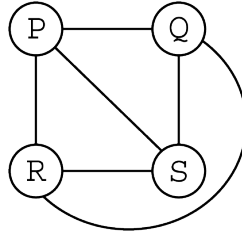## Unit 4 COMPUTING SYSTEMS AND NETWORKS

1. The following figure represents a network of physically linked devices labeled P through S. A line between two devices indicates a connection. Devices can communicate only through the connections shown.

Which of the following statements best explains the ability of the network to provide fault tolerance?

(A)   The network is considered fault-tolerant because there are redundant paths between each pair of devices.

(B)   The network is considered fault-tolerant because it guarantees that no individual component will fail.

(C)   The network is not considered fault-tolerant because it relies on physical connections.

(D)   The network is not considered fault-tolerant because it provides more paths than are needed.

2. Which of the following best explains the ability to solve problems algorithmically?

(A)   Any problem can be solved algorithmically, though some algorithmic solutions may require humans to validate the results.

(B)   Any problem can be solved algorithmically, though some algorithmic solutions must be executed on multiple devices in parallel.

(C)   Any problem can be solved algorithmically, though some algorithmic solutions require a very large amount of data storage to execute.

(D)   There exist some problems that cannot be solved algorithmically using any computer.

3. Which of the following best describes the ability of parallel computing solutions to improve efficiency?

(A)   Any problem that can be solved sequentially can be solved using a parallel solution in approximately half the time.

(B)   Any solution can be broken down into smaller and smaller parallel portions, making the improvement in efficiency theoretically limitless as long as there are enough processors available.

(C)   The efficiency of parallel computing solutions is rarely improved over the efficiency of sequential computing solutions.

(D)   The efficiency of a solution that can be broken down into parallel portions is still limited by a sequential portion.

4. According to the domain name system (DNS), which of the following is a subdomain of the domain *example.com*?

(A)   *about.example.com*

(B)   *example.co.uk*

(C)   *example.com.org*

(D)   *example.org*

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5. A certain computer game is played between a human player and a computer-controlled player. Every time the computer-controlled player has a turn, the game runs slowly because the computer evaluates all potential moves and selects the best one. Which of the following best describes the possibility of improving the running speed of the game?

(A) The game's running speed can only be improved if the game is played between two human players instead of with the computer-controlled player.

(B) The game's running speed might be improved by using a process that finds approximate solutions every time the computer-controlled player has a turn.

(C) The game's running speed cannot be improved because computers can only be programmed to find the best possible solution.

(D) The game's running speed cannot be improved because the game is an example of an algorithm that does not run in a reasonable time.

6. Which of the following best describes a challenge involved in using a parallel computing solution?

(A) A parallel computing solution may not be appropriate for an algorithm in which each step requires the output from the preceding step.

(B) A parallel computing solution may not be appropriate for an algorithm in which the same formula is applied to many numeric data elements.

(C) A parallel computing solution may not be appropriate for an algorithm that can be easily broken down into small independent tasks.

(D) A parallel computing solution may not be appropriate for an algorithm that searches for occurrences of a key word in a large number of documents.

7. For which of the following situations would it be best to use a heuristic in order to find a solution that runs in a reasonable amount of time?

(A) Appending a value to a list of n elements, which requires no list elements be examined.

(B) Finding the fastest route that visits every location among n locations, which requires $n!$ possible routes be examined.

(C) Performing a binary search for a score in a sorted list of n scores, which requires that fewer than n scores be examined.

(D) Performing a linear search for a name in an unsorted database of n people, which requires that up to n entries be examined.

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8. **Directions: The question or incomplete statement below is followed by four suggested answers or completions. Select the one that is best in each case.**

    An online retailer uses an algorithm to sort a list of *n* items by price. The table below shows the approximate number of steps the algorithm takes to sort lists of different sizes.

Number of Items	Number of Steps
10	100
20	400
30	900
40	1,600
50	2,500
60	3,600

    Based on the values in the table, which of the following best characterizes the algorithm for very large values of *n* ?

    (A) The algorithm runs in reasonable time.

    (B) The algorithm runs, but not in reasonable time.

    (C) The algorithm attempts to solve an undecidable problem.

    (D) The algorithm attempts to find an approximate solution whenever it fails to find an exact solution.

