

AP Principles 1.2 to 2.1 MCQ

1. **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 computer program performs the operation $2 \div 3$ and represents the result as the value 0.6666667 . Which of the following best explains this result?

- (A) An overflow error occurred.
 - (B) The precision of the result is limited due to the constraints of using a floating-point representation.
 - (C) The program attempted to execute the operation with the arguments in reverse order.
 - (D) The program attempted to represent a floating-point number as an integer.
2. A computer program uses 3 bits to represent integers. When the program adds the decimal (base 10) numbers 5 and 3, the result is 0. Which of the following is the best explanation for the result?
- (A) An overflow error occurred.
 - (B) A round-off error occurred.
 - (C) The result was affected by lossy data compression.
 - (D) The result was approximated by a floating-point representation.

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

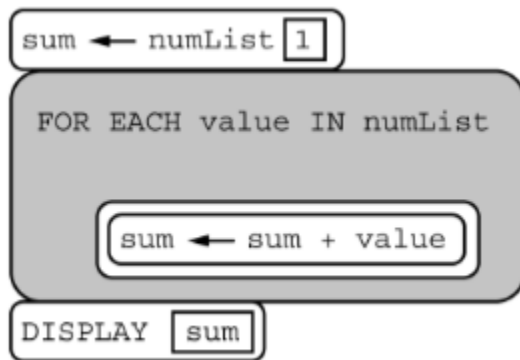
A computer program uses 4 bits to represent nonnegative integers. Which of the following statements describe a possible result when the program uses this number representation?

- I. The operation $4 + 8$ will result in an overflow error.
- II. The operation $7 + 10$ will result in an overflow error.
- III. The operation $12 + 3$ will result in an overflow error.

- (A) I only
 - (B) II only
 - (C) II and III only
 - (D) I, II, and III
4. A certain programming language uses 4-bit binary sequences to represent nonnegative integers. For example, the binary sequence 0101 represents the corresponding decimal value 5. Using this programming language, a programmer attempts to add the decimal values 14 and 15 and assign the sum to the variable `total`. Which of the following best describes the result of this operation?
- (A) The correct sum of 29 will be assigned to the variable `total`.
 - (B) An overflow error will occur because 4 bits is not large enough to represent either of the values 14 or 15.
 - (C) An overflow error will occur because 4 bits is not large enough to represent 29, the sum of 14 and 15.
 - (D) A round-off error will occur because the decimal values 14 and 15 are represented as approximations due to the fixed number of bits used to represent numbers.

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5. An online store uses 6-bit binary sequences to identify each unique item for sale. The store plans to increase the number of items it sells and is considering using 7-bit binary sequences. Which of the following best describes the result of using 7-bit sequences instead of 6-bit sequences?
- (A) 2 more items can be uniquely identified.
 - (B) 10 more items can be uniquely identified.
 - (C) 2 times as many items can be uniquely identified.
 - (D) 10 times as many items can be uniquely identified.
6. A programmer wrote the program below. The program uses a list of numbers called *numList*. The program is intended to display the sum of the numbers in the list.



In order to test the program, the programmer initializes *numList* to $[0, 1, 4, 5]$. The program displays *10*, and the programmer concludes that the program works as intended.

Which of the following is true?

- (A) The conclusion is correct; the program works as intended.
- (B) The conclusion is incorrect; the program does not display the correct value for the test case $[0, 1, 4, 5]$.
- (C) The conclusion is incorrect; using the test case $[0, 1, 4, 5]$ is not sufficient to conclude the program is correct.
- (D) The conclusion is incorrect; using the test case $[0, 1, 4, 5]$ only confirms that the program works for lists in increasing order.

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7. ASCII is a character-encoding scheme that uses a numeric value to represent each character. For example, the uppercase letter “G” is represented by the decimal (base 10) value 71. A partial list of characters and their corresponding ASCII values are shown in the table below.

Decimal	ASCII Character	Decimal	ASCII Character
65	A	78	N
66	B	79	O
67	C	80	P
68	D	81	Q
69	E	82	R
70	F	83	S
71	G	84	T
72	H	85	U
73	I	86	V
74	J	87	W
75	K	88	X
76	L	89	Y
77	M	90	Z

ASCII characters can also be represented by hexadecimal numbers. According to ASCII character encoding, which of the following letters is represented by the hexadecimal (base 16) number 56?

- (A) A
 - (B) L
 - (C) V
 - (D) Y
8. A student is recording a song on her computer. When the recording is finished, she saves a copy on her computer. The student notices that the saved copy is of lower sound quality than the original recording. Which of the following could be a possible explanation for the difference in sound quality?
- (A) The song was saved using fewer bits per second than the original song.
 - (B) The song was saved using more bits per second than the original song.
 - (C) The song was saved using a lossless compression technique.
 - (D) Some information is lost every time a file is saved from one location on a computer to another location.

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9. **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 wrote the following code for a guessing game.

```
Line 1: secretNumber ← RANDOM (1, 100)
Line 2: win ← false
Line 3: REPEAT UNTIL (win)
Line 4: {
Line 5:     DISPLAY ("Guess a number.")
Line 6:     guess ← INPUT ()
Line 7:     IF (guess = secretNumber)
Line 8:     {
Line 9:         DISPLAY ("You got it right!")
Line 10:    }
Line 11:    ELSE
Line 12:    {
Line 13:        IF (guess > secretNumber)
Line 14:        {
Line 15:            DISPLAY ("Your guess is too high.")
Line 16:        }
Line 17:        ELSE
Line 18:        {
Line 19:            DISPLAY ("Your guess is too low.")
Line 20:        }
Line 21:    }
Line 22: }
```

While debugging the code, the student realizes that the loop never terminates. The student plans to insert the instruction `win ← true` somewhere in the code. Where could `win ← true` be inserted so that the code segment works as intended?

