest number of subnets you can create with a Class A IPv4 address if you use a 14-bit subnet identifier?
- A.** 256
 - B.** 1,022
 - C.** 1,024
 - D.** 16,382
 - E.** 16,384
- 241.** Alice has been asked to design her company's Internet Protocol (IPv4) addressing scheme. The company has been assigned a Class C network address of 192.168.30.0. Alice's director wants 4 subnets with 28 hosts per subnet. How many bits are required for subnets? How many bits are required for hosts? What will the new subnet mask be for this network?
- A.** 3 subnet bits, 5 host bits, and subnet mask 255.255.255.240
 - B.** 4 subnet bits, 3 host bits, and subnet mask 255.255.255.248
 - C.** 3 subnet bits, 5 host bits, and subnet mask 255.255.255.224
 - D.** 5 subnet bits, 3 host bits, and subnet mask 255.255.255.192
- 242.** The default mask for an IPv4 Class B network is 255.255.0.0. How many subnet bits do you need to create 600 subnets with 55 hosts per subnet, and what is the new subnet mask for the network?
- A.** 10 subnet bits with a subnet mask of 255.255.255.192
 - B.** 9 subnet bits with a subnet mask of 255.255.255.128
 - C.** 10 subnet bits with a subnet mask of 255.255.224.0
 - D.** 11 subnet bits with a subnet mask of 255.255.255.192

- 243.** What is the greatest number of host addresses you can create on a single subnet of a network with the following address: 172.16.0.0/20?
- A.** 142
 - B.** 144
 - C.** 4,094
 - D.** 4,096
- 244.** Ralph has an IPv4 Class B network with a subnet mask of 255.255.248.0. How many subnets can he create, and how many hosts can he create per subnet?
- A.** 64 subnets and 2,046 hosts
 - B.** 32 subnets and 2,046 hosts
 - C.** 30 subnets and 1,022 hosts
 - D.** 62 subnets and 1,022 hosts
- 245.** Convert the binary mask 11111111.11111111.11100000.00000000 into its equivalent decimal value. What is the decimal representation of this mask?
- A.** 255.255.224.0
 - B.** 255.255.240.0
 - C.** 255.255.248.0
 - D.** 255.255.252.0
- 246.** If you have an IPv4 network address of 192.168.1.32/27, what is the valid range of host addresses you can use for your workstations?
- A.** 192.168.1.33 through 192.168.1.63
 - B.** 192.168.1.33 through 192.168.1.62
 - C.** 192.168.1.34 through 192.168.1.62
 - D.** 192.168.1.34 through 192.168.1.63
- 247.** Alice has been assigned the IPv4 network address 172.21.0.0/22 for the creation of a new department network in her company. How many host addresses does she have available to her?
- A.** 510
 - B.** 512
 - C.** 1,022
 - D.** 1,024
- 248.** Automatic Private IP Addressing (APIPA) assigns IPv4 addresses from which of the following classes to Dynamic Host Configuration Protocol (DHCP) clients that cannot contact a DHCP server?
- A.** Class A
 - B.** Class B
 - C.** Class C
 - D.** Class D

- 249.** Which of the following Internet Protocol (IPv4) address classes identifies multicast addresses?
- A.** Class A
 - B.** Class B
 - C.** Class C
 - D.** Class D
 - E.** Class E
- 250.** Which of the following is an address that you can assign to a host on a private IPv4 network?
- A.** 192.167.9.46
 - B.** 172.16.255.255
 - C.** 10.1.0.253
 - D.** 225.87.34.1
- 251.** Which of the following is the correct subnet mask for an IPv4 network with the address 172.16.0.0/20?
- A.** 255.255.224.0
 - B.** 255.255.240.0
 - C.** 255.255.248.0
 - D.** 255.255.255.224
 - E.** 255.255.255.240
- 252.** Ed has been assigned the IPv4 network address 192.168.2.32/28 for the computers in his department. Which of the following ranges of addresses can Ed use to configure the TCP/IP clients on his computers?
- A.** 192.168.2.32 to 192.168.2.55
 - B.** 192.168.2.33 to 192.168.2.46
 - C.** 192.168.2.33 to 192.168.2.40
 - D.** 192.168.2.1 to 192.168.2.254
- 253.** Which of the following IPv4 addresses is available for use on a network device?
- A.** 1.0.0.1
 - B.** 127.98.127.0
 - C.** 234.9.76.32
 - D.** 240.65.8.124