9. A programmer wrote the code segment below to display the average of all the elements in a list called numbers. There is always at least one number in the list.

```
Line 1:   count ← 0
Line 2:   sum ← 0
Line 3:   FOR EACH value IN numbers
Line 4:   {
Line 5:       count ← count + 1
Line 6:       sum ← sum + value
Line 7:       average ← sum / count
Line 8:   }
Line 9:   DISPLAY (average)
```

    The programmer wants to reduce the number of operations that are performed when the program is run. Which change will result in a correct program with a reduced number of operations performed?

    (A) Interchanging line 1 and line 2

    (B) Interchanging line 5 and line 6

    (C) Interchanging line 6 and line 7

    (D) Interchanging line 7 and line 8

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10. A computer has two processors that are able to run in parallel. The table below indicates the amount of time it takes either processor to execute four different processes. Assume that none of the processes is dependent on any of the other processes.

Process	Execution Time
W	20 seconds
X	30 seconds
Y	45 seconds
Z	50 seconds

A program is used to assign processes to each of the processors. Which of the following describes how the program should assign the four processes to optimize execution time?

(A) Processes W and X should be assigned to one processor, and processes Y and Z should be assigned to the other processor.

(B) Processes W and Y should be assigned to one processor, and processes X and Z should be assigned to the other processor.

(C) Processes W and Z should be assigned to one processor, and processes X and Y should be assigned to the other processor.

(D) Process Z should be assigned to one processor, and processes W, X, and Y should be assigned to the other processor.

11. **Directions: The question or incomplete statement below is followed by four suggested answers or completions. Select the one that is best in each case.**

A student wants to create an algorithm that can determine, given any program and program input, whether or not the program will go into an infinite loop for that input.

The problem the student is attempting to solve is considered an undecidable problem. Which of the following is true?

(A) It is possible to create an algorithm that will solve the problem for all programs and inputs, but the algorithm can only be implemented in a low-level programming language.

(B) It is possible to create an algorithm that will solve the problem for all programs and inputs, but the algorithm requires simultaneous execution on multiple CPUs.

(C) It is possible to create an algorithm that will solve the problem for all programs and inputs, but the algorithm will not run in reasonable time.

(D) It is not possible to create an algorithm that will solve the problem for all programs and inputs.

12. A user enters a Web address in a browser, and a request for a file is sent to a Web server. Which of the following best describes how the file is sent to the user?

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(A)   The file is broken into packets for transmission. The packets must be reassembled upon receipt.

(B)   The file is broken into packets for transmission. The user's browser must request each packet in order until all packets are received.

(C)   The server attempts to connect directly to the user's computer. If the connection is successful, the entire file is sent. If the connection is unsuccessful, an error message is sent to the user.

(D)   The server repeatedly attempts to connect directly to the user's computer until a connection is made. Once the connection is made, the entire file is sent.

13.   **Directions: The question or incomplete statement below is followed by four suggested answers or completions. Select the one that is best in each case.**

A video-streaming service maintains a database of information about its customers and the videos they have watched.

The program below analyzes the data in the database and compares the number of viewers of science fiction videos to the number of viewers of videos of other genres. It uses the procedure `Analysis (category)`, which returns the number of unique users who viewed videos of a given category in the past year. The `Analysis` procedure takes approximately 1 hour to return a result, regardless of the number of videos of the given genre. All other operations happen nearly instantaneously.

```
sciFiFans ← Analysis ("science fiction")
genreList ← ["comedy", "drama", "mystery", "romance"]
FOR EACH genre IN genreList
{
    IF (Analysis (genre) > sciFiFans)
    {
        DISPLAY (genre)
    }
}
```

Which of the following best approximates the amount of time it takes the program to execute?

(A)   1 hour

(B)   2 hours

(C)   4 hours

(D)   5 hours

14.   Internet protocol version 6 (IPv6) has been introduced to replace the previous version (IPv4). Which of the following best describes a benefit of IPv6 over IPv4?

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(A) IPv6 addresses are shorter than IPv4 addresses, which allows for faster routing of packets.

(B) IPv6 allows for a greater number of addresses than IPv4, which allows more devices to be connected to the Internet.

(C) IPv6 eliminates the use of hierarchy in addressing, making addresses easier to use.

(D) IPv6 allows users to bypass older security protocols so that data can be sent peer-to-peer without the use of routers.