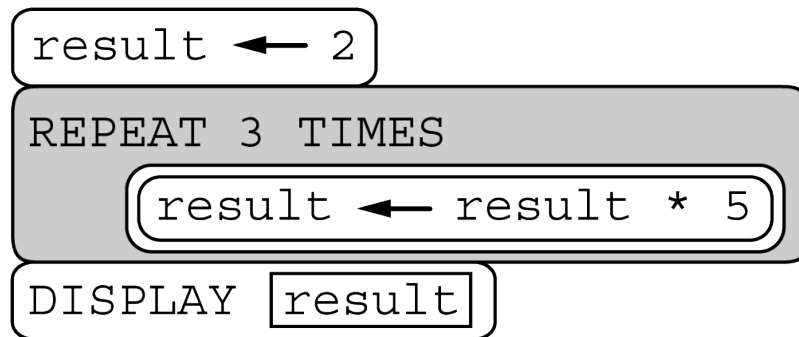
- (A) Between line 6 and line 7
 - (B) Between line 9 and line 10
 - (C) Between line 20 and 21
 - (D) Between line 21 and 22
10. **Directions:** The question or incomplete statement below is followed by four suggested answers or completions. Select the one that is best in each case.

A text-editing application uses binary sequences to represent each of 200 different characters. What is the minimum number of bits needed to assign a unique bit sequence to each of the possible characters?

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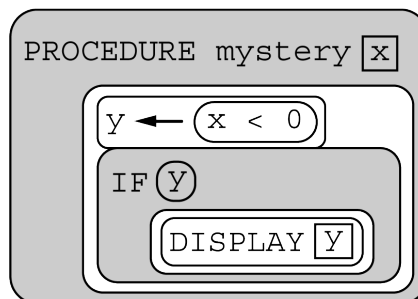
- (A) 4
- (B) 6
- (C) 7
- (D) 8

11. Consider the following code segment.



Which of the following best describes the behavior of the code segment?

- (A) The code segment displays the value of $2(5 \times 3)$ by initializing `result` to 2 and then multiplying `result` by 3 a total of five times.
 - (B) The code segment displays the value of $2(5 \times 3)$ by initializing `result` to 2 and then multiplying `result` by 5 a total of three times.
 - (C) The code segment displays the value of $2(5^3)$ by initializing `result` to 2 and then multiplying `result` by 3 a total of five times.
 - (D) The code segment displays the value of $2(5^3)$ by initializing `result` to 2 and then multiplying `result` by 5 a total of three times.
12. In the following procedure, assume that the parameter `x` is an integer.



Which of the following best describes the behavior of the procedure?

- (A) It displays nothing if `x` is negative and displays `true` otherwise.
- (B) It displays nothing if `x` is negative and displays `false` otherwise.
- (C) It displays `true` if `x` is negative and displays nothing otherwise.
- (D) It displays `true` if `x` is negative and displays `false` otherwise.

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- 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.**

Which of the following best describes one of the benefits of using an iterative and incremental process of program development?

- (A) It allows programmers to implement algorithmic solutions to otherwise unsolvable problems.
 - (B) It eliminates the need for programmers to test completed programs.
 - (C) It enables programmers to create programs that use the lowest-level abstractions available.
 - (D) It helps programmers identify errors as components are added to a working program.
- 14.** Which of the following actions are generally helpful in program development?
- I. Consulting potential users of the program to identify their concerns
 - II. Writing and testing small code segments before adding them to the program
 - III. Collaborating with other individuals when developing a large program
- (A) I and II only
 - (B) I and III only
 - (C) II and III only
 - (D) I, II, and III

A color in a computing application is represented by an RGB triplet that describes the amount of red, green, and blue, respectively, used to create the desired color. A selection of colors and their corresponding RGB triplets are shown in the following table. Each value is represented in decimal (base 10).

Color Name	RGB Triplet
indigo	(75, 0, 130)
ivory	(255, 255, 240)
light pink	(255, 182, 193)
light yellow	(255, 255, 224)
magenta	(255, 0, 255)
neutral gray	(127, 127, 112)
pale yellow	(255, 255, 160)
vivid yellow	(255, 255, 14)

- 15.** What is the binary RGB triplet for the color indigo?

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- (A) (00100101, 00000000, 10000010)
(B) (00100101, 00000000, 01000001)
(C) (01001011, 00000000, 10000010)
(D) (01001011, 00000000, 01000001)
16. According to information in the table, what color is represented by the binary RGB triplet (11111111, 11111111, 11110000) ?
- (A) Ivory
(B) Light yellow
(C) Neutral gray
(D) Vivid yellow
-
17. A video game character can face toward one of four directions: north, south, east, and west. Each direction is stored in memory as a sequence of four bits. A new version of the game is created in which the character can face toward one of eight directions, adding northwest, northeast, southwest, and southeast to the original four possibilities. Which of the following statements is true about how the eight directions must be stored in memory?
- (A) Four bits are not enough to store the eight directions. Five bits are needed for the new version of the game.
(B) Four bits are not enough to store the eight directions. Eight bits are needed for the new version of the game.
(C) Four bits are not enough to store the eight directions. Sixteen bits are needed for the new version of the game.
(D) Four bits are enough to store the eight directions.
18. In a certain computer program, two positive integers are added together, resulting in an overflow error. Which of the following best explains why the error occurs?
- (A) The program attempted to perform an operation that is considered an undecidable problem.
(B) The precision of the result is limited due to the constraints of using a floating-point representation.
(C) The program can only use a fixed number of bits to represent integers; the computed sum is greater than the maximum representable value.
(D) The program cannot represent integers; the integers are converted into decimal approximations, leading to rounding errors.
19. A video-streaming Web site keeps count of the number of times each video has been played since it was first added to the site. The count is updated each time a video is played and is displayed next to each video to show its popularity.
- At one time, the count for the most popular video was about two million. Sometime later, the same video displayed a seven-digit negative number as its count, while the counts for the other videos displayed correctly. Which of the following is the most likely explanation for the error?

