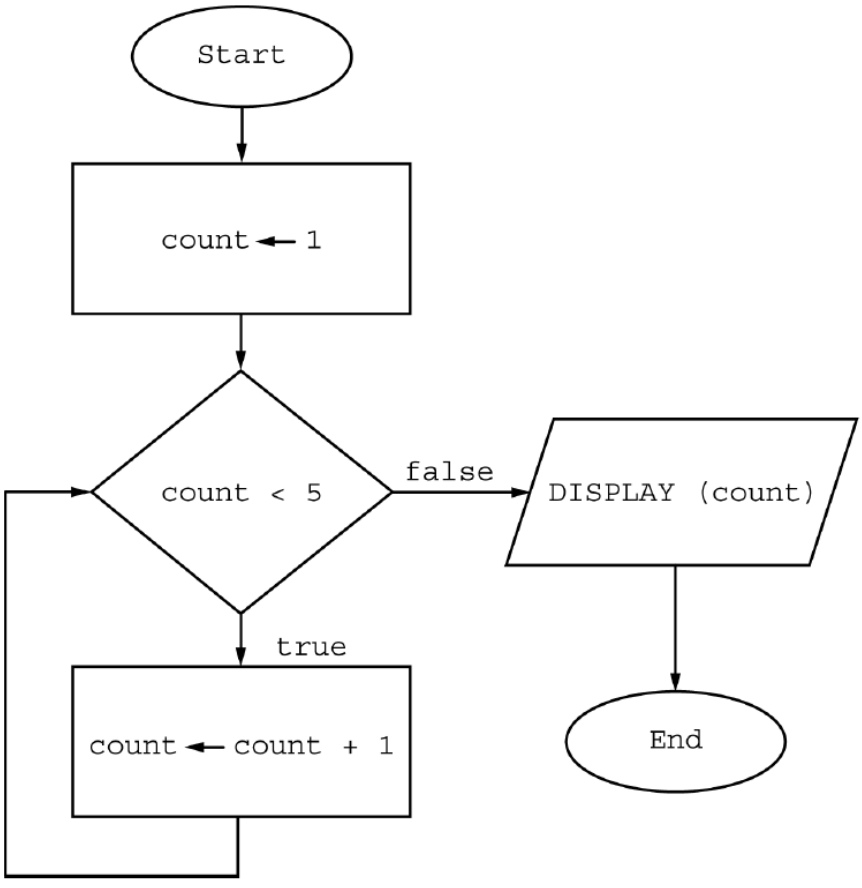
AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

1. A flowchart is a way to visually represent an algorithm. The flowchart below uses the following building blocks.

Block	Explanation
Oval	The start or end of the algorithm
Rectangle	One or more processing steps, such as a statement that assigns a value to a variable
Diamond	A conditional or decision step, where execution proceeds to the side labeled `true` if the condition is true and to the side labeled `false` otherwise
Parallelogram	Displays a message



What is displayed as a result of executing the algorithm in the flowchart?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

(A) 5
(B) 15
(C) 1 2 3 4
(D) 1 2 3 4 5

2. Suppose a large group of people in a room were all born in the same year. Consider the following three algorithms, which are each intended to identify the people in the room who have the earliest birthday based on just the month and day. For example, a person born on February 10 is considered to have an earlier birthday than a person born on March 5. Which of the three algorithms will identify the correct people?

I. All the people in the room stand up. All standing people form pairs where possible, leaving at most one person not part of a pair. For each pair, the person with the earlier birthday remains standing, while the other person in the pair sits down. If there is a tie, both people sit down. Any individual not part of a pair remains standing. Continue doing this until only one person remains standing. That person has the earliest birthday.

II. All the people in the room stand up. All standing people form pairs with another standing person that they have not previously been paired with where possible, leaving at most one person not part of a pair. For each pair, the person with the earlier birthday remains standing, while the other person in the pair sits down. If there is a tie, both people in the pair remain standing. Any individual not part of a pair remains standing. Continue doing this until only one person remains standing or all persons standing have the same birthday. Anyone still standing has the earliest birthday.

III. Beginning with the number 1, ask if anyone was born on that day of any month. Continue with the numbers 2, 3, and so on until a positive response is received. If only one person responds, that person has the earliest birthday. If more than one person responds, determine which person was born in the earliest month, and that person or those persons have the earliest birthday.

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

3. A certain game keeps track of the maximum and minimum scores obtained so far. If `num` represents the most recent score obtained, which of the following algorithms correctly updates the values of the maximum and the minimum?

(A) If `num` is greater than the minimum, set the minimum equal to `num`. Otherwise, if `num` is greater than the maximum, set the maximum equal to `num`.

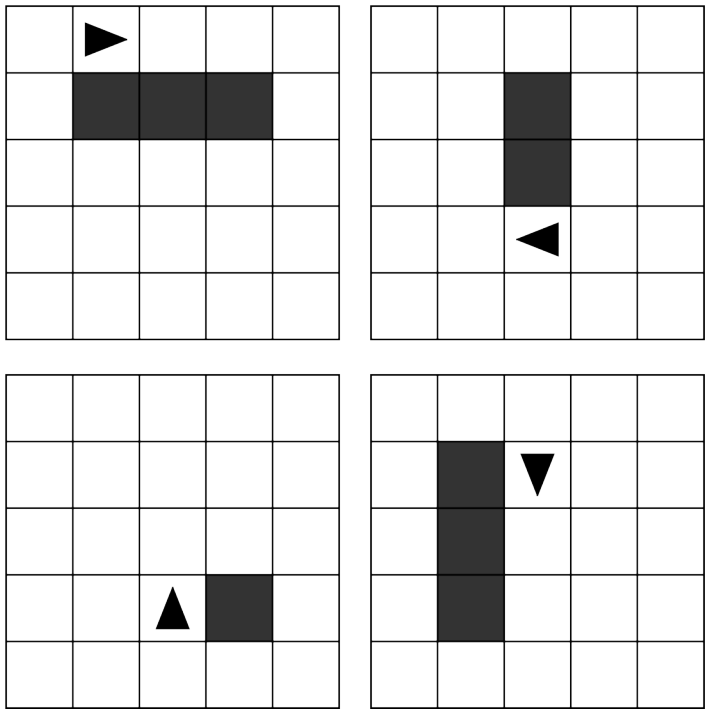
(B) If `num` is less than the minimum, set the minimum equal to `num`. Otherwise, if `num` is greater than the maximum, set the maximum equal to `num`.

(C) If `num` is less than the minimum, set the minimum equal to `num`. Otherwise, if `num` is less than the maximum, set the maximum equal to `num`.

(D) If `num` is greater than the minimum, set the minimum equal to `num`. Otherwise, if `num` is less than the maximum, set the maximum equal to `num`.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

4. The figure below shows four grids, each containing a robot represented as a triangle. The robot cannot move to a black square or move beyond the edge of the grid.



Which of the following algorithms will allow the robot to make a single circuit around the rectangular region of black squares, finishing in the exact location and direction that it started in each of the four grids?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

(A)

Step 1:
Keep moving forward, one square at a time, until the square to the right of the robot is black.

Step 2:
Turn right and move one square forward.

Step 3:
Repeat steps 1 and 2 three more times.

(B)

Step 1:
Keep moving forward, one square at a time, until the square to the right of the robot is no longer black.

Step 2:
Turn right and move one square forward.

Step 3: Repeat steps 1 and 2 three more times.

(C)

Step 1:
Move forward three squares.

Step 2:
Turn right and move one square forward.

Step 3: If the square to the right of the robot is black, repeat steps 1 and 2.

(D)

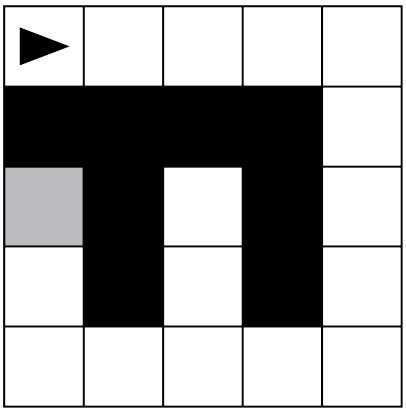
Step 1:
Move forward three squares.

Step 2:
Turn right and move one square forward.