15. Which of the following best describes a direct benefit in using redundant routing on the Internet?

(A) Redundancy enables messages to be transmitted with as few packets as possible.

(B) Redundancy enables network devices to communicate with as few network connections as possible.

(C) Redundancy often allows messages to be sent on the network even if some network devices or connections have failed.

(D) Redundancy prevents network communications from being intercepted by unauthorized individuals.

16. Under which of the following conditions is it most beneficial to use a heuristic approach to solve a problem?

(A) When the problem can be solved in a reasonable time and an approximate solution is acceptable

(B) When the problem can be solved in a reasonable time and an exact solution is needed

(C) When the problem cannot be solved in a reasonable time and an approximate solution is acceptable

(D) When the problem cannot be solved in a reasonable time and an exact solution is needed

17. Which of the following is a characteristic of the fault-tolerant nature of routing on the Internet?

(A) The ability to use a hierarchical naming system to avoid naming conflicts

(B) The ability to provide data transmission even when some connections have failed

(C) The ability to resolve errors in domain name system (DNS) lookups

(D) The ability to use multiple protocols such as hypertext transfer protocol (HTTP), Internet protocol (IP), and simple mail transfer protocol (SMTP) to transfer data

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18. An online game collects data about each player's performance in the game. A program is used to analyze the data to make predictions about how players will perform in a new version of the game.

    The procedure `GetPrediction (idNum)` returns a predicted score for the player with ID number `idNum`. Assume that all predicted scores are positive. The `GetPrediction` procedure takes approximately 1 minute to return a result. All other operations happen nearly instantaneously.

    Two versions of the program are shown below.

    Version I

    ```
    topScore ← 0
    idList ← [1298702, 1356846, 8848491, 8675309]
    FOR EACH id IN idList
    {
         score ← GetPrediction (id)
         IF (score > topScore)
         {
              topScore ← score
         }
    }
    DISPLAY (topScore)
    ```

    Version II

    ```
    idList ← [1298702, 1356846, 8848491, 8675309]
    topID ← idList[1]
    FOR EACH id IN idList
    {
         IF (GetPrediction (id) > GetPrediction (topID))
         {
              topID ← id
         }
    }
    DISPLAY (GetPrediction (topID))
    ```

    Which of the following best compares the execution times of the two versions of the program?
    - (A) Version I requires approximately 1 more minute to execute than version II.
    - (B) Version I requires approximately 5 more minutes to execute than version II.
    - (C) Version II requires approximately 1 more minute to execute than version I.
    - (D) Version II requires approximately 5 more minutes to execute than version I.

19. A team of programmers is designing software. One portion of the project presents a problem for which there is not an obvious solution. After some research, the team determines that the problem is undecidable. Which of the following best explains the consequence of the problem being undecidable?

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(A)   The problem can be solved algorithmically, but it will require an unreasonably long amount of time.

(B)   The problem can be solved algorithmically, but it will require an unreasonably large amount of data storage.

(C)   There is no possible algorithm that can be used to solve all instances of the problem.

(D)   There are several different possible algorithms that can solve the problem, but there is controversy about which is the most efficient.

20.   Which of the following best explains how data is typically assembled in packets for transmission over the Internet?

(A)   Each packet contains data to be transmitted, along with metadata containing information used for routing the data.

(B)   Each packet contains an encrypted version of the data to be transmitted, along with metadata containing the key needed to decrypt the data.

(C)   Each packet contains only the metadata used to establish a direct connection so that the data can be transmitted.

(D)   Each packet contains multiple data files bundled together, along with metadata describing how to categorize each data file.

21.   A student wants to determine whether a certain problem is undecidable. Which of the following will demonstrate that the problem is undecidable?

(A)   Show that for one instance of the problem, an algorithm can be written that is always capable of providing a correct yes-or-no answer.

(B)   Show that for one instance of the problem, no algorithm can be written that is capable of providing a correct yes-or-no answer.

(C)   Show that for one instance of the problem, a heuristic is needed to write an algorithm that is capable of providing a correct yes-or-no answer.

(D)   Show that for one instance of the problem, an algorithm that runs in unreasonable time can be written that is capable of providing a correct yes-or-no answer.

22.   A certain computer has two identical processors that are able to run in parallel. The table below indicates the amount of time it takes each processor to execute each of two processes. Assume that neither process is dependent on the other.