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- (A) The count for the video became larger than the maximum value allowed by the data type used to store the count.
- (B) The mathematical operations used to calculate the count caused a rounding error to occur.
- (C) The software used to update the count failed when too many videos were played simultaneously by too many users.
- (D) The software used to update the count contained a sampling error when using digital data to approximate the analog count.

20. Central High School keeps a database of information about each student, including the numeric variables *numberOfAbsences* and *gradePointAverage*. The expression below is used to determine whether a student is eligible to receive an academic award.

$$(\text{numberOfAbsences} \leq 5) \text{ AND } (\text{gradePointAverage} > 3.5)$$

Which of the following pairs of values indicates that a student is eligible to receive an academic award?

- (A) *numberOfAbsences* = 3, *gradePointAverage* = 3.5
- (B) *numberOfAbsences* = 5, *gradePointAverage* = 3.8
- (C) *numberOfAbsences* = 6, *gradePointAverage* = 3.4
- (D) *numberOfAbsences* = 6, *gradePointAverage* = 3.6

The player controls in a particular video game are represented by numbers. The controls and their corresponding binary values are shown in the following table.

Control	Binary Value
←	01000
↑	01001
→	01011
↓	01111
Jump	11000
Run	11001
Pause	11011
Reset	11111

The numeric values for the controls can also be represented in decimal (base 10).

21. What control is represented by the decimal value 15 ?

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- (A) ←
- (B) ↑
- (C) →
- (D) ↓

22. What is the decimal value for the jump control?

- (A) 3
- (B) 12
- (C) 24
- (D) 48

23. Assume that the list `originalList` contains integer values and that the list `newList` is initially empty. The following code segment is intended to copy all even numbers from `originalList` to `newList` so that the numbers in `newList` appear in the same relative order as in `originalList`. The code segment may or may not work as intended.

```
Line 1: FOR EACH number IN originalList
Line 2: {
Line 3:     IF (number MOD 2 = 0)
Line 4:     {
Line 5:         INSERT (newList, 1, number)
Line 6:     }
Line 7: }
```

Which of the following changes, if any, can be made so that the code segment works as intended?

- (A) Changing line 1 to `FOR EACH number IN newList`
- (B) Changing line 3 to `IF (number MOD 2 = 1)`
- (C) Changing line 5 to `APPEND (newList, number)`
- (D) No change is needed; the code segment is correct as is.

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RunRoutr is a fitness tracking application for smartphones that creates suggested running routes so that users can run with each other. Upon downloading the application, each user creates a username, a personal profile, and a contact list of friends who also use the application. The application uses the smartphone's GPS unit to track a user's location, running speed, and distance traveled. Users can use the application to review information and statistics about their previous runs.

At the beginning of a run, users indicate the distance they want to run from their current location, and the application suggests a running route. Once a user accepts a suggested route, the application shares the suggested route with other compatible users in the area so that they can run together. Users are considered compatible if they are on each other's contact lists or if they typically run at similar speeds.

A basic RunRoutr account is free, but it displays advertisements that are targeted to individual users based on data collected by the application. For example, if a user's running route begins or ends near a particular store, the application may display an advertisement for that store. Users have the ability to pay a monthly fee for a premium account, which removes advertisements from the application.

24. Adrianna uses RunRoutr to suggest a running route. All compatible users near Adrianna receive a notification that shows her running route. Which of the following data is not obtained using data collected from Adrianna's smartphone but necessary for RunRoutr to share Adrianna's running route?
- (A) Adrianna's average running speed
 - (B) Adrianna's preferred running distance
 - (C) The current locations of other RunRoutr users
 - (D) The usernames on Adrianna's contact list
25. Which of the following data must be collected from a user's smartphone in order for RunRoutr to suggest a running route?
- (A) Available running routes near the user's home
 - (B) The current time
 - (C) The starting location of the user's previous run
 - (D) The user's geographic position
-

26. Which of the following can be represented by a sequence of bits?

- I. An integer
- II. An alphanumeric character
- III. A machine language instruction

- (A) I only
 - (B) III only
 - (C) I and II only
 - (D) I, II, and III
27. Consider the 4-bit binary numbers 0011, 0110, and 1111. Which of the following decimal values is NOT equal to one of these binary numbers?
-

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- (A) 3
 - (B) 6
 - (C) 9
 - (D) 15
28. Which of the following best explains how an analog audio signal is typically represented by a computer?
- (A) An analog audio signal is measured as input parameters to a program or procedure. The inputs are represented at the lowest level as a collection of variables.
 - (B) An analog audio signal is measured at regular intervals. Each measurement is stored as a sample, which is represented at the lowest level as a sequence of bits.
 - (C) An analog audio signal is measured as a sequence of operations that describe how the sound can be reproduced. The operations are represented at the lowest level as programming instructions.
 - (D) An analog audio signal is measured as text that describes the attributes of the sound. The text is represented at the lowest level as a string.
29. The position of a runner in a race is a type of analog data. The runner's position is tracked using sensors. Which of the following best describes how the position of the runner is represented digitally?
- (A) The position of the runner is determined by calculating the time difference between the start and the end of the race and making an estimation based on the runner's average speed.
 - (B) The position of the runner is measured and rounded to either 0 or 1 depending on whether the runner is closer to the starting line or closer to the finish line.
 - (C) The position of the runner is predicted using a model based on performance data captured from previous races.
 - (D) The position of the runner is sampled at regular intervals to approximate the real-world position, and a sequence of bits is used to represent each sample.