Step 3:
If the square to the right of the robot is not black, repeat steps 1 and 2.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

5. The grid below contains a robot represented as a triangle, initially facing right. 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)
```
REPEAT UNTIL (CAN_MOVE (forward) = false)
{
     ROTATE_RIGHT ()
}
MOVE_FORWARD ()
```

(B)
```
REPEAT UNTIL (CAN_MOVE (forward) = false)
{
     MOVE_FORWARD ()
}
ROTATE_RIGHT ()
```

(C)
```
REPEAT UNTIL (CAN_MOVE (right))
{
     ROTATE_RIGHT ()
}
MOVE_FORWARD ()
```

(D)
```
REPEAT UNTIL (CAN_MOVE (right))
{
     MOVE_FORWARD ()
}
ROTATE_RIGHT ()
```

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

6. A programmer is creating an algorithm that will be used to turn on the motor to open the gate in a parking garage. The specifications for the algorithm are as follows.

- The gate should not open when the time is outside of business hours.
- The motor should not turn on unless the gate sensor is activated.
- The motor should not turn on if the gate is already open.

Which of the following algorithms can be used to open the gate under the appropriate conditions?

(A) Check if the time is outside of business hours. If it is, check if the gate sensor is activated. If it is, check if the gate is closed. If it is, turn on the motor.

(B) Check if the time is during business hours. If it is, check if the gate sensor is activated. If it is, check if the gate is open. If it is, turn on the motor.

(C) Check if the time is during business hours. If it is, check if the gate sensor is activated. If it is not, check if the gate is open. If it is not, turn on the motor.

(D) Check if the time is during business hours. If it is, check if the gate sensor is activated. If it is, check if the gate is open. If it is not, turn on the motor.

7. Three different numbers need to be placed in order from least to greatest. For example, if the numbers are ordered 9, 16, 4, they should be reordered as 4, 9, 16. Which of the following algorithms can be used to place any three numbers in the correct order?

(A) If the first number is greater than the last number, swap them. Then, if the first number is greater than the middle number, swap them.

(B) If the first number is greater than the middle number, swap them. Then, if the middle number is greater than the last number, swap them.

(C) If the first number is greater than the middle number, swap them. Then, if the middle number is greater than the last number, swap them. Then, if the first number is greater than the last number, swap them.

(D) If the first number is greater than the middle number, swap them. Then, if the middle number is greater than the last number, swap them. Then, if the first number is greater than the middle number, swap them.

8. Which of the following algorithms display all integers between 1 and 20, inclusive, that are not divisible by 3 ?

Select two answers.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

A

Step 1:
Set *x* to 0.

Step 2:
Increment *x* by 1.

Step 3:
If *x* is not divisible by 3, then display *x*.

Step 4:
Repeat steps 2 and 3 until *x* is 20.

B

Step 1:
Set *x* to 0.

Step 2: If *x* is divisible by 3, then display *x*.
Step 3:
Increment *x* by 1.

Step 4: Repeat steps 2 and 3 until *x* is greater than 20.

C

Step 1:
Set *x* to 1.

Step 2: If *x* is divisible by 3, then do nothing; otherwise display *x*.
Step 3:
Increment *x* by 1.

Step 4: Repeat steps 2 and 3 until *x* is 20.

D

Step 1:
Set *x* to 1.

Step 2: If *x* is divisible by 3, then do nothing; otherwise display *x*.
Step 3:
Increment *x* by 1.

Step 4: Repeat steps 2 and 3 until *x* is greater than 20.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

9. The algorithm below is used to simulate the results of flipping a coin 4 times. Consider the goal of determining whether the simulation resulted in an equal number of heads and tails.

Step 1: Initialize the variables *heads_counter* and *flip_counter* to 0.

Step 2: A variable *coin_flip* is randomly assigned a value of either 0 or 1. If *coin_flip* has the value 0, the coin flip result is heads, so *heads_counter* is incremented by 1.

Step 3: Increment the value of *flip_counter* by 1.

Step 4: Repeat steps 2 and 3 until *flip_counter* equals 4.

Following execution of the algorithm, which of the following expressions indicates that the simulation resulted in an equal number of heads and tails?

(A) *coin_flip* = 1

(B) *flip_counter* = 1

(C) *flip_counter* = 2

(D) *heads_counter* = 2

10. An algorithm has been developed to compute the sum of all the elements in a list of integers. Which of the following programming structures must be added to the existing algorithm so that the new algorithm computes the sum of only the even integers in the list?

(A) Iteration

(B) Searching

(C) Selection

(D) Sequencing

11. An algorithm will be used to identify the maximum value in a list of one or more integers. Consider the two versions of the algorithm below.

Algorithm I : Set the value of a variable *max* to -1. Iterate through the list of integer values. If a data value is greater than the value of the variable *max*, set *max* to the data value.

Algorithm II : Set the value of a variable *max* to the first data value. Iterate through the remaining values in the list of integers. If a data value is greater than the value of the variable *max*, set *max* to the data value.

Which of the following statements best describes the behavior of the two algorithms?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

(A) Both algorithms work correctly on all input values.

(B) Algorithm I always works correctly, but Algorithm II only works correctly when the maximum value is not the first value in the list.

(C) Algorithm II always works correctly, but Algorithm I only works correctly when the maximum value is greater than or equal to -1.

(D) Neither algorithm will correctly identify the maximum value when the input contains both positive and negative input values.

12. In a certain game, the integer variable `bonus` is assigned a value based on the value of the integer variable `score`.

- If `score` is greater than `100`, `bonus` is assigned a value that is `10` times `score`.
- If `score` is between `50` and `100` inclusive, `bonus` is assigned the value of `score`.
- If `score` is less than `50`, `bonus` is assigned a value of `0`.

Which of the following code segments assigns `bonus` correctly for all possible integer values of `score` ?

Select two answers.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

A

```
IF(score > 100)
{
     bonus ← score * 10
}
ELSE
{
     IF(score ≥ 50)
     {
         bonus ← score
     }
     ELSE
     {
         bonus ← 0
     }
}
```

B

```
IF(score ≥ 50)
{
     IF(score > 100)
     {
         bonus ← score * 10
     }
     ELSE
     {
         bonus ← 0
     }
}
ELSE
{
     bonus ← score
}
```

C

```
IF(score < 50)
{
     bonus ← 0
}
ELSE
{
     IF(score ≥ 50)
     {
         bonus ← score
     }
     ELSE
     {
         bonus ← score * 10
     }
}
```

D

```
IF(score < 50)
{
     bonus ← 0
}
ELSE
{
     IF(score > 100)
     {
         bonus ← score * 10
```

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

```
        }
        ELSE
        {
            bonus ← score
        }
    }
```

13. The cost of a customer's electricity bill is based on the number of units of electricity the customer uses.

- For the first 25 units of electricity, the cost is $5 per unit.
- For units of electricity after the first 25, the cost is $7 per unit.

Which of the following code segments correctly sets the value of the variable `cost` to the cost, in dollars, of using `numUnits` units of electricity?

(A)
```
IF (numUnits ≤ 25)
    [cost ← numUnits * 5]
ELSE
    [cost ← numUnits * 7]
```

(B)
```
IF (numUnits ≤ 25)
    [cost ← numUnits * 5]
ELSE
    [cost ← (numUnits - 25) * 7]
```

(C)
```
IF (numUnits ≤ 25)
    [cost ← numUnits * 5]
ELSE
    [cost ← 25 * 5 + (numUnits - 25) * 7]
```

(D)
```
IF (numUnits ≤ 25)
    [cost ← numUnits * 5]
ELSE
    [cost ← 25 * 7 + (numUnits - 25) * 5]
```

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

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.

A student is creating a procedure to determine whether the weather for a particular month was considered very hot. The procedure takes as input a list containing daily high temperatures for a particular month. The procedure is intended to return `true` if the daily high temperature was at least 90 degrees for a majority of days in the month and return `false` otherwise.

```
PROCEDURE IsHot (temperatureList)
{
   total ← 0
   counter ← 0
   FOR EACH temperature IN temperatureList
   {
      IF (temperature ≥ 90)
      {
         counter ← counter + 1
      }
      total ← total + 1
   }
   RETURN (<MISSING CODE>)
}
```

Which of the following can be used to replace `<MISSING CODE>` so that the procedure works as intended?

(A) `counter < 0.5 * total`

(B) `counter > 0.5 * total`

(C) `total < 0.5 * counter`

(D) `total > 0.5 * counter`

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

15. A summer camp offers a morning session and an afternoon session. The list *morningList* contains the names of all children attending the morning session, and the list *afternoonList* contains the names of all children attending the afternoon session.

Only children who attend both sessions eat lunch at the camp. The camp director wants to create *lunchList*, which will contain the names of children attending both sessions.

The following code segment is intended to create *lunchList*, which is initially empty. It uses the procedure *IsFound (list, name)*, which returns *true* if *name* is found in *list* and returns *false* otherwise.

```
FOR EACH child IN morningList
{
   <MISSING CODE>
}
```

Which of the following could replace <*MISSING CODE*> so that the code segment works as intended?

