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1. 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 countNumOccurences(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

2. A company that develops mobile applications wants to involve users in the software development process. Which of the following best explains the benefit in having users participate?

(A) Users can identify and correct errors they encounter when using released versions of the software.

(B) Users can review the algorithms used in the software to help improve their efficiency.

(C) Users can provide documentation for program code at the end of the software development process.

(D) Users can provide feedback that can be used to incorporate a variety of perspectives into the software.

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3. 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.

The procedure `Smallest` is intended to return the least value in the list `numbers`. The procedure does not work as intended.

```
PROCEDURE Smallest (numbers)
{
   min ← numbers[1]
   FOR EACH number IN numbers
   {
      IF (number < min)
      {
         RETURN (number)
      }
   }
   RETURN (min)
}
```

For which of the following values of `theList` will `Smallest (theList)` NOT return the intended value?

Select two answers.

A `theList ← [10, 20, 30, 40]`

B `theList ← [20, 10, 30, 40]`

C `theList ← [30, 40, 20, 10]`

D `theList ← [40, 30, 20, 10]`

4. Three students in different locations are collaborating on the development of an application. Which of the following strategies is LEAST likely to facilitate collaboration among the students?

(A) Having all three students participate in frequent video chat sessions to discuss ideas about the project and to provide feedback on work done so far

(B) Having all three students use an online shared folder to contribute and discuss components to be considered for use in the application

(C) Having all three students write code independently and then having one student combine the code into a program

(D) Having all three students work in a shared document that each can edit to provide comments on the work in progress

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5. 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.

A program is created to perform arithmetic operations on positive and negative integers. The program contains the following incorrect procedure, which is intended to return the product of the integers `x` and `y`.

```
PROCEDURE Multiply (x, y)
{
   count ← 0
   result ← 0
   REPEAT UNTIL (count = y)
   {
      result ← result + x
      count ← count + 1
   }
   RETURN (result)
}
```

A programmer suspects that an error in the program is caused by this procedure. Under which of the following conditions will the procedure NOT return the correct product?

Select two answers.

A. When the values of `x` and `y` are both positive.

B. When the values of `x` is positive and the value of `y` is negative.

C. When the values of `x` is negative and the value of `y` is positive.

D. When the values of `x` and `y` are both negative.

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6. 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

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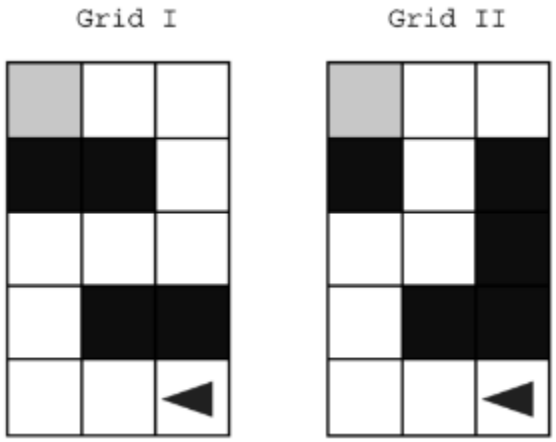
7. Two grids are shown below. Each grid contains a robot represented as a triangle. Both robots are initially facing left. Each robot can move into a white or gray square, but cannot move into a black region.



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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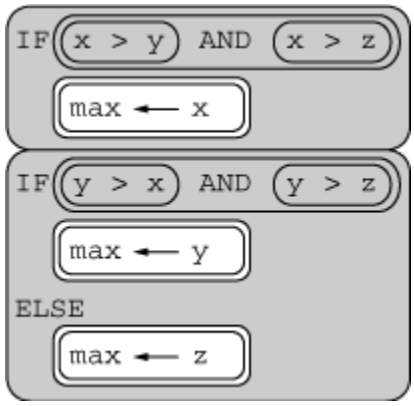
8. The following code segment is intended to set `max` equal to the maximum value among the integer variables `x`, `y`, and `z`. The code segment does not work as intended in all cases.



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`

9. Which of the following is NOT a benefit of collaborating to develop a computing innovation?

(A) Collaboration can decrease the size and complexity of tasks required of individual team members.

(B) Collaboration can make it easier to find and correct errors during the development process.

(C) Collaboration eliminates the need to resolve differences of opinion.

(D) Collaboration facilitates multiple perspectives in developing ideas.