Process	Execution Time on Either Processor
P	30 seconds
Q	45 seconds

Which of the following best approximates the difference in execution time between running the two processes in parallel instead of running them one after the other on a single processor?

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    (A)   15 seconds

    (B)   30 seconds

    (C)   45 seconds

    (D)   75 seconds

23.   A local router is configured to limit the bandwidth of guest users connecting to the Internet. Which of the following best explains the result of this configuration as compared to a configuration in which the router does not limit the bandwidth?

    (A)   The amount of time it takes guest users to send and receive large files is likely to decrease.

    (B)   The number of packets required for guest users to send and receive data is likely to decrease.

    (C)   Guest users will be prevented from having fault-tolerant routing on the Internet.

    (D)   Guest users will be restricted in the maximum amount of data that they can send and receive per second.

24.   A graphic artist uses a program to draw geometric shapes in a given pattern. The program uses an algorithm that draws the shapes based on input from the artist. The table shows the approximate number of steps the algorithm takes to draw different numbers of shapes.

Number of Shapes Drawn	Number of Steps
4	17
5	24
6	35
7	50

Based on the values in the table, which of the following best characterizes the algorithm for drawing n shapes, where n is a very large number?

    (A)   The algorithm runs in a reasonable amount of time because it will use approximately n steps to draw n shapes.

    (B)   The algorithm runs in a reasonable amount of time because it will use approximately n^2 steps to draw n shapes.

    (C)   The algorithm runs in an unreasonable amount of time because it will use approximately n steps to draw n shapes.

    (D)   The algorithm runs in an unreasonable amount of time because it will use approximately n^2 steps to draw n shapes.

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25. A company delivers packages by truck and would like to minimize the length of the route that each driver must travel in order to reach n delivery locations. The company is considering two different algorithms for determining delivery routes.

> Algorithm I Generate all possible routes, compute their lengths, and then select the shortest possible route. This algorithm does not run in reasonable time.

> Algorithm II Starting from an arbitrary delivery location, find the nearest unvisited delivery location. Continue creating the route by selecting the nearest unvisited location until all locations have been visited. This algorithm does not guarantee the shortest possible route and runs in time proportional to n^2.

Which of the following best categorizes algorithm II?

(A) Algorithm II attempts to use an algorithmic approach to solve an otherwise undecidable problem.

(B) Algorithm II uses a heuristic approach to provide an approximate solution in reasonable time.

(C) Algorithm II provides no improvement over algorithm I because neither algorithm runs in reasonable time.

(D) Algorithm II requires a much faster computer in order to provide any improvement over algorithm I.

26. Which of the following best explains why it is not possible to use computers to solve every problem?

(A) Current computer processing capabilities cannot improve significantly.

(B) Large-scale problems require a crowdsourcing model, which is limited by the number of people available to work on the problem.

(C) The ability of a computer to solve a problem is limited by the bandwidth of the computer's Internet connection.

(D) There exist some problems that cannot be solved using any algorithm.

27. Which of the following best explains how algorithms that run on a computer can be used to solve problems?

(A) All problems can be solved with an algorithm that runs in a reasonable amount of time.

(B) All problems can be solved with an algorithm, but some algorithms might need a heuristic to run in a reasonable amount of time.

(C) All problems can be solved with an algorithm, but some algorithms might run in an unreasonable amount of time.

(D) Some problems cannot be solved by an algorithm.

28. Which of the following best explains how data is transmitted on the Internet?

(A) Data is broken into packets, which are all sent to the recipient in a specified order along the same path.

(B) Data is broken into packets, which can be sent along different paths.

(C) All data is transmitted in a single packet through a direct connection between the sender and the recipient.

(D) Multiple data files are bundled together in a packet and transmitted together.

29. Which of the following best explains how fault tolerance in a network is achieved?

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(A) By providing high-bandwidth connections between devices, enabling data packets to be transmitted as quickly as possible

(B) By providing multiple paths between devices, enabling routing to occur even in the presence of a failed component

(C) By providing open network protocols, ensuring that all devices on the network are interacting in a standard way

(D) By providing software to monitor all network traffic, ensuring that data packets are sent and received in the proper order

30. Which of the following best explains how messages are typically transmitted over the Internet?

(A) The message is broken into packets that are transmitted in a specified order. Each packet must be received in the order it was sent for the message to be correctly reassembled by the recipient's device.