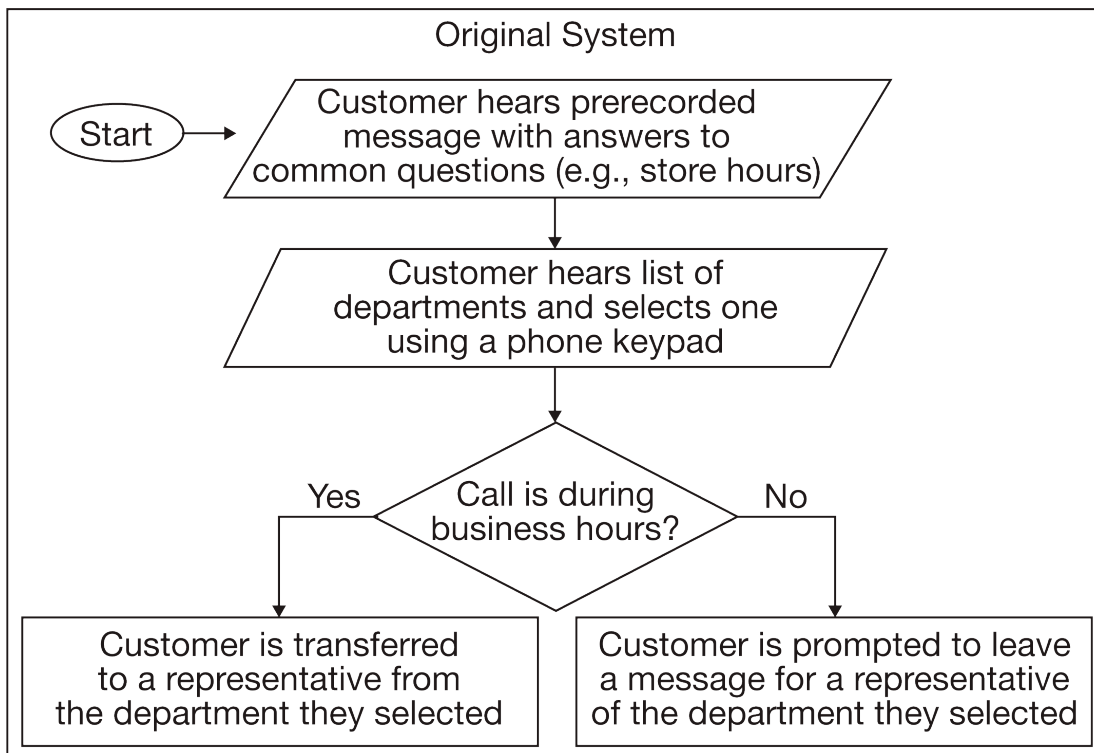
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A chain of retail stores uses software to manage telephone calls from customers. The system was recently upgraded. Customers interacted with the original system using their phone keypad. Customers interact with the upgraded system using their voice.

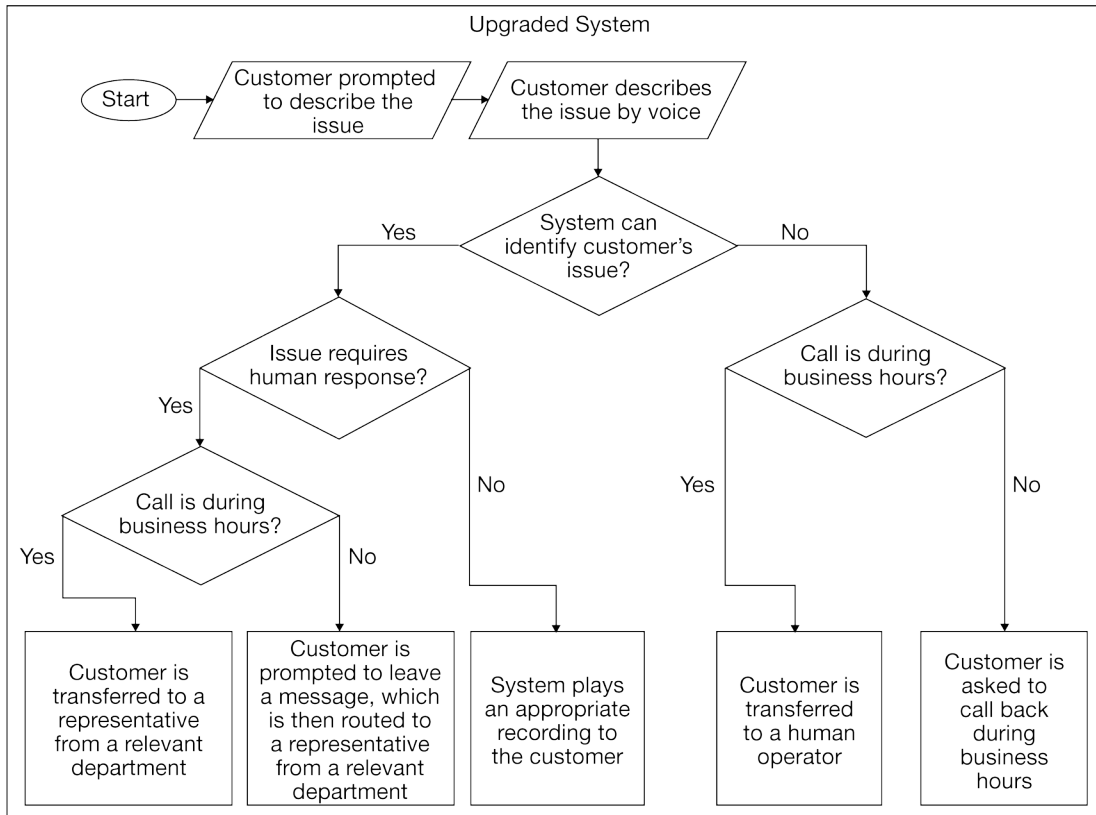
The upgraded system (but not the original system) stores all information from the calling session in a database for future reference. This includes the customer’s telephone number and any information provided by the customer (name, address, order number, credit card number, etc.).