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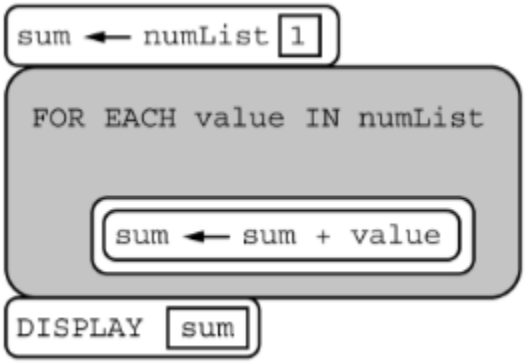
10. A programmer wrote the program below. The program uses a list of numbers called *numList*. The program is intended to display the sum of the numbers in the list.



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?

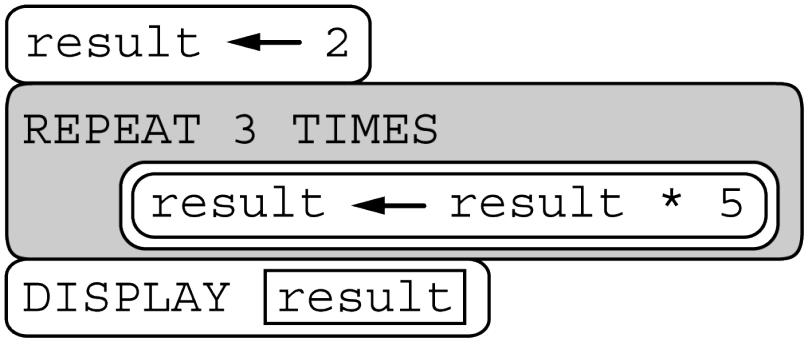
(A) The conclusion is correct; the program works as intended.

(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.

11. Consider the following code segment.



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

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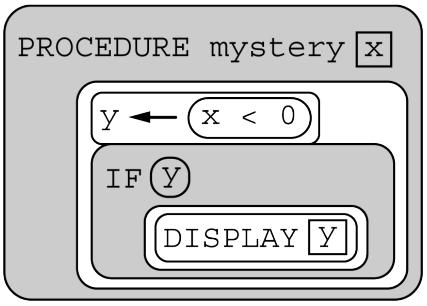
(A) The code segment displays the value of $2(5 \times 3)$ by initializing `result` to `2` and then multiplying `result` by `3` a total of five times.

(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.

13. A company that develops educational software wants to assemble a collaborative team of developers from a variety of professional and cultural backgrounds. Which of the following is NOT considered a benefit of assembling such a team?

(A) Collaboration that includes diverse backgrounds and perspectives can eliminate the need for software testing.

(B) Collaboration that includes diverse backgrounds and perspectives can help the team anticipate the needs of a variety of software users.

(C) Collaboration that includes diverse backgrounds and perspectives can help the team avoid bias.

(D) Collaboration that includes diverse backgrounds and perspectives can reflect the strengths of the individual team members.

14. 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?

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(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.

15. 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

16. 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.

17. 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.

(*numberOfAbsences* $\leq$ 5) AND (*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

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18. 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.

DineOutHelper is a mobile application that people can use to select a restaurant for a group meal. Each user creates a profile with a unique username and a list of food allergies or dietary restrictions. Each user can then build a contact list of other users of the app.

A user who is organizing a meal with a group selects all the members of the group from the user's contact list. The application then recommends one or more nearby restaurants based on whether the restaurant can accommodate all of the group members' allergies and dietary restrictions.

Suppose that Alejandra is using DineOutHelper to organize a meal with Brandon and Cynthia.

19. Which of the following data are needed for DineOutHelper to recommend a restaurant for the group?

I. Each group member's list of food allergies or dietary restrictions
II. Alejandra's geographic location
III. The usernames of the people on Brandon and Cynthia's contact lists

(A) I and II only

(B) I and III only

(C) II and III only

(D) I, II, and III

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20. Which of the following data is not provided by Alejandra but is necessary for DineOutHelper to recommend a restaurant for the group?

I. Brandon's contact list
II. Information about which restaurants Brandon and Cynthia have visited in the past
III. Information about which food allergies and dietary restrictions can be accommodated at different restaurants near Alejandra

(A) II only
(B) III only
(C) II and III only
(D) I, II, and III

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.