(A)
```
IF (IsFound (afternoonList, child))
{
   APPEND (lunchList, child)
}
```

(B)
```
IF (IsFound (lunchList, child))
{
   APPEND (afternoonList, child)
}
```

(C)
```
IF (IsFound (morningList, child))
{
   APPEND (lunchList, child)
}
```

(D)
```
IF ((IsFound (morningList, child)) OR
   (IsFound (afternoonList, child)))
{
   APPEND (lunchList, child)
}
```

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

16. The following algorithm is intended to determine the average height, in centimeters, of a group of people in a room. Each person has a card, a pencil, and an eraser. Step 2 of the algorithm is missing.

Step 1: All people stand up.

Step 2: (missing step)

Step 3: Each standing person finds another standing person and they form a pair. If a person cannot find an unpaired standing person, that person remains standing and waits until the next opportunity to form pairs.

Step 4: In each pair, one person hands their card to the other person and sits down.

Step 5: At this point, the standing person in each pair is holding two cards. The standing person in each pair replaces the top number on their card with the sum of the top numbers on the two cards and replaces the bottom number on their card with the sum of the bottom numbers on the two cards. The sitting partner's card is discarded.

Step 6: Repeat steps 3–5 until there is only one person standing.

Step 7: The last person standing divides the top number by the bottom number to determine the average height.

Which of the following can be used as step 2 so that the algorithm works as intended?

(A) Step 2: Each person writes their height, in centimeters, at the top of the card and writes the number 1 at the bottom of the card.

(B) Step 2: Each person writes their height, in centimeters, at the top of the card and writes the number 2 at the bottom of the card.

(C) Step 2: Each person writes the number 1 at the top of the card and writes their height, in centimeters, at the bottom of the card.

(D) Step 2: Each person writes the number 2 at the top of the card and writes their height, in centimeters, at the bottom of the card.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

17. A biologist wrote a program to simulate the population of a sample of bacteria. The program uses the following procedures.

Procedure Call	Explanation
`InitialPopulation ()`	Returns the number of bacteria at the start of the simulation
`NextPopulation (currPop)`	Based on the current value of `currPop`, returns the number of bacteria after one hour

Code for the simulation is shown below.

```
hours ← 0
startPop ← InitialPopulation ()
currentPop ← startPop
REPEAT UNTIL ((hours ≥ 24) OR (currentPop ≤ 0))
{
     currentPop ← NextPopulation (currentPop)
     hours ← hours + 1
}
DISPLAY (currentPop - startPop)
```

Which of the following are true statements about the simulation?

I. The simulation continues until either 24 hours pass or the population reaches 0.
II. The simulation displays the average change in population per hour over the course of the simulation.
III. The simulation displays the total population at the end of the simulation.

(A) I only

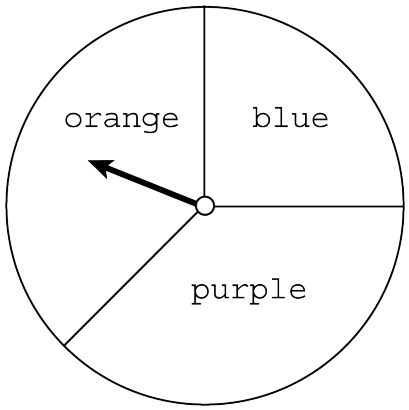
(B) II only

(C) III only

(D) I and II

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

18. The following spinner is used in a game. The region labeled `"blue"` represents $\frac{1}{4}$ of the spinner. The regions labeled `"orange"` and `"purple"` are equal in size.

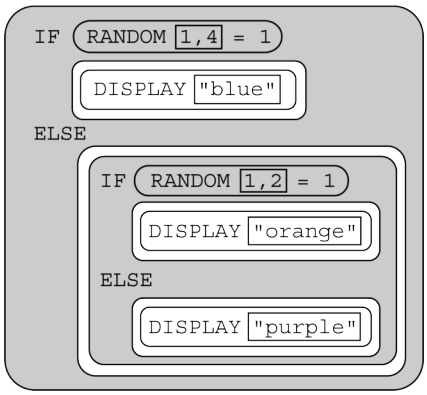


Which of the following code segments can be used to simulate the behavior of the spinner?

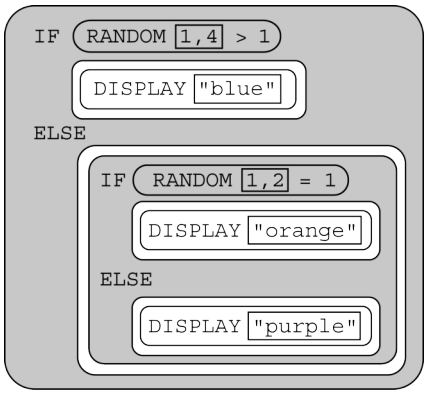
Select two answers.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

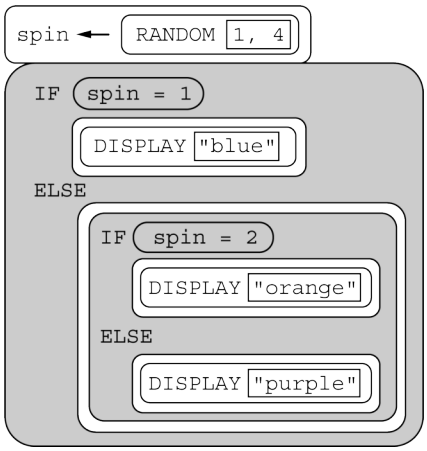
A



B

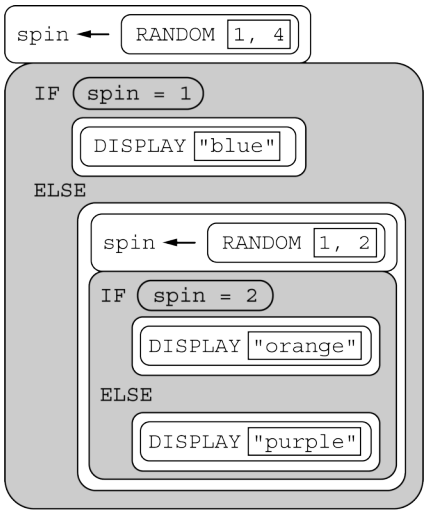


C

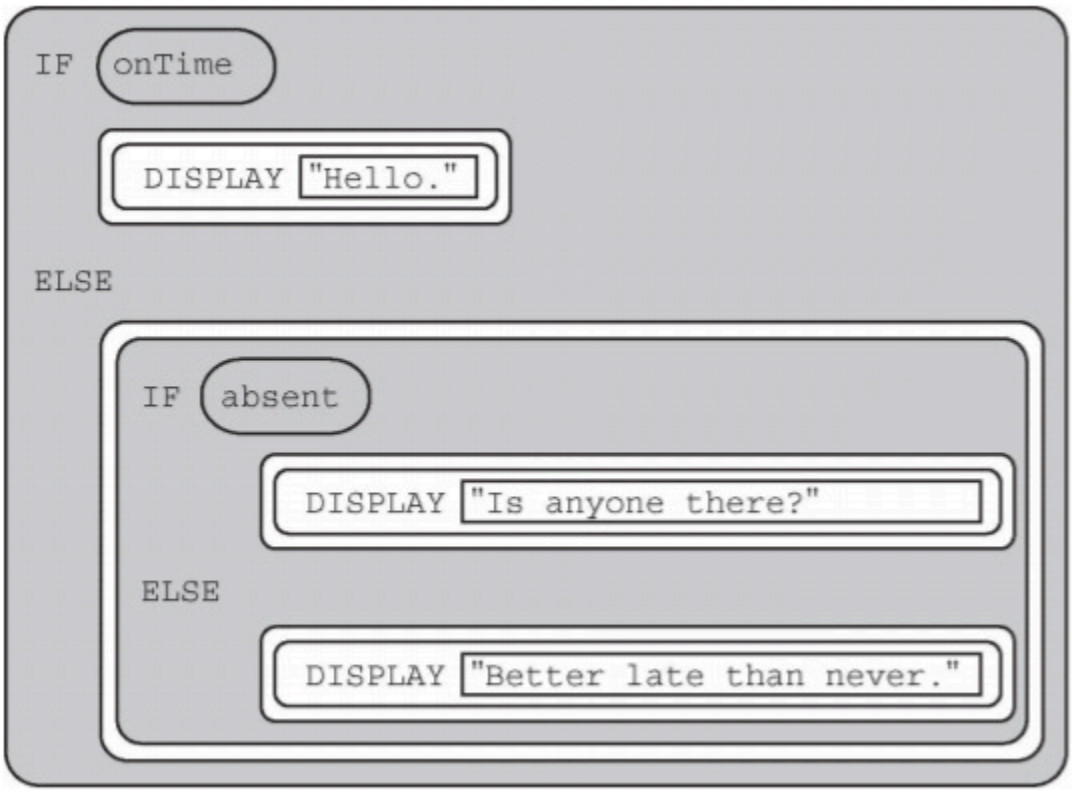


AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

D



19. Consider the code segment below.



If the variables *onTime* and *absent* both have the value *false*, what is displayed as a result of running the code segment?