The original system and the upgraded system are described in the following flowcharts. Each flowchart uses the following blocks.

Block	Explanation
Oval	The start of the algorithm
Parallelogram	An input or output step
Diamond	A conditional or decision step, where execution proceeds to the side labeled “Yes” if the answer to the question is yes and to the side labeled “No” if the answer to the question is no
Rectangle	The result of the algorithm



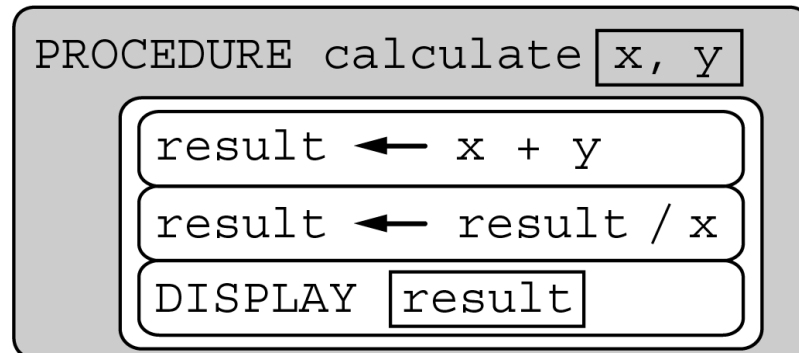
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30. The upgraded system uses a directory containing additional information not supplied by the customer. The directory is used to help direct calls effectively. Which of the following is LEAST likely to be included in the directory?
- (A) A list of common issues and whether each issue requires a human representative
 - (B) A list of common keywords or phrases and a corresponding issue for each keyword or phrase
 - (C) A list of computers the company owns and the computers' corresponding IP addresses
 - (D) A list of human representatives and the corresponding department for each representative

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31. In the following procedure, the parameters x and y are integers.



Which of the following is the most appropriate documentation to appear with the `calculate` procedure?

- (A) Displays the value of $x + (y / x)$.
The value of the parameter x must not be 0.
- (B) Displays the value of $x + (y / x)$.
The value of the parameter y must not be 0.
- (C) Displays the value of $(x + y) / x$.
The value of the parameter x must not be 0.
- (D) Displays the value of $(x + y) / x$.
The sum of the parameters x and y must not be 0.
32. In the following procedure, the parameter `max` is a positive integer.

```

PROCEDURE printNums(max)
{
  count ← 1
  REPEAT UNTIL(count > max)
  {
    DISPLAY(count)
    count ← count + 2
  }
}
  
```

Which of the following is the most appropriate documentation to appear with the `printNums` procedure?

- (A) Prints all positive even integers that are less than or equal to `max`.
- (B) Prints all positive odd integers that are less than or equal to `max`.
- (C) Prints all positive even integers that are greater than `max`.
- (D) Prints all positive odd integers that are greater than `max`.

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33. In the following procedure, the parameter `numList` is a list of numbers and the parameters `j` and `k` are integers.

```
PROCEDURE swapListElements(numList, j, k)
{
    newList ← numList
    newList[j] ← numList[k]
    newList[k] ← numList[j]
    RETURN (newList)
}
```

Which of the following is the most appropriate documentation to appear with the `swapListElements` procedure?

- (A) Returns a copy of `numList` with the elements at indices `j` and `k` interchanged.
The value of `j` must be between 0 and the value of `k`, inclusive.
- (B) Returns a copy of `numList` with the elements at indices `j` and `k` interchanged.
The values of `j` and `k` must both be between 1 and `LENGTH(numList)`, inclusive.
- (C) Interchanges the values of the parameters `j` and `k`.
The value of `j` must be between 0 and the value of `k`, inclusive.
- (D) Interchanges the values of the parameters `j` and `k`.
The values of `j` and `k` must both be between 1 and `LENGTH(numList)`, inclusive.
34. A binary number is to be transformed by appending three 0s to the end of the number. For example, 11101 is transformed to 11101000. Which of the following correctly describes the relationship between the transformed number and the original number?
- (A) The transformed number is 3 times the value of the original number.
- (B) The transformed number is 4 times the value of the original number.
- (C) The transformed number is 8 times the value of the original number.
- (D) The transformed number is 1,000 times the value of the original number.
35. The following procedure is intended to return `true` if at least two of the three parameters are equal in value and is intended to return `false` otherwise.

```
PROCEDURE AnyPairs (x, y, z)
{
    IF (x = y)
    {
        RETURN (true)
    }
    ELSE
    {
        RETURN (y = z)
    }
}
```

For which of the following procedure calls does the procedure NOT return the intended value?