21. 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

22. 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

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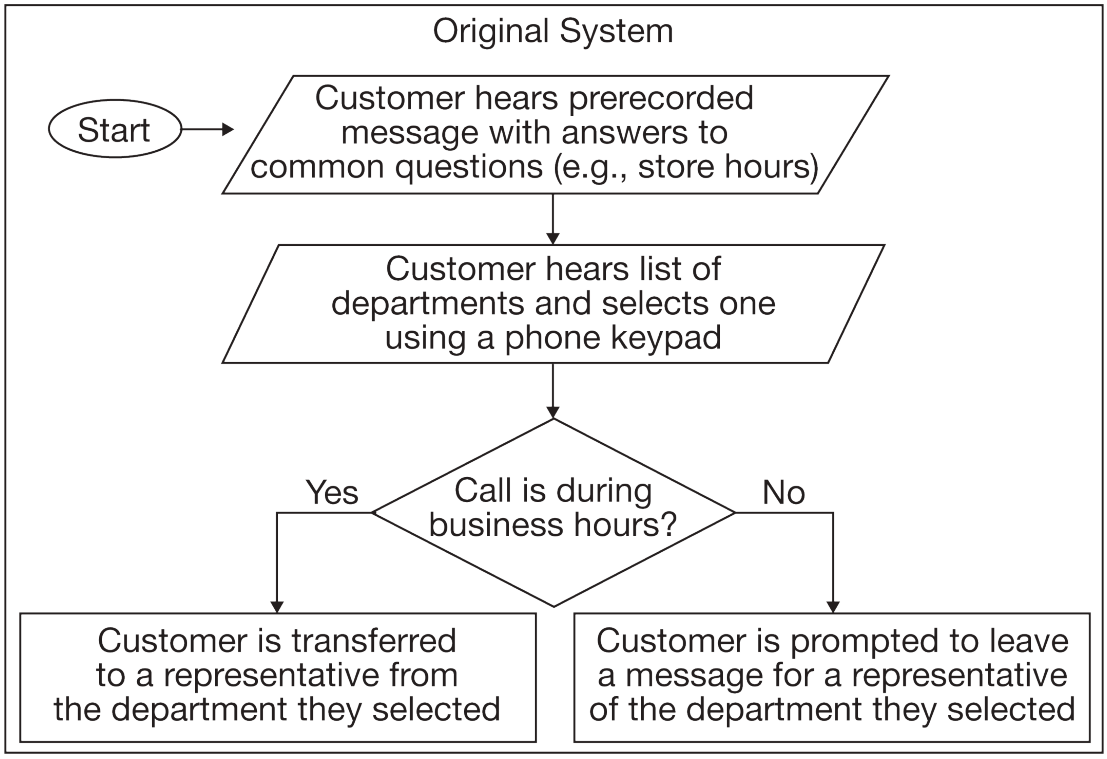
A chain of retail stores uses software to manage telephone calls from customers. The system was recently upgraded. Customers interacted with the original system using their phone keypad. Customers interact with the upgraded system using their voice.