(A) Is anyone there?

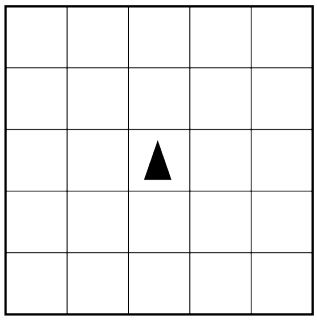
(B) Better late than never.

(C) Hello. Is anyone there?

(D) Hello. Better late than never.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

20. The question below uses a robot in a grid of squares. The robot is represented as a triangle, which is initially in the center square and facing toward the top of the grid.



The following code segment is used to move the robot in the grid.

```
count ← 1
REPEAT 4 TIMES
{
     REPEAT count TIMES
     {
         MOVE_FORWARD()
     }
     ROTATE_LEFT()
     count ← count + 1
}
```

Which of the following code segments will move the robot from the center square along the same path as the code segment above?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

(A)

```
count ← 0
REPEAT 4 TIMES
{
     count ← count + 1
     REPEAT count TIMES
     {
         MOVE_FORWARD()
     }
     ROTATE_LEFT()
}
```

(B)

```
count ← 0
REPEAT 4 TIMES
{
     count ← count + 1
     ROTATE_LEFT()
     REPEAT count TIMES
     {
         MOVE_FORWARD()
     }
}
```

(C)

```
count ← 0
REPEAT 4 TIMES
{
     REPEAT count TIMES
     {
         ROTATE_LEFT()
     }
     MOVE_FORWARD()
     count ← count + 1
}
```

(D)

```
count ← 0
REPEAT 4 TIMES
{
     ROTATE_LEFT()
     REPEAT count TIMES
     {
         MOVE_FORWARD()
     }
     count ← count + 1
}
```

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

21. In the following code segment, assume that `x` and `y` have been assigned integer values.

```
sum ← 0
REPEAT x TIMES
{
      REPEAT y TIMES
      {
          sum ← sum + 1
      }
}
```

At the end of which of the following code segments is the value of `sum` the same as the value of `sum` at the end of the preceding code segment?

Select two answers.

A

```
sum ← 0
z ← x + y
REPEAT z TIMES
{
      sum ← sum + 1
}
```

B

```
sum ← 0
z ← x * y
REPEAT z TIMES
{
      sum ← sum + 1
}
```

C

```
sum ← 0
REPEAT x TIMES
{
      sum ← sum + 1
}
REPEAT y TIMES
{
      sum ← sum + 1
}
```

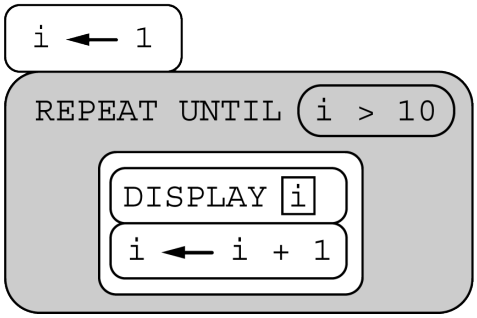
D

```
sum ← 0
REPEAT y TIMES
{
      REPEAT x TIMES
      {
          sum ← sum + 1
      }
}
```

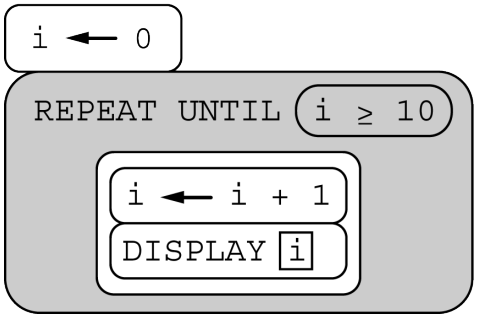
AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

22. Consider the two programs below.

Program A:



Program B:



Which of the following best compares the values displayed by programs A and B?

(A) Program A and program B display identical values in the same order.

(B) Program A and program B display the same values in different orders.

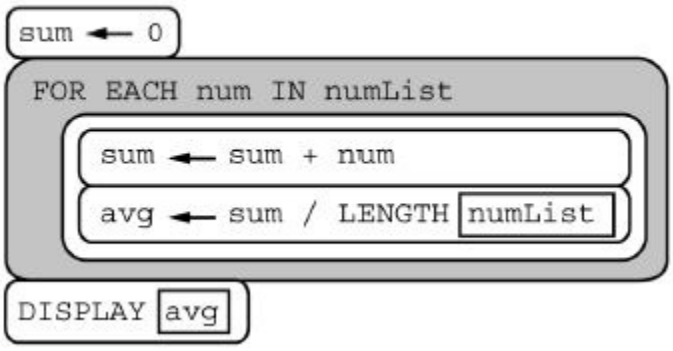
(C) Program A and program B display the same number of values, but the values differ.

(D) Program B displays one more value than program A.

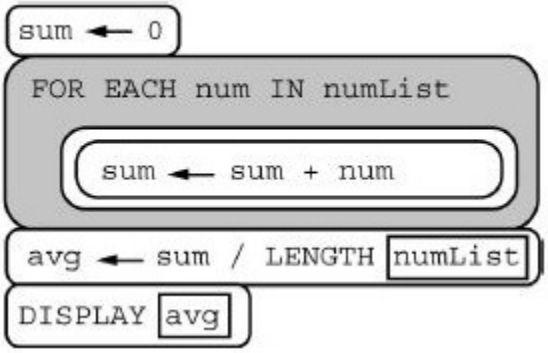
23. Directions: The question or incomplete statement below is followed by four suggested answers or completions. Select the one that is best in each case.

The two code segments below are each intended to display the average of the numbers in the list `numList`. Assume that `numList` contains more than one value.

Program I:



Program II:



Which of the following best describes the two code segments?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

(A) Code segment I displays the correct average, but code segment II does not.

(B) Code segment II displays the correct average, but code segment I does not.

(C) Both code segments display the correct average, but code segment I requires more arithmetic operations than code segment II.

(D) Both code segments display the correct average, but code segment II requires more arithmetic operations than code segment I.

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

Consider the code segment below.

```
Line 1:  IF (a = 0)
Line 2:  {
Line 3:     b ← a + 10
Line 4:  }
Line 5:  ELSE
Line 6:  {
Line 7:     b ← a + 20
Line 8:  }
```

Which of the following changes will NOT affect the results when the code segment is executed?

(A) Changing line 3 to `b ← 10`

(B) Changing line 3 to `a ← b + 10`

(C) Changing line 7 to `b ← 20`

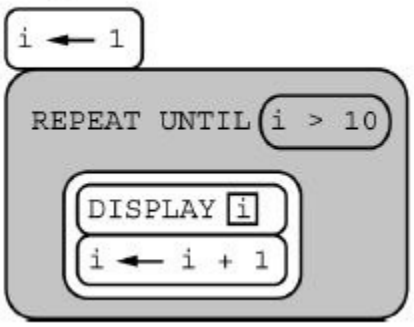
(D) Changing line 7 to `a ← b + 20`

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

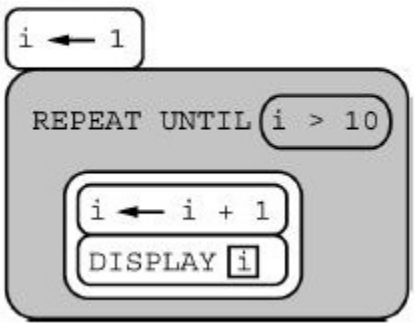
25. Directions: The question or incomplete statement below is followed by four suggested answers or completions. Select the one that is best in each case.

Consider the two programs below.

Program A:



Program B:



Which of the following best compares the values displayed by programs A and B?

(A) Program A and program B display identical values.

(B) Program A and program B display the same values in different orders.

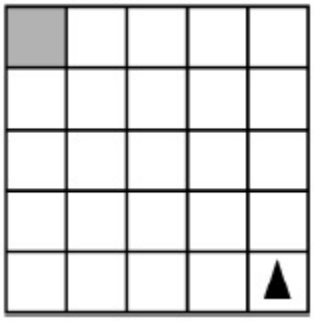
(C) Program A and program B display the same number of values, but the values differ.