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- (A) AnyPairs ("bat", "cat", "rat")
- (B) AnyPairs ("bat", "bat", "rat")
- (C) AnyPairs ("bat", "cat", "bat")
- (D) AnyPairs ("bat", "cat", "cat")

36. Assume that the list of numbers `nums` has more than 10 elements. The program below is intended to compute and display the sum of the first 10 elements of `nums`.

```

Line 1: i ← 1
Line 2: sum ← 0
Line 3: REPEAT UNTIL (i > 10)
Line 4: {
Line 5:     i ← i + 1
Line 6:     sum ← sum + nums[i]
Line 7: }
Line 8: DISPLAY (sum)

```

Which change, if any, is needed for the program to work as intended?

- (A) Lines 1 and 2 should be interchanged.
 - (B) Line 3 should be changed to REPEAT UNTIL ($i \geq 10$).
 - (C) Lines 5 and 6 should be interchanged.
 - (D) No change is needed; the program works correctly.
37. The following procedure is intended to return the number of times the value `val` appears in the list `myList`. The procedure does not work as intended.

```

Line 01: PROCEDURE countNumOccurrences(myList, val)
Line 02: {
Line 03:     FOR EACH item IN myList
Line 04:     {
Line 05:         count ← 0
Line 06:         IF(item = val)
Line 07:         {
Line 08:             count ← count + 1
Line 09:         }
Line 10:     }
Line 11:     RETURN(count)
Line 12: }

```

Which of the following changes can be made so that the procedure will work as intended?

- (A) Changing line 6 to IF(item = count)
- (B) Changing line 6 to IF(myList[item] = val)
- (C) Moving the statement in line 5 so that it appears between lines 2 and 3
- (D) Moving the statement in line 11 so that it appears between lines 9 and 10

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38. A list of numbers is considered increasing if each value after the first is greater than or equal to the preceding value. The following procedure is intended to return `true` if `numberList` is increasing and return `false` otherwise. Assume that `numberList` contains at least two elements.

```
Line 1:  PROCEDURE isIncreasing(numberList)
Line 2:  {
Line 3:      count ← 2
Line 4:      REPEAT UNTIL(count > LENGTH(numberList))
Line 5:      {
Line 6:          IF(numberList[count] < numberList[count - 1])
Line 7:          {
Line 8:              RETURN(true)
Line 9:          }
Line 10:         count ← count + 1
Line 11:     }
Line 12:     RETURN(false)
Line 13: }
```

Which of the following changes is needed for the program to work as intended?

- (A) In line 3, 2 should be changed to 1.
 - (B) In line 6, < should be changed to ≥.
 - (C) Lines 8 and 12 should be interchanged.
 - (D) Lines 10 and 11 should be interchanged.
39. In the following code segment, `score` and `penalty` are initially positive integers. The code segment is intended to reduce the value of `score` by `penalty`. However, if doing so would cause `score` to be negative, `score` should be assigned the value 0.

For example, if `score` is 20 and `penalty` is 5, the code segment should set `score` to 15. If `score` is 20 and `penalty` is 30, `score` should be set to 0.

The code segment does not work as intended.

```
Line 1: IF(score - penalty < 0)
Line 2: {
Line 3:     score ← score - penalty
Line 4: }
Line 5: ELSE
Line 6: {
Line 7:     score ← 0
Line 8: }
```

Which of the following changes can be made so that the code segment works as intended?

- (A) Changing line 1 to `IF(score < 0)`
- (B) Changing line 1 to `IF(score + penalty < 0)`
- (C) Changing line 7 to `score ← score + penalty`
- (D) Interchanging lines 3 and 7

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40. In a science experiment, result X is expected to occur 25% of the time and result Y is expected to occur the remaining 75% of the time. The following code segment is intended to simulate the experiment if there are 100 trials.

```
Line 1: xCount ← 0
Line 2: yCount ← 0
Line 3: REPEAT 100 TIMES
Line 4: {
Line 5:     IF (RANDOM(1, 4) = 1)
Line 6:     {
Line 7:         xCount ← xCount + 1
Line 8:     }
Line 9:     IF (RANDOM(1, 4) > 1)
Line 10:    {
Line 11:        yCount ← yCount + 1
Line 12:    }
Line 13: }
Line 14: DISPLAY("Result X occurred")
Line 15: DISPLAY(xCount)
Line 16: DISPLAY("times and result Y occurred")
Line 17: DISPLAY(yCount)
Line 18: DISPLAY("times.")
```

A programmer runs the code segment, and the following message is displayed.

```
Result X occurred 24 times and result Y occurred 70 times.
```

The result shows that 94 trials were counted, rather than the intended 100 trials. Which of the following changes to the code segment will ensure a correct simulation of the experiment?