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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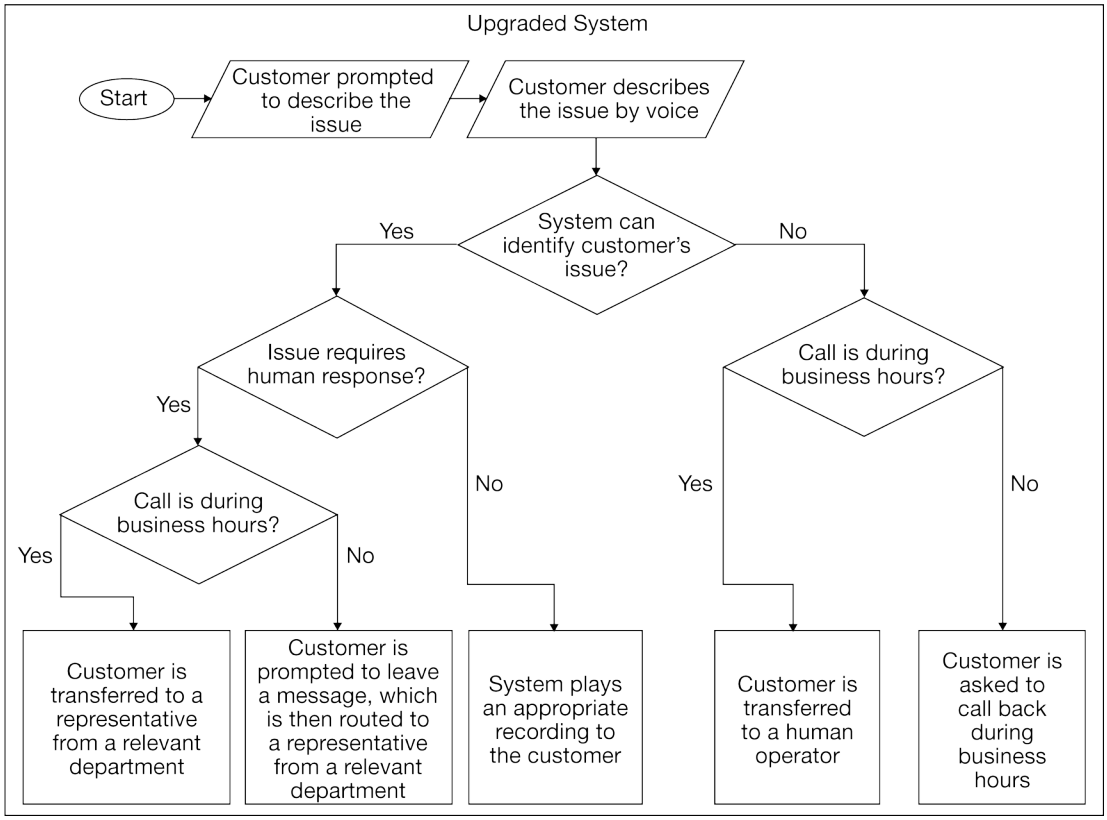

23. The upgraded system uses a directory containing additional information not supplied by the customer. The directory is used to help direct calls effectively. Which of the following is LEAST likely to be included in the directory?

(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

24. To direct a call to the appropriate destination, which of the following input data is needed by the upgraded system that was NOT needed by the original system?

I. Audio signal of the customer's voice
II. The customer's keypad selection
III. The customer's phone number

(A) I only

(B) II only

(C) I and III only

(D) I, II, and III

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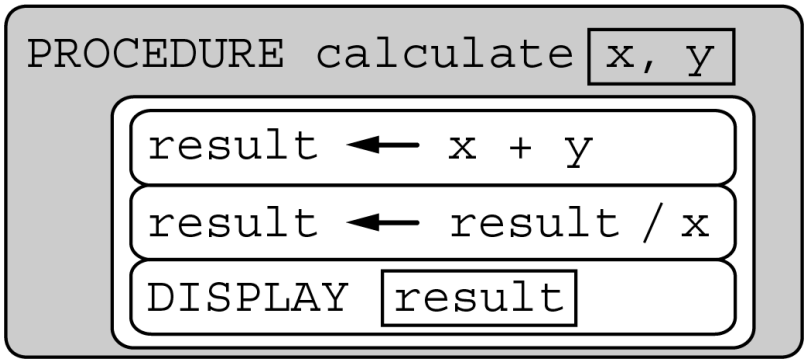
25. In the following procedure, the parameters `x` and `y` are integers.



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`.

26. 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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27. 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.

28. 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.

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29. In the following procedure, the parameter `age` represents a person's age. The procedure is intended to return the name of the age group associated with `age`. People who are under 18 are considered minors, people who are 65 and older are considered senior citizens, and all other people are considered adults. The procedure does not work as intended.

```
Line 1:  PROCEDURE ageGroup(age)
Line 2:  {
Line 3:     result ← "adult"
Line 4:     IF(age ≥ 65)
Line 5:     {
Line 6:        result ← "senior citizen"
Line 7:     }
Line 8:     RETURN(result)
Line 9:
Line 10:    result ← "adult"
Line 11:    IF(age < 18)
Line 12:    {
Line 13:       result ← "minor"
Line 14:    }
Line 15:    RETURN(result)
Line 16: }
```

Removing which two lines of code will cause the procedure to work as intended?

Select two answers.

A Line 3

B Line 8

C Line 10

D Line 15

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30. 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?

(A) `AnyPairs ("bat", "cat", "rat")`

(B) `AnyPairs ("bat", "bat", "rat")`

(C) `AnyPairs ("bat", "cat", "bat")`

(D) `AnyPairs ("bat", "cat", "cat")`

31. 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 ≥ 10)`.