(D) Program A and program B display a different number of values.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

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

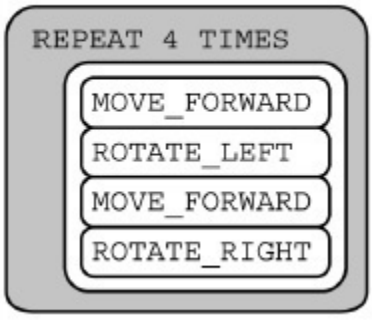
The question below uses a robot in a grid of squares. The robot is represented as a triangle, which is initially in the bottom right square of the grid and facing toward the top of the grid.



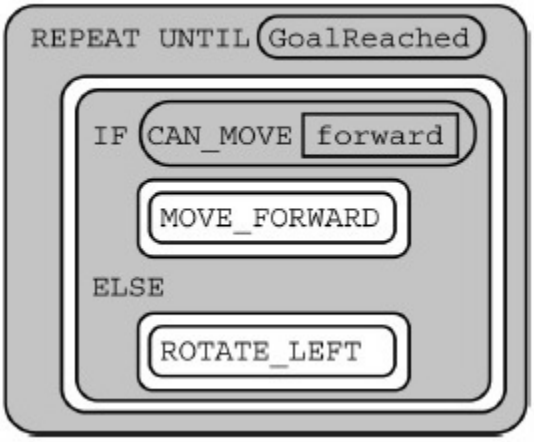
The following programs are each intended to move the robot to the gray square. Program II uses the procedure `GoalReached`, which returns `true` if the robot is in the gray square and returns

`false` otherwise.

Program I:



Program II:



Which of the following statements is true?

(A) Program I correctly moves the robot to the gray square, but program II does not.

(B) Program II correctly moves the robot to the gray square, but program I does not.

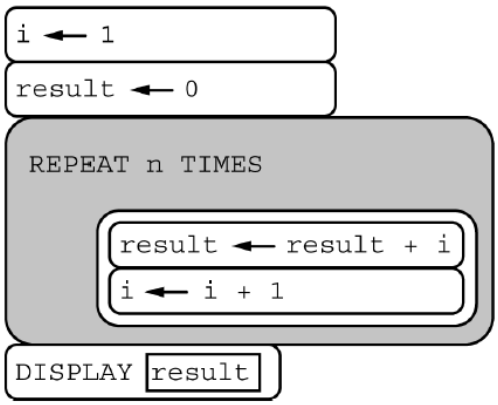
(C) Both program I and program II correctly move the robot to the gray square.

(D) Neither program I nor program II correctly moves the robot to the gray square.

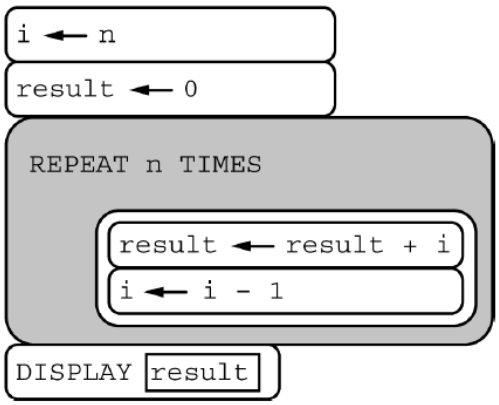
AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

27. Programs I and II below are each intended to calculate the sum of the integers from 1 to *n*. Assume that *n* is a positive integer (e.g., 1, 2, 3, …).

Program I:



Program II:



Which of the following best describes the behavior of the two programs?

(A) Program I displays the correct sum, but program II does not.

(B) Program II displays the correct sum, but program I does not.

(C) Both program I and program II display the correct sum.

(D) Neither program I nor program II displays the correct sum.

28. **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 code segment below is intended to display all multiples of 5 between the values `start` and `end`, inclusive. For example, if `start` has the value `35` and `end` has the value `50`, the code segment should display the values `35`, `40`, `45`, and `50`. Assume that `start` and `end` are multiples of 5 and that `start` is less than `end`.

```
Line 1:  i ← start
Line 2:  REPEAT <MISSING EXPRESSION> TIMES
Line 3:  {
Line 4:     DISPLAY (i)
Line 5:     i ← i + 5
Line 6:  }
```

Which of the following could replace `<MISSING EXPRESSION>` in line 2 so that the code segment works as intended?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

(A) `end - start + 1`

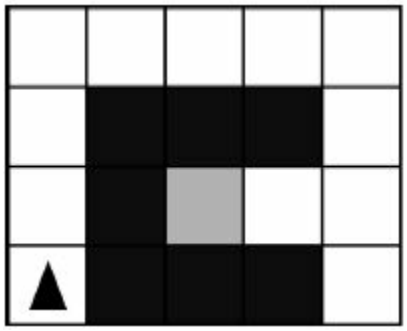
(B) `end - start + 6`

(C) `((end - start) / 5) + 1`

(D) `5 * (end - start) + 1`

29. 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 grid below contains a robot represented as a triangle, initially facing up. 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?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

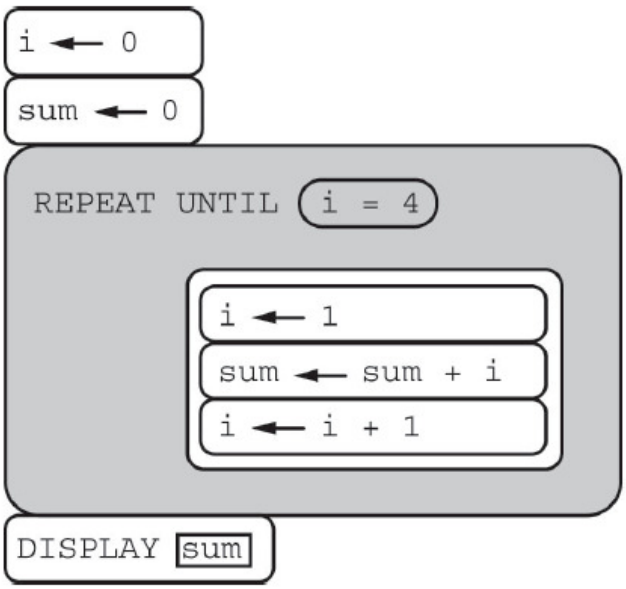
(A)
```
IF (CAN_MOVE (right))
{
   ROTATE_RIGHT ()
}
MOVE_FORWARD ()
```

(B)
```
IF (CAN_MOVE (right))
{
   ROTATE_RIGHT ()
   MOVE_FORWARD ()
}
```

(C)
```
IF (CAN_MOVE (forward))
{
   MOVE_FORWARD ()
}
ROTATE_RIGHT ()
```

(D)
```
IF (CAN_MOVE (forward))
{
   MOVE_FORWARD ()
   ROTATE_RIGHT ()
}
```

30. Consider the following program code.



Which of the following best describes the result of running the program code?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

(A) The number *0* is displayed.

(B) The number *6* is displayed.

(C) The number *10* is displayed.

(D) Nothing is displayed; the program results in an infinite loop.

31. Consider the following code segment, where `exam` and `presentation` are integer variables and `grade` is a string variable.

```
IF((exam > 90) AND (presentation > 80))
{
     grade ← "A"
}
IF((exam > 80) OR (presentation > 75))
{
     grade ← "B"
}
ELSE
{
     IF((exam > 70) OR (presentation > 60))
     {
         grade ← "C"
     }
     ELSE
     {
         IF(exam > 60)
         {
            grade ← "D"
         }
         ELSE
         {
            grade ← "F"
         }
     }
}
```

Under which of the following conditions will the value `"C"` be assigned to the variable `grade`?

(A) When the value of `exam` is `70` and the value of `presentation` is `50`

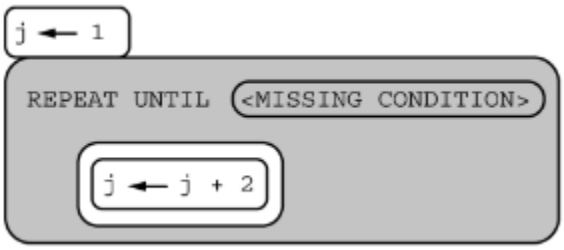
(B) When the value of `exam` is `70` and the value of `presentation` is `80`

(C) When the value of `exam` is `80` and the value of `presentation` is `60`

(D) When the value of `exam` is `80` and the value of `presentation` is `80`

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

32. Consider the following code segment.

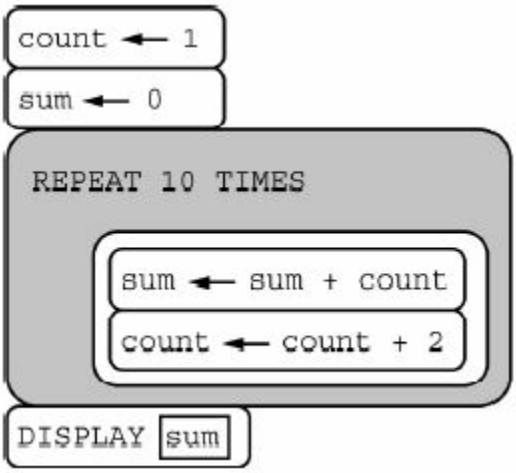


Which of the following replacements for <MISSING CONDITION> will result in an infinite loop?