1.8 Summarize evolving use cases for modern network environments.

- 254.** Which of the following are mechanisms by which IPv6 traffic can be transmitted on an IPv4 network through the use of tunneling? (Choose all that apply.)
- A. Teredo
 - B. IPsec
 - C. ICMPv6
 - D. 6to4
 - E. NAT64
- 255.** Which of the following best describes why IPv6 hosts exchange ICMPv6 Router Solicitation and Router Advertisement messages with routers?
- A. To obtain the prefix needed to generate a link-local address
 - B. To learn the IPv6 address of the nearest router
 - C. To perform address conflict detection for its link-local address
 - D. To encapsulate IPv4 packets and transmit them over the router
- 256.** Which of the following is the IPv6 equivalent of Automatic Private IP Addressing (APIPA)?
- A. EUI-64
 - B. SLAAC
 - C. APIPAv6
 - D. DHCPv6
- 257.** Which of the following IPv6 address types is the functional equivalent of an IPv4 APIPA address?
- A. Link local
 - B. Global unicast
 - C. Site local
 - D. Anycast
- 258.** A network interface adapter in a workstation has a hexadecimal MAC address of 001F9EF-C7AD0. Which of the following would be the adapter's IPv6 link local address based on its EUI-64 value?
- A. FE80::001F:9EFF:FEFC:7AD0
 - B. FE80::FFFE:021F:9EFC:7AD0
 - C. FE80::FF00:1F9E:FC7A:D0FE
 - D. FE80::021F:9EFF:FEFC:7AD0

- 259.** Which of the following is a valid IPv6 address?
- A. fe00::b491:cf79:p493:23ff
 - B. 2001:0:49e6:39ff:8cf5:6812:ef56
 - C. fe00::c955:c944:acdd:3fcb
 - D. 2001:0:44ef68:23eb:99fe:72bec6:ea5f
- 260.** Which of the following best defines the concept of the dual stack?
- A. A computer with two network interface adapters
 - B. A computer with two installed operating systems
 - C. A computer with two sets of networking protocols
 - D. A computer with connections to two different network segments
- 261.** In a software-defined network (SDN), as defined in the RFC 7426 specification, a plane is a set of resources related to a particular function. Which of the following is not one of the five planes defined in the SDN architecture?
- A. Forwarding
 - B. Operational
 - C. Control
 - D. Management
 - E. Infrastructure
 - F. Application
- 262.** Which of the following layers in a software-defined network (SDN) architecture consists of hardware devices?
- A. Application
 - B. Control
 - C. Infrastructure
 - D. Core
- 263.** Ralph is evaluating software products for potential deployment on his company's network. Which of the following types of searches can Ralph use to identify security issues that have been discovered in specific products?
- A. CIA
 - B. CVE
 - C. SKU
 - D. SIEM
- 264.** When starting her new position as a network administrator, Alice was given two user accounts. One account is intended for standard user activities, and the other has the additional permissions needed for Alice to perform administrative tasks. This is an example of which of the following security concepts?
- A. Zero day
 - B. Multifactor authentication

- C. Least privilege
 - D. Defense in depth
- 265.** Which of the following is a practice that a zero trust architecture (ZTA) is designed to protect against?
- A. Zero day vulnerabilities
 - B. External threats
 - C. Deauthentication
 - D. Lateral movement
- 266.** Which of the following is not one of the advantages of infrastructure as code (IaC) deployment for cloud-based virtual machines?
- A. IaC provides rapid deployment of playbooks containing virtual machine configurations.
 - B. IaC provides configuration drift protection for virtual machines.
 - C. IaC provides cost savings by automating the virtual machine configuration process.
 - D. IaC provides increased security by encrypting the virtual machine configuration.
 - E. IaC provides elasticity and scalability by simplifying the virtual machine deployment process.
 - F. IaC can automate the deployment of operating system and application upgrades and updates.
- 267.** Which of the following is a benefit that the SD-WAN architecture brings when compared to a standard WAN architecture?
- A. The SD-WAN architecture routes traffic based on IP addresses and access control lists.
 - B. The SD-WAN architecture provides routing and QoS based on the application producing the data.
 - C. The SD-WAN architecture routes traffic through a central datacenter to the cloud.
 - D. The SD-WAN architecture provides end-to-end performance guarantees.
 - E. The SD-WAN architecture is implemented as a virtual overlay that is entirely transport agnostic.
- 268.** Which of the following is not one of the three core services that make up the security service edge (SSE) cloud security framework?
- A. CASB
 - B. ZTNA
 - C. SASE
 - D. SWG
- 269.** Which of the following are the three fundamental principles of a zero trust architecture (ZTA)? (Choose three.)
- A. Use least privileges
 - B. Always authenticate and authorize
 - C. Assume a breach
 - D. Use the three-tier hierarchical model

- 270.** Which of the following protocols are commonly used in zero touch provisioning (ZTP)? (Choose all that apply.)
- A.** DHCP
 - B.** FTP
 - C.** TFTP
 - D.** HTTPS
- 271.** Which of the following are reasons why an overlay network using a virtual extensible LAN (VXLAN) might be preferable to one using VLANs? (Choose all that apply.)
- A.** VXLANs can be used for Data Center Interconnect (DCI).
 - B.** VXLANs use a 24-bit network identifier.
 - C.** VXLANs run as an overlay network.
 - D.** VXLANs encapsulate layer 2 frames within TCP segments.