(B) The message is broken into packets. The packets can be received in any order and still be reassembled by the recipient's device.

(C) The message is broken into two packets. One packet contains the data to be transmitted and the other packet contains metadata for routing the data to the recipient's device.

(D) The message is transmitted as a single file and received in whole by the recipient's device.

31. Which of the following statements correctly explain how the Internet is able to facilitate communication at a large scale?

    I. A central monitoring computer is used to track and maintain the connections of the Internet.
    II. Data is routed between points in multiple ways so that if a connection fails, the data can be rerouted around the inoperative connections.
    III. Protocols for packets and routing are used so that computers from different manufacturers can communicate in a standard way.

(A) I and II only

(B) I and III only

(C) II and III only

(D) I, II, and III

32. Which of the following best explains how the Internet is a fault-tolerant system?

(A) The Internet is fault-tolerant because cybercriminals can conceal their actions, allowing them the ability to carry out faulty actions without leaving a trace.

(B) The Internet is fault-tolerant because there are usually multiple paths between devices, allowing messages to sometimes be sent even when parts of the network fail.

(C) The Internet is fault-tolerant because users can transmit messages using a variety of different protocols, allowing them to use devices from any manufacturer.

(D) The Internet is fault-tolerant because users usually understand and accept the fact that servers sometimes fail, allowing network engineers to repair faulty devices as quickly as possible.

33. Which of the following best explains what happens when a new device is connected to the Internet?

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(A)   A device driver is assigned to the device.

(B)   An Internet Protocol (IP) address is assigned to the device.

(C)   A packet number is assigned to the device.

(D)   A Web site is assigned to the device.

34.   **Directions: The question or incomplete statement below is followed by four suggested answers or completions. Select the one that is best in each case.**

Which of the following is a true statement about Internet communication?

(A)   Devices from different manufacturers are required to run the same operating system to communicate over the Internet.

(B)   Every device connected to the Internet is assigned a digital certificate by a certificate authority.

(C)   Every device connected to the Internet is assigned an Internet protocol (IP) address.

(D)   Every device connected to the Internet requires a high-bandwidth connection to enable redundant routing to each device.

35.   **Directions: The question or incomplete statement below is followed by four suggested answers or completions. Select the one that is best in each case.**

Which of the following best describes the role of the Internet Engineering Task Force (IETF) ?

(A)   Developing standards and protocols for Internet communication

(B)   Preventing copyrighted materials from being illegally distributed online

(C)   Preventing malicious software from being distributed online

(D)   Verifying the ownership of encrypted keys used in secured messages

36.   **Directions: The question or incomplete statement below is followed by four suggested answers or completions. Select the one that is best in each case.**

Which of the following explains a benefit of using open standards and protocols for Internet communication?

(A)   Open standards and protocols allow different manufacturers and developers to build hardware and software that can communicate with hardware and software on the rest of the network.

(B)   Open standards and protocols provide ways for users to eliminate the latency of messages they send on the Internet.

(C)   Open standards and protocols allow users to freely share or reuse material found on the Internet for noncommercial purposes.

(D)   Open standards and protocols prevent developers from releasing software that contains errors.

37.   Which of the following best explains how IP addresses are assigned?

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(A) As a new device is connected to the Internet, it is assigned an IP address to enable communication on the network.

(B) IP addresses are assigned only to servers that host Web sites; user devices do not require an IP address.

(C) New devices are connected to the Internet without an IP address, but are eventually assigned an IP address once they can be verified by a certificate authority.

(D) New devices are connected to the Internet without an IP address; IP addresses are assigned only for encrypted communications.

38. A certain computer has two identical processors that are able to run in parallel. Each processor can run only one process at a time, and each process must be executed on a single processor. The following table indicates the amount of time it takes to execute each of three processes on a single processor. Assume that none of the processes are dependent on any of the other processes.

Process	Execution Time on Either Processor
X	60 seconds
Y	30 seconds
Z	50 seconds

Which of the following best approximates the minimum possible time to execute all three processes when the two processors are run in parallel?

(A) 60 seconds

(B) 70 seconds

(C) 80 seconds

(D) 90 seconds

39. A certain computer has two identical processors that are able to run in parallel. The following table indicates the amount of time it takes to execute each of four processes on a single processor. Assume that none of the processes is dependent on any of the other processes.