(A) j = 6
(B) j ≥ 6
(C) j = 7
(D) j > 7

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

Consider the following program.

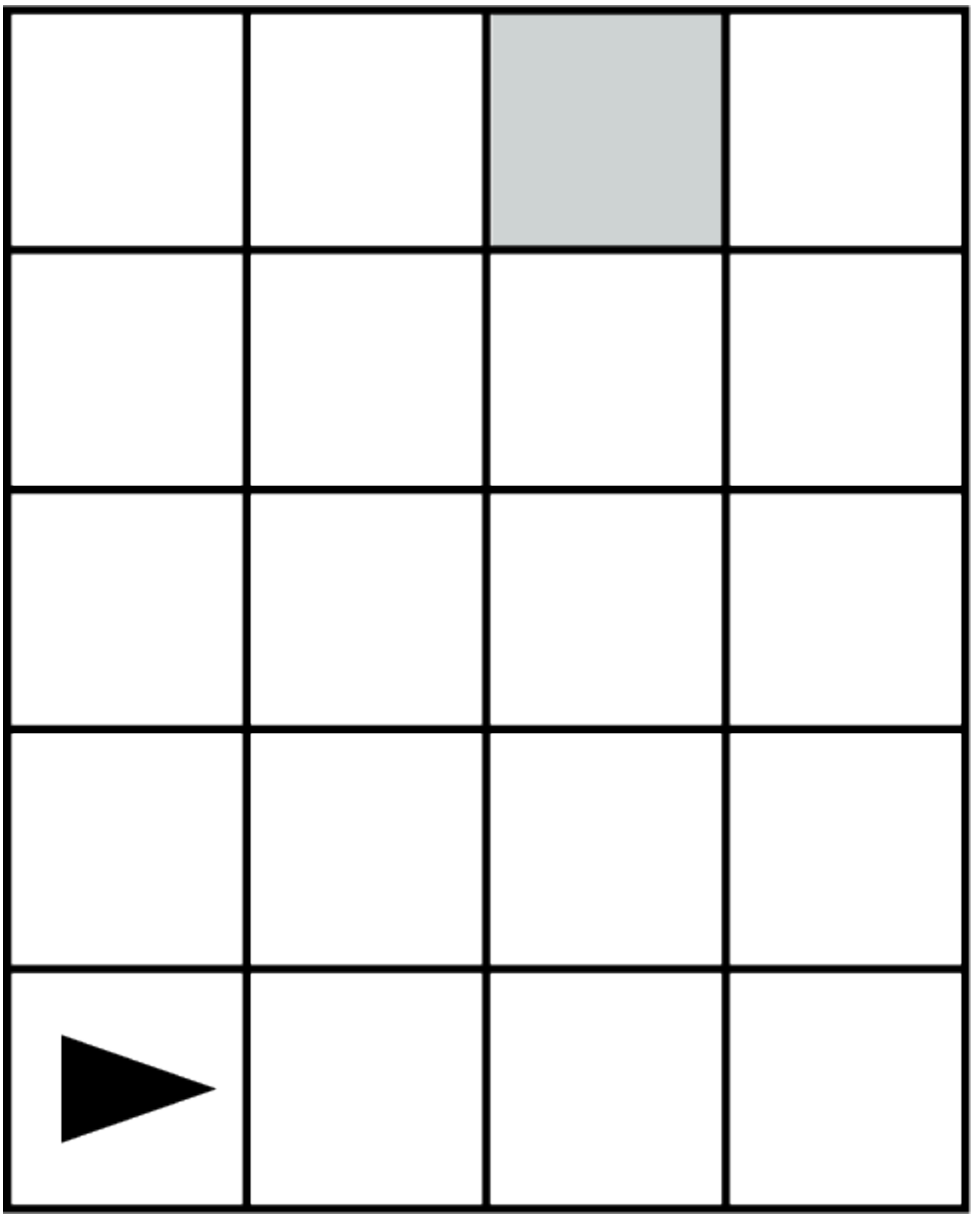


Which of the following describes the result of executing the program?

(A) The program displays the sum of the even integers from 0 to 10.
(B) The program displays the sum of the even integers from 0 to 20.
(C) The program displays the sum of the odd integers from 1 to 9.
(D) The program displays the sum of the odd integers from 1 to 19.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

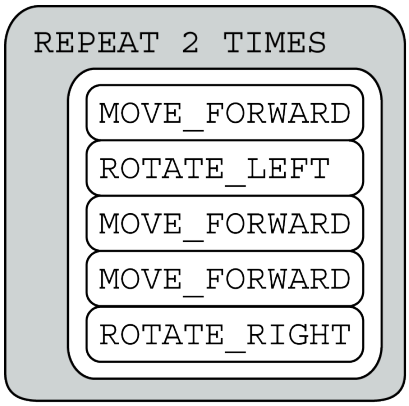
34. The question below uses a robot in a grid of squares. The robot is represented as a triangle, which is initially in the bottom left square of the grid and facing right.



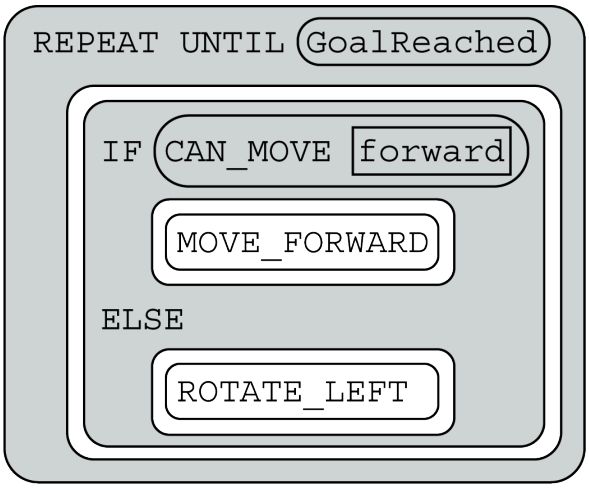
The following programs are each intended to move the robot to the gray square. Program II uses the procedure `GoalReached`, which returns `true` if the robot is in the gray square and returns `false` otherwise.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

Program I:



Program II:



Which of the following statements best describes the correctness of the programs?

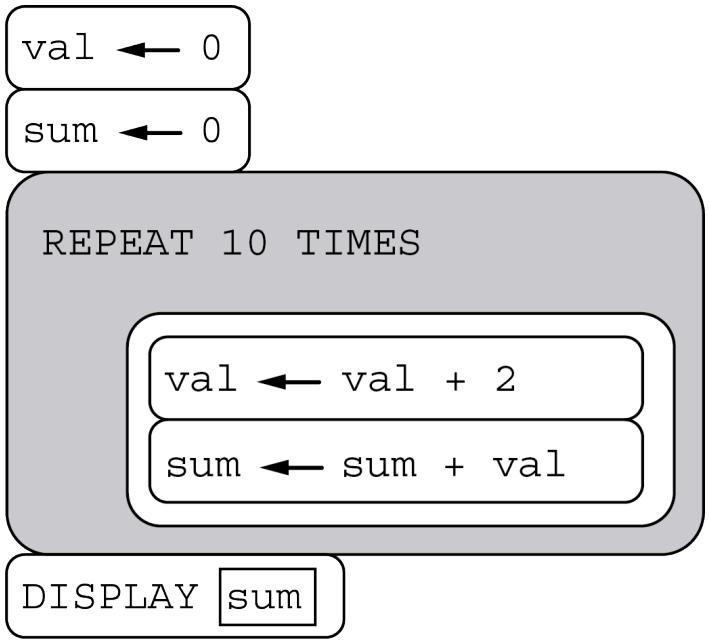
(A) Program I correctly moves the robot to the gray square, but program II does not.

(B) Program II correctly moves the robot to the gray square, but program I does not.

(C) Both program I and program II correctly move the robot to the gray square.