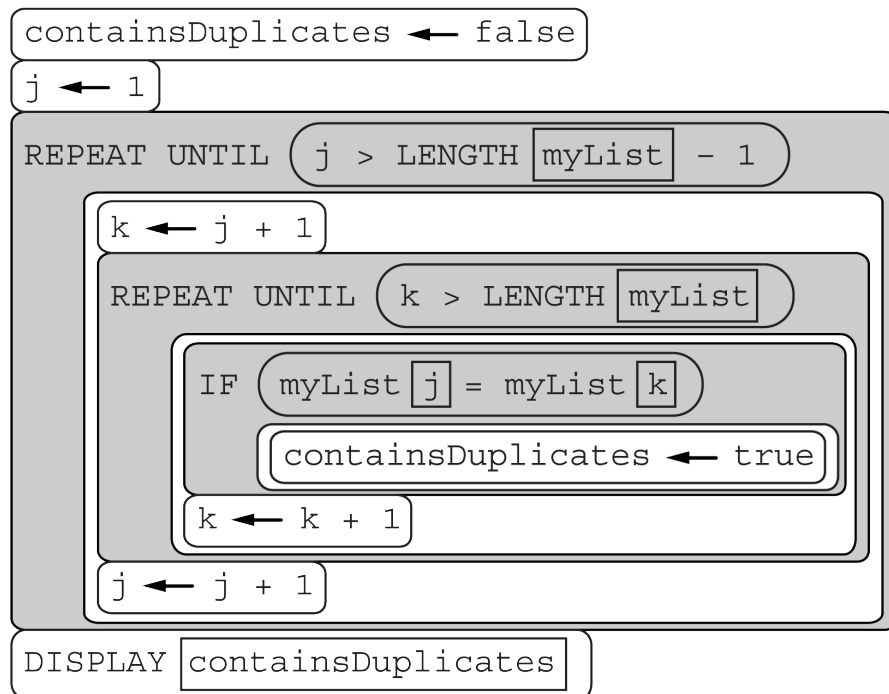
- (A) Replacing line 9 with `IF (RANDOM(1, 4) ≥ 2)`
 - (B) Replacing line 9 with `ELSE`
 - (C) Interchanging lines 5 and 9
 - (D) Interchanging lines 7 and 11
41. A student wrote the following program to remove all occurrences of the strings "the" and "a" from the list `wordList`.

```
Line 1: index ← LENGTH (wordList)
Line 2: REPEAT UNTIL (index < 1)
Line 3: {
Line 4:     IF ((wordList[index] = "the") OR (wordList[index] = "a"))
Line 5:     {
Line 6:         REMOVE (wordList, index)
Line 7:     }
Line 8: }
```

While debugging the program, the student realizes that the loop never terminates. Which of the following changes can be made so that the program works as intended?

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- (A) Inserting `index ← index + 1` between lines 6 and 7
- (B) Inserting `index ← index + 1` between lines 7 and 8
- (C) Inserting `index ← index - 1` between lines 6 and 7
- (D) Inserting `index ← index - 1` between lines 7 and 8
42. A student wrote the following code segment, which displays `true` if the list `myList` contains any duplicate values and displays `false` otherwise.

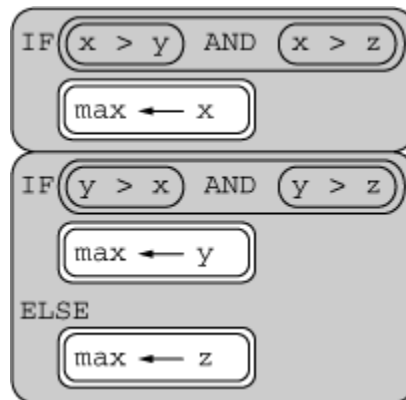


- The code segment compares pairs of list elements, setting `containsDuplicates` to `true` if any two elements are found to be equal in value. Which of the following best describes the behavior of how pairs of elements are compared?
- (A) The code segment iterates through `myList`, comparing each element to all other elements in the list.
- (B) The code segment iterates through `myList`, comparing each element to all subsequent elements in the list.
- (C) The code segment iterates through `myList`, comparing each element to the element that immediately follows it in the list.
- (D) The code segment iterates through `myList`, comparing each element to the element that immediately precedes it in the list.
43. **Directions: The question or incomplete statement below is followed by four suggested answers or completions. Select the one that is best in each case.**

Internet protocol version 4 (IPv4) represents each IP address as a 32-bit binary number. Internet protocol version 6 (IPv6) represents each IP address as a 128-bit binary number. Which of the following best describes the result of using 128-bit addresses instead of 32-bit addresses?

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- (A) 4 times as many addresses are available.
- (B) 96 times as many addresses are available.
- (C) 2^4 times as many addresses are available.
- (D) 2^{96} times as many addresses are available.
44. The following code segment is intended to set `max` equal to the maximum value among the integer variables `x`, `y`, and `z`. The code segment does not work as intended in all cases.



- Which of the following initial values for `x`, `y`, and `z` can be used to show that the code segment does not work as intended?
- (A) `x = 1, y = 2, z = 3`
- (B) `x = 1, y = 3, z = 2`
- (C) `x = 2, y = 3, z = 1`
- (D) `x = 3, y = 2, z = 1`
45. A student is creating an application that allows customers to order food for delivery from a local restaurant. Which of the following is LEAST likely to be an input provided by a customer using the application?
- (A) The address where the order should be delivered
- (B) The cost of a food item currently available for order
- (C) The credit card or payment information for the purchaser
- (D) The name of a food item to be included in the delivery
46. Each student that enrolls at a school is assigned a unique ID number, which is stored as a binary number. The ID numbers increase sequentially by 1 with each newly enrolled student. If the ID number assigned to the last student who enrolled was the binary number 1001 0011, what binary number will be assigned to the next student who enrolls?
- (A) 1001 0100
- (B) 1001 0111
- (C) 1101 0100
- (D) 1101 0111

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47. A store uses binary numbers to assign a unique binary sequence to each item in its inventory. What is the minimum number of bits required for each binary sequence if the store has between 75 and 100 items in its inventory?
- (A) 5
 - (B) 6
 - (C) 7
 - (D) 8

48. Consider the following numeric values.

- Binary 1011
- Binary 1101
- Decimal 5
- Decimal 12

Which of the following lists the values in order from least to greatest?