(C) Lines 5 and 6 should be interchanged.

(D) No change is needed; the program works correctly.

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32. In mathematics, a perfect number is a type of integer. The procedure `IsPerfect (num)` returns `true` if `num` is a perfect number and returns `false` otherwise.

The following program is intended to count and display the number of perfect numbers between the integers `start` and `end`, inclusive. Assume that `start` is less than `end`. The program does not work as intended.

```
Line 1:  currentNum ← start
Line 2:  count ← 0
Line 3:  REPEAT UNTIL (currentNum > end)
Line 4:  {
Line 5:     count ← count + 1
Line 6:     IF (IsPerfect (currentNum))
Line 7:     {
Line 8:        count ← count + 1
Line 9:        currentNum ← currentNum + 1
Line 10:    }
Line 11:    currentNum ← currentNum + 1
Line 12: }
Line 13: DISPLAY (count)
```

Which two lines of code should be removed so that the program will work as intended?

Select two answers.

A Line 5

B Line 8

C Line 9

D Line 11

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33. 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?

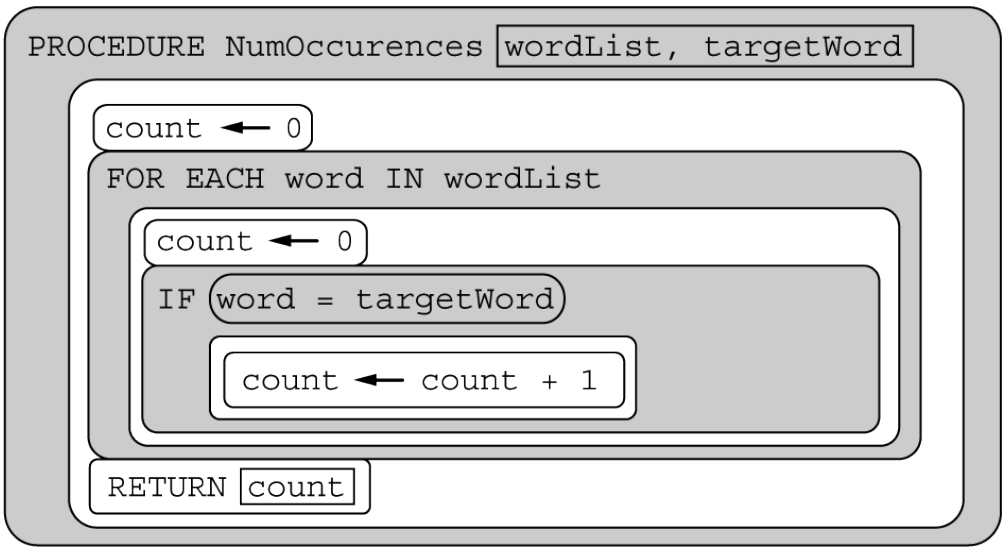
(A) In line 3, `2` should be changed to `1`.

(B) In line 6, `<` should be changed to `≥`.

(C) Lines 8 and 12 should be interchanged.

(D) Lines 10 and 11 should be interchanged.

34. The procedure `NumOccurrences` is intended to count and return the number of times `targetWord` appears in the list `wordList`. The procedure does not work as intended.



For which of the following code segments will the call to `NumOccurrences` NOT return the intended value?

Select two answers.

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A

```
treeList ← "birch", "maple", "birch"
numOccurences treeList, "birch"
```

B

```
treeList ← "birch", "maple", "oak"
numOccurences treeList, "maple"
```

C

```
treeList ← "birch", "maple", "oak"
numOccurences treeList, "oak"
```

D

```
treeList ← "birch", "maple", "oak"
numOccurences treeList, "spruce"
```

35. 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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36. The following code segment is intended to remove all duplicate elements in the list `myList`. The procedure does not work as intended.

```
j ← LENGTH(myList)
REPEAT UNTIL(j = 1)
{
      IF(myList[j] = myList[j - 1])
      {
          REMOVE(myList, j)
      }
      j ← j - 1
}
```

For which of the following contents of `myList` will the procedure NOT produce the intended results?

Select two answers.