(D) Neither program I nor program II correctly moves the robot to the gray square.

35. Consider the following program.



Which of the following describes the result of executing the program?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

(A) The program displays the sum of the even integers from 2 to 10.

(B) The program displays the sum of the even integers from 2 to 20.

(C) The program displays the sum of the odd integers from 1 to 9.

(D) The program displays the sum of the odd integers from 1 to 19.

36. A list of numbers has `n` elements, indexed from `1` to `n`. The following algorithm is intended to display the number of elements in the list that have a value greater than `100`. The algorithm uses the variables `count` and `position`. Steps 3 and 4 are missing.

Step 1: Set `count` to `0` and `position` to `1`.

Step 2: If the value of the element at index `position` is greater than `100`, increase the value of `count` by `1`.

Step 3: (missing step)

Step 4: (missing step)

Step 5: Display the value of `count`.

Which of the following could be used to replace steps 3 and 4 so that the algorithm works as intended?

(A)

Step 3
Increase the value of `position` by `1`.

Step 4
Repeat steps 2 and 3 until the value of `count` is greater than `100`.

(B)

Step 3
Increase the value of `position` by `1`.

Step 4
Repeat steps 2 and 3 until the value of `position` is greater than `n`.

(C)

Step 3
Repeat step 2 until the value of `count` is greater than `100`.

Step 4
Increase the value of `position` by `1`.

(D)

Step 3
Repeat step 2 until the value of `position` is greater than `n`.

Step 4
Increase the value of `count` by `1`.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

37. A list of numbers has `n` elements, indexed from `1` to `n`. The following algorithm is intended to display `true` if the value `target` appears in the list more than once and to display `false` otherwise. The algorithm uses the variables `position` and `count`. Steps 4 and 5 are missing.

Step 1: Set `count` to `0` and `position` to `1`.

Step 2: If the value of the element at index `position` is equal to `target`, increase the value of `count` by `1`.

Step 3: Increase the value of `position` by `1`.

Step 4: (missing step)

Step 5: (missing step)

Which of the following could be used to replace steps 4 and 5 so that the algorithm works as intended?

(A)

Step 4
Repeat steps 2 and 3 until the value of `position` is greater than `n`.

Step 5
If `count` is greater than or equal to `2`, display `true`. Otherwise, display `false`.

(B)

Step 4
Repeat steps 2 and 3 until the value of `position` is greater than `n`.

Step 5
If `count` is greater than or equal to `position`, display `true`. Otherwise, display `false`.

(C)

Step 4
Repeat steps 2 and 3 until the value of `count` is greater than `2`.

Step 5
If `position` is greater than or equal to `n`, display `true`. Otherwise, display `false`.

(D)

Step 4
Repeat steps 2 and 3 until the value of `count` is greater than `n`.

Step 5
If `count` is greater than or equal to `2`, display `true`. Otherwise, display `false`.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

38. An algorithm is intended to display the following output.

```
red red blue red red blue red red blue
```

Which of the following code segments can be used to display the intended output?

(A)

```
REPEAT 2 TIMES
    REPEAT 3 TIMES
        DISPLAY "red"
    DISPLAY "blue"
```

(B)

```
REPEAT 2 TIMES
    REPEAT 3 TIMES
        DISPLAY "blue"
    DISPLAY "red"
```

(C)

```
REPEAT 3 TIMES
    REPEAT 2 TIMES
        DISPLAY "red"
    DISPLAY "blue"
```

(D)

```
REPEAT 3 TIMES
    REPEAT 2 TIMES
        DISPLAY "blue"
    DISPLAY "red"
```

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

39. A code segment is intended to display the following output.

```
up down down down up down down down
```

Which of the following code segments can be used to display the intended output?

(A)

```
REPEAT 2 TIMES
    DISPLAY "up"
    REPEAT 3 TIMES
        DISPLAY "down"
```

(B)

```
REPEAT 3 TIMES
    DISPLAY "up"
    REPEAT 2 TIMES
        DISPLAY "down"
```

(C)

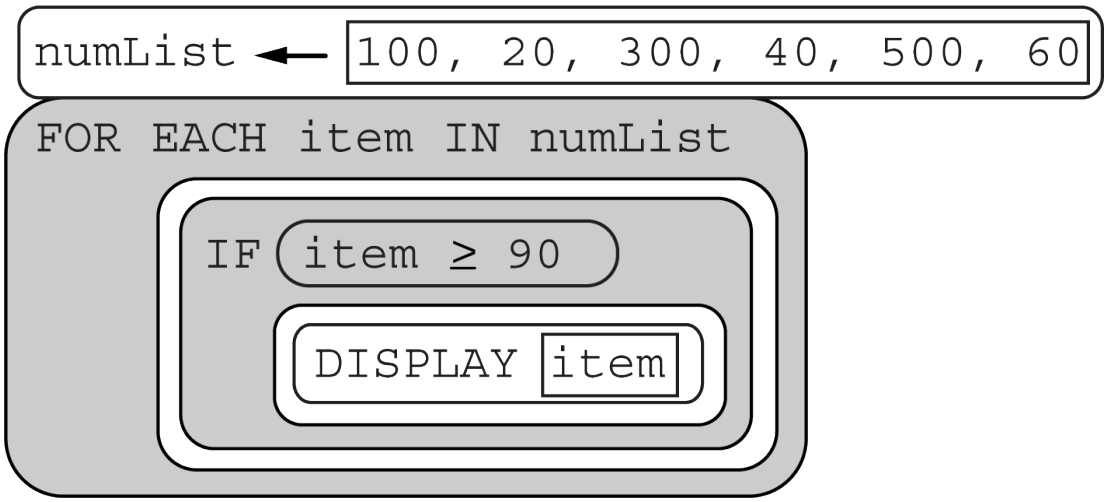
```
REPEAT 2 TIMES
    REPEAT 3 TIMES
        DISPLAY "up"
    DISPLAY "down"
```

(D)

```
REPEAT 3 TIMES
    REPEAT 2 TIMES
        DISPLAY "up"
    DISPLAY "down"
```

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

40. Consider the following code segment.



What is displayed as a result of executing the code segment?

(A) `1 3 5`

(B) `5 3 1`

(C) `100 300 500`

(D) `500 300 100`

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

41. 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

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

42. 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

43. 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.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

44. 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]`

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

45. 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

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

46. There are 32 students standing in a classroom. Two different algorithms are given for finding the average height of the students.

Algorithm A

Step 1: All students stand.

Step 2: A randomly selected student writes his or her height on a card and is seated.

Step 3: A randomly selected standing student adds his or her height to the value on the card, records the new value on the card, and is seated. The previous value on the card is erased.

Step 4: Repeat step 3 until no students remain standing.

Step 5: The sum on the card is divided by 32. The result is given to the teacher.

Algorithm B

Step 1: All students stand.

Step 2: Each student is given a card. Each student writes his or her height on the card.

Step 3: Standing students form random pairs at the same time. Each pair adds the numbers written on their cards and writes the result on one student's card; the other student is seated. The previous value on the card is erased.

Step 4: Repeat step 3 until one student remains standing.

Step 5: The sum on the last student's card is divided by 32. The result is given to the teacher.

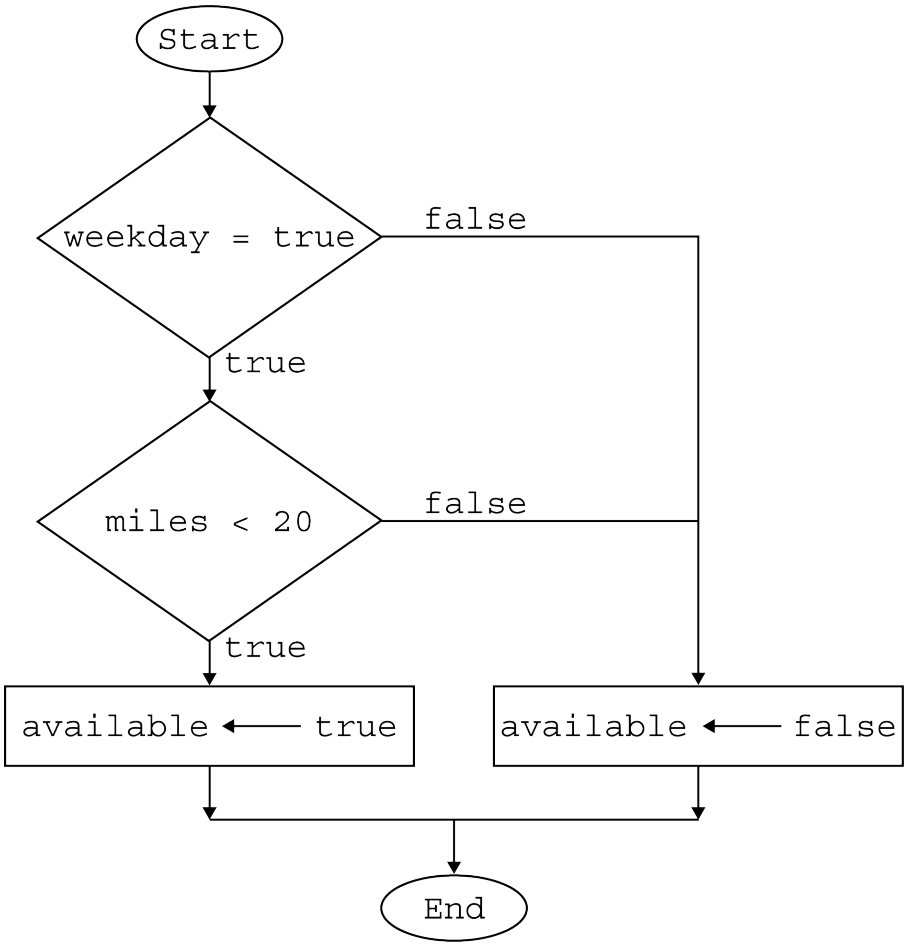
Which of the following statements is true?