- (A) Decimal 5, binary 1011, decimal 12, binary 1101
 - (B) Decimal 5, decimal 12, binary 1011, binary 1101
 - (C) Decimal 5, binary 1011, binary 1101, decimal 12
 - (D) Binary 1011, binary 1101, decimal 5, decimal 12
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.**

Some programming languages use constants, which are variables that are initialized at the beginning of a program and never changed. Which of the following are good uses for a constant?

- I. To represent the mathematical value π (pi) as 3.14
- II. To represent the current score in a game
- III. To represent a known value such as the number of days in a week

- (A) I and II only
 - (B) I and III only
 - (C) II and III only
 - (D) I, II, and III
50. A program developed for a Web store represents customer account balances using a format that approximates real numbers. While testing the program, a software developer discovers that some values appear to be mathematically imprecise. Which of the following is the most likely cause of the imprecision?
- (A) The account balances are represented using a fixed number of bits, resulting in overflow errors.
 - (B) The account balances are represented using a fixed number of bits, resulting in round-off errors.
 - (C) The account balances are represented using an unlimited number of bits, resulting in overflow errors.
 - (D) The account balances are represented using an unlimited number of bits, resulting in round-off errors.

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51. The following procedure is intended to return `true` if the list of numbers `myList` contains only positive numbers and is intended to return `false` otherwise. The procedure does not work as intended.

```
PROCEDURE allPositive(myList)
{
    index ← 1
    len ← LENGTH(myList)
    REPEAT len TIMES
    {
        IF(myList[index] > 0)
        {
            RETURN(true)
        }
        index ← index + 1
    }
    RETURN(false)
}
```

For which of the following contents of `myList` does the procedure NOT return the intended result?

- (A) [-3, -2, -1]
 - (B) [-2, -1, 0]
 - (C) [-1, 0, 1]
 - (D) [1, 2, 3]
52. The procedure below is intended to display the index in a list of unique names (*nameList*) where a particular name (*targetName*) is found. If *targetName* is not found in *nameList*, the code should display 0.

```
PROCEDURE FindName (nameList, targetName)
{
    index ← 0
    FOR EACH name IN nameList
    {
        index ← index + 1
        IF (name = targetName)
        {
            foundIndex ← index
        }
        ELSE
        {
            foundIndex ← 0
        }
    }
    DISPLAY (foundIndex)
}
```

Which of the following procedure calls can be used to demonstrate that the procedure does NOT work as intended?

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- (A) *FindName* (["Andrea", "Ben"], "Ben")
- (B) *FindName* (["Andrea", "Ben"], "Diane")
- (C) *FindName* (["Andrea", "Ben", "Chris"], "Ben")
- (D) *FindName* (["Andrea", "Chris", "Diane"], "Ben")

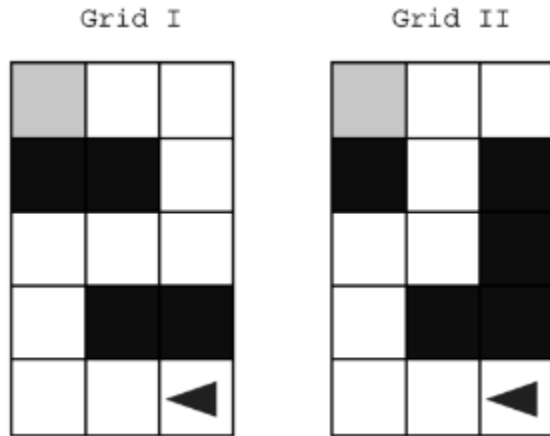
53. Directions: The question or incomplete statement below is followed by four suggested answers or completions. Select the one that is best in each case.

Which of the following is a true statement about program documentation?

- (A) Program documentation should not be changed after it is first written.
- (B) Program documentation is only needed for programs in development; it is not needed after a program is completed.
- (C) Program documentation is useful when programmers collaborate but not when a programmer works individually on a project.
- (D) Program documentation is useful during initial program development and also when modifications are made to existing programs.

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54. Two grids are shown below. Each grid contains a robot represented as a triangle. Both robots are initially facing left. Each robot can move into a white or gray square, but cannot move into a black region.



For each grid, the program below is intended to move the robot to the gray square. The program uses the procedure *Goal_Reached ()*, which evaluates to *true* if the robot is in the gray square and evaluates to *false* otherwise.

```
REPEAT UNTIL (Goal_Reached ())
{
  IF (CAN_MOVE (right))
  {
    ROTATE_RIGHT ()
  }
  ELSE
  {
    IF (CAN_MOVE (left))
    {
      ROTATE_LEFT ()
    }
  }
  IF (CAN_MOVE (forward))
  {
    MOVE_FORWARD ()
  }
}
```

For which of the grids does the program correctly move the robot to the gray square?

- (A) Grid I only
- (B) Grid II only
- (C) Both grid I and grid II
- (D) Neither grid I nor grid II

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55. An office uses an application to assign work to its staff members. The application uses a binary sequence to represent each of 100 staff members. What is the minimum number of bits needed to assign a unique bit sequence to each staff member?
- (A) 5
 - (B) 6
 - (C) 7
 - (D) 8