Process	Execution Time on Either Processor
P	30 seconds
Q	10 seconds
R	20 seconds
S	15 seconds

Which of the following parallel computing solutions would minimize the amount of time it takes to execute all four processes?

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(A) Running processes P and Q on one processor and processes R and S on the other processor

(B) Running processes P and R on one processor and processes Q and S on the other processor

(C) Running processes P and S on one processor and processes Q and R on the other processor

(D) Running process P on one processor and processes Q, R, and S on the other processor

The figure below represents a network of physically linked computers labeled A through G. A line between two computers indicates that the computers can communicate directly with each other. Any information sent between two computers that are not directly connected must go through at least one other computer. For example, information can be sent directly between computers A and B, but information sent between computers A and C must go through other computers.
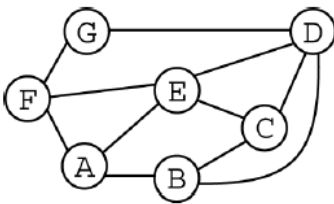
40. What is the minimum number of connections that must be broken or removed in the network before computer E can no longer communicate with computer F?

(A) 1

(B) 2

(C) 3

(D) 4

41. Which of the following statements about security in the network is true?

  I. Computers A and D need to communicate with at least two additional computers in the network in order to communicate with each other.

  II. Computers B and C can communicate with each other without additional computers being aware of the communication.

(A) I only
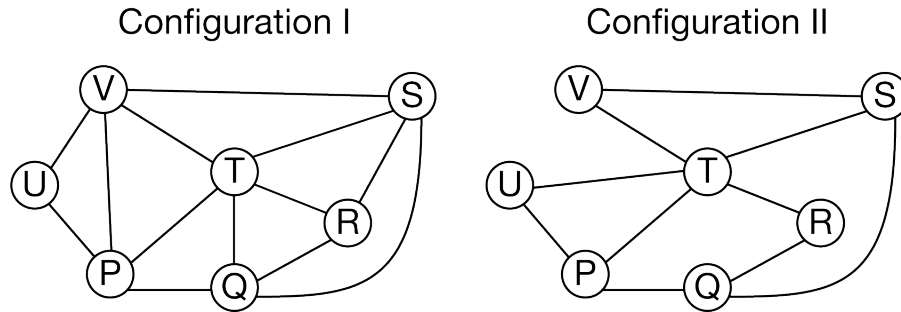
(B) II only

(C) I and II

(D) Neither I nor II

42. Which of the following is a primary benefit of making a computing system fault-tolerant?

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    (A)   If one component of the system fails, users of the system can often still access it.

    (B)   If one component of the system is hacked, no information will be stolen.

    (C)   If the system becomes too expensive, making it fault-tolerant will save money.

    (D)   If the system cannot operate efficiently, making it fault-tolerant will speed up its operation.

43. Which of the following programs is most likely to benefit from the use of a heuristic?

    (A)   A program that calculates a student's grade based on the student's quiz and homework scores

    (B)   A program that encrypts a folder of digital files

    (C)   A program that finds the shortest driving route between two locations on a map

    (D)   A program that sorts a list of numbers in order from least to greatest

44. The transmission control protocol (TCP) and Internet protocol (IP) are used in Internet communication. Which of the following best describes the purpose of these protocols?

    (A)   To ensure that communications between devices on the Internet are above a minimum transmission speed

    (B)   To ensure that private data is inaccessible to unauthorized devices on the Internet

    (C)   To establish a common standard for sending messages between devices on the Internet

    (D)   To validate the ownership of encryption keys used in Internet communication

45. Which of the following is a primary reason for the use of open protocols on the Internet?

    (A)   Open protocols allow devices to specify how data packets are to be routed on the Internet in advance.

    (B)   Open protocols ensure that all data transmission on the Internet is kept secure.

    (C)   Open protocols ensure that all Internet users are provided connections with equal bandwidth.

    (D)   Open protocols provide a way to standardize data transmission between different devices.

46. Consider the following algorithms. Each algorithm operates on a list containing n elements, where n is a very large integer.

     I. An algorithm that accesses each element in the list twice
    II. An algorithm that accesses each element in the list n times
   III. An algorithm that accesses only the first 10 elements in the list, regardless of the size of the list

Which of the algorithms run in reasonable time?