A `[10, 10, 20, 20, 10, 10]`

B `[30, 30, 30, 10, 20, 20]`

C `[30, 50, 40, 10, 20, 40]`

D `[50, 50, 50, 50, 50, 50]`

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37. 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

38. 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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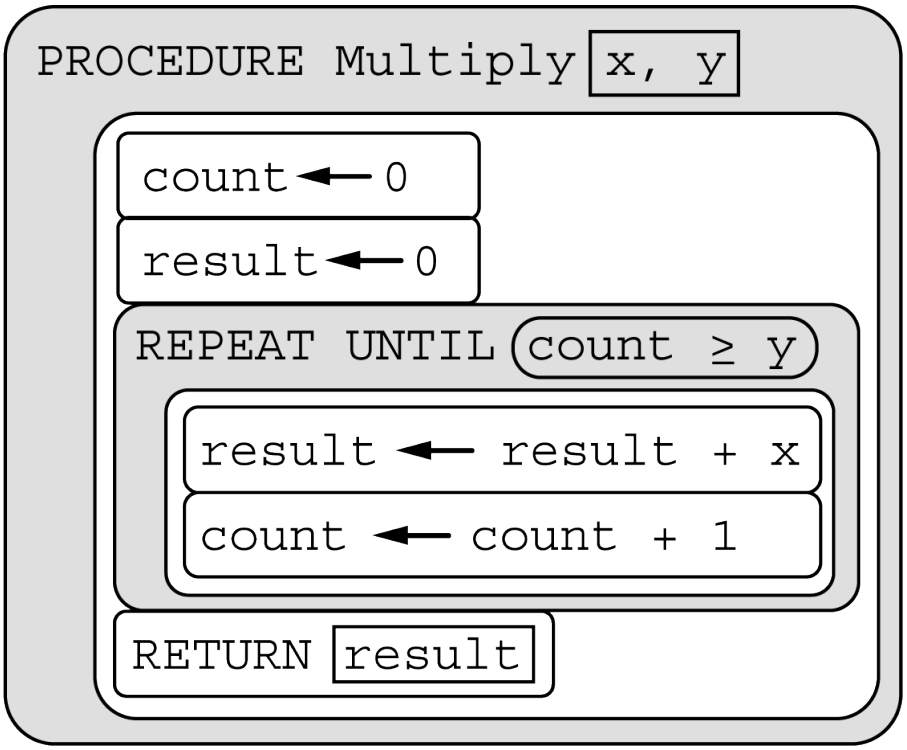
(A) Inserting `index ← index + 1` between lines 6 and 7

(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

39. The following procedure is intended to return the value of `x` times `y`, where `x` and `y` are integers. Multiplication is implemented using repeated additions.



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

Select two answers.

A `Multiply 2, 5`

B `Multiply 2, -5`

C `Multiply -2, 5`

D `Multiply -2, -5`

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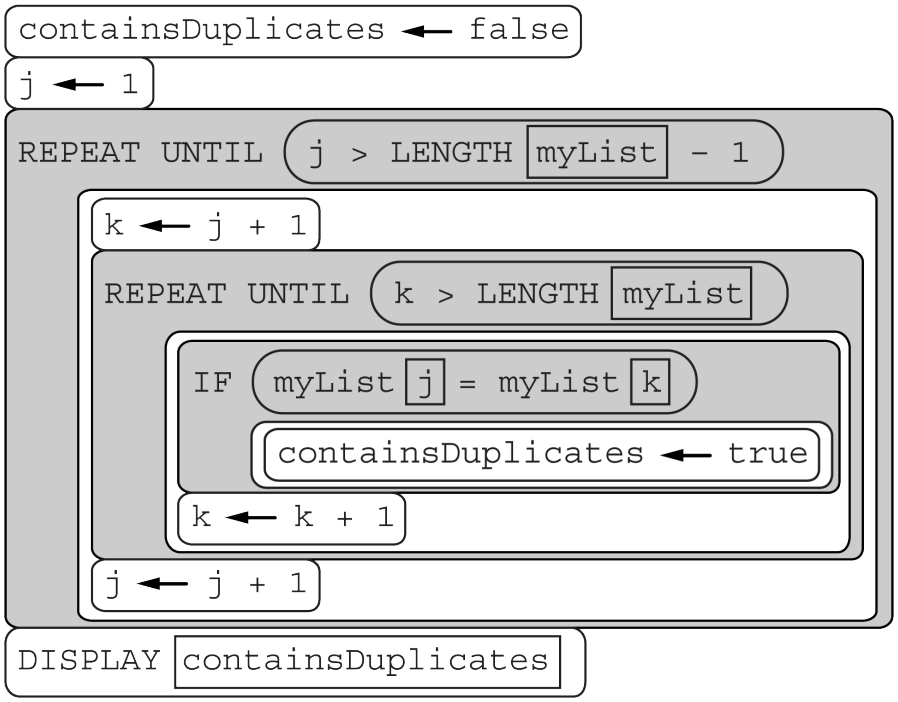
40. A student wrote the following code segment, which displays `true` if the list `myList` contains any duplicate values and displays `false` otherwise.