    (A)   I only

    (B)   III only

    (C)   I and II only

    (D)   I, II, and III

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The figure below shows two possible network configurations for devices P through V. A line between two devices indicates a connection. Devices can communicate only through the connections shown.


Configuration I   Configuration II

47. In which of the configurations is it possible to have redundant routing between devices Q and V?

   (A) Configuration I only

   (B) Configuration II only

   (C) Both configuration I and configuration II

   (D) Neither configuration I nor configuration II

48. In configuration I, what is the minimum number of connections that must be broken or removed before device T can no longer communicate with device U?

   (A) One

   (B) Two

   (C) Three

   (D) Four

49. **Directions: The question or incomplete statement below is followed by four suggested answers or completions. Select the one that is best in each case.**

   The following figures represent different ways of configuring a network of physically linked computers labeled P, Q, R, and S. A line between two computers indicates that the computers can communicate directly with each other. In which configuration is it NOT possible to have redundant routing between computers P and S?

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(A)

(B)

(C)

(D)
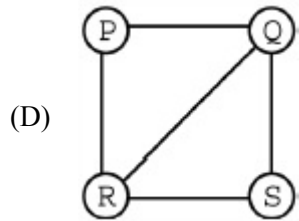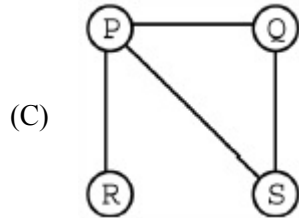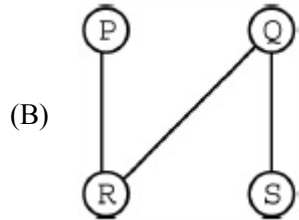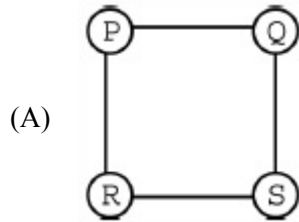
50. Which of the following best describes the relationship between the World Wide Web and the Internet?

(A) The World Wide Web is a protocol that is accessed using a data stream called the Internet.

(B) The World Wide Web is a system of linked pages, programs, and files that is accessed using a data stream called the Internet.

(C) The World Wide Web is a system of linked pages, programs, and files that is accessed via a network called the Internet.

(D) The World Wide Web is a Web site that is accessed using a protocol called the Internet.

51. Which of the following best explains the relationship between the Internet and the World Wide Web?

(A) Both the Internet and the World Wide Web refer to the same interconnected network of devices.

(B) The Internet is an interconnected network of data servers, and the World Wide Web is a network of user devices that communicates with the data servers.

(C) The Internet is a local network of interconnected devices, and the World Wide Web is a global network that connects the local networks with each other.

(D) The Internet is a network of interconnected networks, and the World Wide Web is a system of linked pages, programs, and files that is accessed via the Internet.

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The figure below represents a network of physically linked devices labeled A through I. A line between two devices indicates that the devices can communicate directly with each other.

Any information sent between two devices that are not directly connected must go through at least one other device. For example, in the network represented below, information can be sent directly between A and B, but information sent between devices A and G must go through other devices.
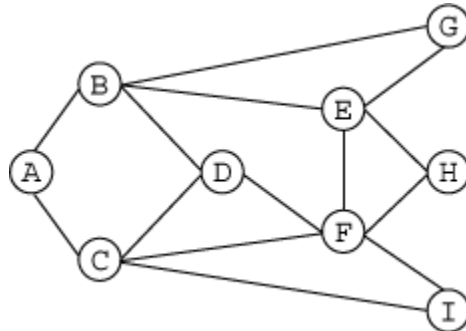
52. What is the minimum number of connections that must be broken or removed before device B can no longer communicate with device C?

   (A) Three

   (B) Four

   (C) Five

   (D) Six

53. Which of the following statements is true about the network?

   (A) Information sent from device A to device D can use at most two unique paths.

   (B) Information sent from device A to device I will pass through at most four other devices.

   (C) If devices B and F fail, then device A will not be able to communicate with device G.

   (D) If devices C and F fail, then device D will not be able to communicate with device H.
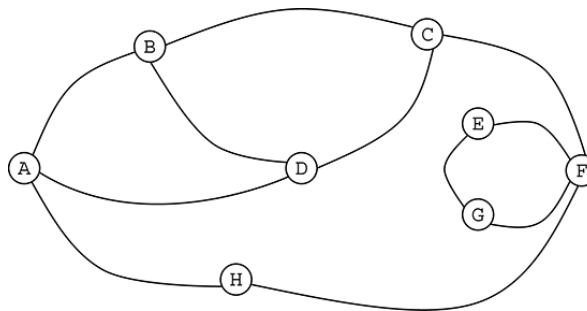
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54. The figure below represents a network of physically linked devices, labeled A through F. A line between two devices indicates a connection. Devices can communicate only through the connections shown.
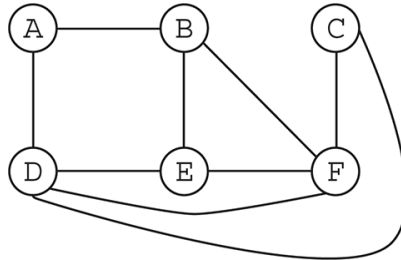
Which of the following statements are true about the ability for devices A and C to communicate?

Select two answers.

A If devices B and D were to fail, then information sent from device A could not reach device C.

B If devices B and F were to fail, then information sent from device A could not reach device C.

C If devices D and F were to fail, then information sent from device A could not reach device C.

D If devices E and F were to fail, then information sent from device A could not reach device C.

55. The figure below represents a network of physically linked devices, labeled A through H. A line between two devices indicates a connection. Devices can communicate only through the connections shown.

What is the minimum number of connections that would need to be removed from the network in order for device A to not be able to communicate with device F?

(A) 2

(B) 3

(C) 4

(D) 5

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56. **Directions: For the question or incomplete statement below, two of the suggested answers are correct. For this question, you must select both correct choices to earn credit. No partial credit will be earned if only one correct choice is selected. Select the two that are best in each case.**

Researchers have developed a simulation of packets traveling between server computers and client computers in a network. Of the following, which two outcomes are most likely to be results of the simulation?

Select <u>two</u> answers.

- A   Better understanding of the effect of temporarily unavailable network connections

- B   Better understanding of the effect of using hexadecimal representations for binary data

- C   Better understanding of the impact of access to public data in identifying solutions to problems

- D   Better understanding of the impact of increased connection speeds for frequently visited servers

57. Which of the following statements about the Internet is true?

- (A)   The Internet is a computer network that uses proprietary communication protocols.
- (B)   The Internet is designed to scale to support an increasing number of users.
- (C)   The Internet requires all communications to use encryption protocols.
- (D)   The Internet uses a centralized system to determine how packets are routed.

58. Two computers are built by different manufacturers. One is running a Web server and the other is running a Web browser. Which of the following best describes the ability of the two computers to communicate with each other across the Internet?

- (A)   The computers cannot communicate because different manufacturers use different communication protocols.
- (B)   The computers can communicate, but additional hardware is needed to convert data packets from one computer's protocol to the other computer's protocol.
- (C)   The computers can communicate directly only if the messages consist of text; other formats cannot be interpreted across computers.
- (D)   The computers can communicate directly because Internet communication uses standard protocols.

59. Which of the following statements is true?

- (A)   Every problem can be solved with an algorithm for all possible inputs, in a reasonable amount of time, using a modern computer.
- (B)   Every problem can be solved with an algorithm for all possible inputs, but some will take more than 100 years, even with the fastest possible computer.
- (C)   Every problem can be solved with an algorithm for all possible inputs, but some of these algorithms have not been discovered yet.
- (D)   There exist problems that no algorithm will ever be able to solve for all possible inputs.

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60. A computer scientist is analyzing four different algorithms used to sort a list. The table below shows the number of steps each algorithm took to sort lists of different sizes.

List Size	Number of Steps for Algorithm A	Number of Steps for Algorithm B	Number of Steps for Algorithm C	Number of Steps for Algorithm D
1	10	2	1	1
2	20	4	2	4
3	30	8	6	9
4	40	16	24	16
5	50	32	120	25

Based on the values in the table, which of the algorithms appear to run in reasonable time?

Select <u>two</u> answers.

A   Algorithm A

B   Algorithm B

C   Algorithm C

D   Algorithm D