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.

41. 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

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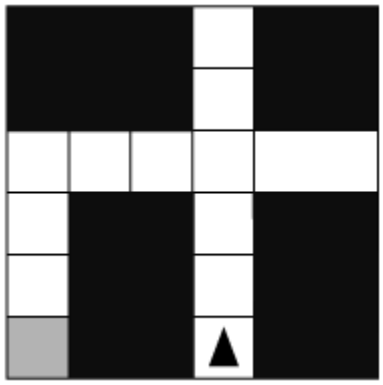
42. The grid below contains a robot represented as a triangle, initially facing toward the top of the grid. The robot can move into a white or gray square but cannot move into a black region.



The code segment below uses the procedure `goalReached`, which evaluates to `true` if the robot is in the gray square and evaluates to `false` otherwise.

```
REPEAT UNTIL(goalReached())
{
     <MISSING CODE>
}
```

Which of the following replacements for `<MISSING CODE>` can be used to move the robot to the gray square?

(A)
```
IF(CAN_MOVE(left))
{
     ROTATE_LEFT()
     MOVE_FORWARD()
}
```

(B)
```
IF(CAN_MOVE(forward))
{
     MOVE_FORWARD()
     ROTATE_LEFT()
}
```

(C)
```
IF(CAN_MOVE(left))
{
     ROTATE_LEFT()
}
MOVE_FORWARD()
```

(D)
```
IF(CAN_MOVE(forward))
{
     MOVE_FORWARD()
}
ELSE
{
     ROTATE_LEFT()
}
```

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43. 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]`

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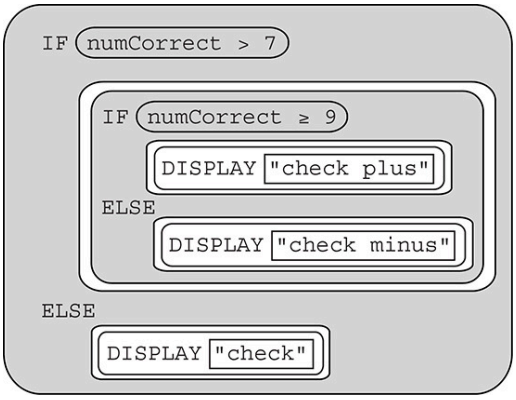
44. A homework assignment consists of 10 questions. The assignment is graded as follows.

Number of Correct Answers	Grade
9–10	check plus
7–8	check
Under 7	check minus

Let `numCorrect` represent the number of correct answers for a particular student. The following code segment is intended to display the appropriate grade based on `numCorrect`. The code segment does not work as intended in all cases.



For which of the following values of `numCorrect` does the code segment NOT display the intended grade?

Select two answers.

A 9

B 8

C 7

D 6

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45. 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?

(A) *FindName* (["Andrea", "Ben"], "Ben")

(B) *FindName* (["Andrea", "Ben"], "Diane")

(C) *FindName* (["Andrea", "Ben", "Chris"], "Ben")

(D) *FindName* (["Andrea", "Chris", "Diane"], "Ben")

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46. 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.

The program below is intended to count the number of prime numbers in a list called `numbers` and display the result. The program uses the procedure `isPrime (n)`, which returns `true` if `n` is a prime number and `false` otherwise.

The program does not work as intended.

```
Line 1:  count ← 0
Line 2:  FOR EACH value IN numbers
Line 3:  {
Line 4:     count ← 0
Line 5:     IF (isPrime (value))
Line 6:     {
Line 7:        count ← count + 1
Line 8:     }
Line 9:     count ← count + 1
Line 10: }
Line 11: DISPLAY (count)
```

Which two lines of code should be removed so that the program will work as intended?

Select two answers.

- A Line 1
- B Line 4
- C Line 7
- D Line 9

47. 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.