(A) Algorithm A always calculates the correct average, but Algorithm B does not.
(B) Algorithm B always calculates the correct average, but Algorithm A does not.
(C) Both Algorithm A and Algorithm B always calculate the correct average.
(D) Neither Algorithm A nor Algorithm B calculates the correct average.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

47. A flowchart is a way to visually represent an algorithm. The flowchart below is used by an application to set the Boolean variable `available` to `true` under certain conditions. The flowchart uses the Boolean variable `weekday` and the integer variable `miles`.

Block	Explanation
Oval	The start or end of the algorithm
Diamond	A conditional or decision step, where execution proceeds to the side labeled `true` if the condition is true and to the side labeled `false` otherwise
Rectangle	One or more processing steps, such as a statement that assigns a value to a variable



Which of the following statements is equivalent to the algorithm in the flowchart?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

(A) 

(B) 

(C) 

(D) 

48. In the program below, the initial value of *x* is 5 and the initial value of *y* is 10.

```
IF (x < 0)
{
   DISPLAY ("Foxtrot")
}
ELSE
{
   IF (x > y)
   {
      DISPLAY ("Hotel")
   }
   ELSE
   {
      IF (y > 0)
      {
         DISPLAY ("November")
      }
      ELSE
      {
         DISPLAY ("Yankee")
      }
   }
}
```

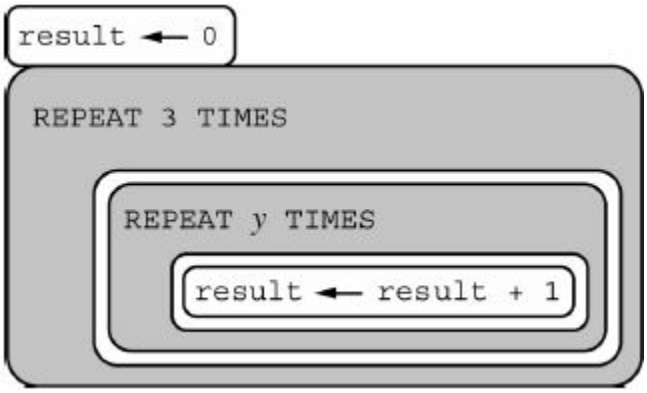
What is displayed as a result of running the program?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

(A) Foxtrot
(B) Hotel
(C) November
(D) Yankee

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.

In the program below, *y* is a positive integer (e.g., 1, 2, 3, …).



What is the value of `result` after running the program?

(A) $y + 3$
(B) $3y$
(C) y^3
(D) 3^y

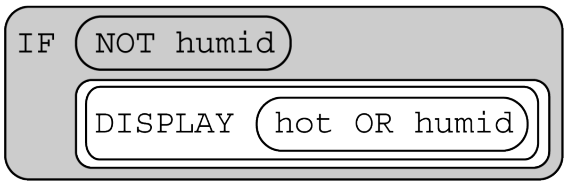
50. Assume that the Boolean variable `hot` is assigned the value `true` and the Boolean variable `humid` is assigned the value `false`. Which of the following will display the value `true` ?

Select two answers.

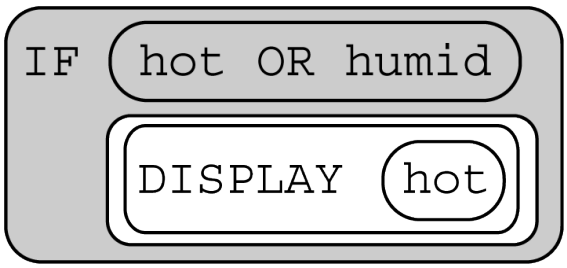
AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

A

B



C



D

51. Consider the following code segment with an integer variable `num`.

```
IF(num > 0)
{
     DISPLAY("positive")
}
IF(num < 0)
{
     DISPLAY("negative")
}
IF(num = 0)
{
     DISPLAY("zero")
}
```

Which of the following code segments is equivalent to the code segment above?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

(A)

```
IF(num < 0)
{
     DISPLAY("negative")
}
ELSE
{
     DISPLAY("positive")
}
IF(num = 0)
{
     DISPLAY("zero")
}
```

(B)

```
IF(num < 0)
{
     DISPLAY("negative")
}
ELSE
{
     IF(num = 0)
     {
         DISPLAY("zero")
     }
     ELSE
     {
         DISPLAY("positive")
     }
}
```

(C)

```
IF(num ≤ 0)
{
     DISPLAY("negative")
}
ELSE
{
     IF(num = 0)
     {
         DISPLAY("zero")
     }
     ELSE
     {
         DISPLAY("positive")
     }
}
```

(D)

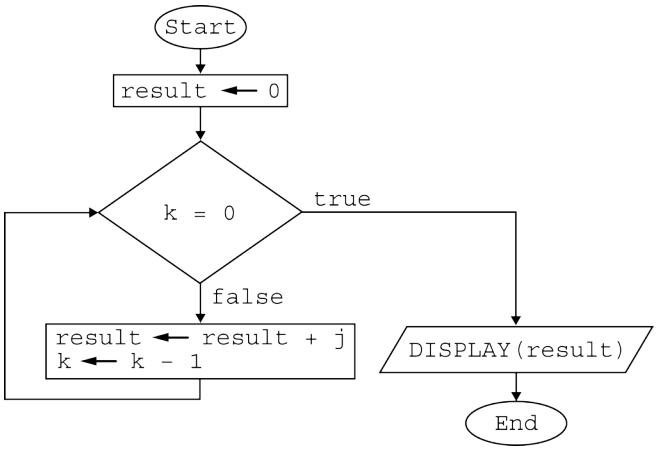
```
IF(num ≤ 0)
{
     DISPLAY("negative")
}
IF(num = 0)
{
     DISPLAY("zero")
}
ELSE
{
     DISPLAY("positive")
}
```

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

A flowchart provides a way to visually represent an algorithm and uses the following building blocks.

Block	Explanation
Oval	The start or end of the algorithm
Rectangle	One or more processing steps, such as a statement that assigns a value to a variable
Diamond	A conditional or decision step, where execution proceeds to the side labeled `true` if the condition is true and to the side labeled `false` otherwise
Parallelogram	Displays a message

In the flowchart below, assume that `j` and `k` are assigned integer values.



52. Which of the following initial values of `j` and `k` will cause the algorithm represented in the flowchart to result in an infinite loop?

(A) `j = -5, k = 5`

(B) `j = 0, k = 5`

(C) `j = 5, k = 0`

(D) `j = 5, k = -5`

53. Based on the algorithm represented in the flowchart, what value is displayed if `j` has the initial value `3` and `k` has the initial value `4` ?

(A) `7`

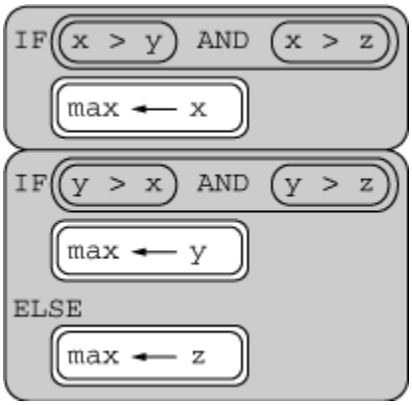
(B) `9`

(C) `10`

(D) `12`

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

54. 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?

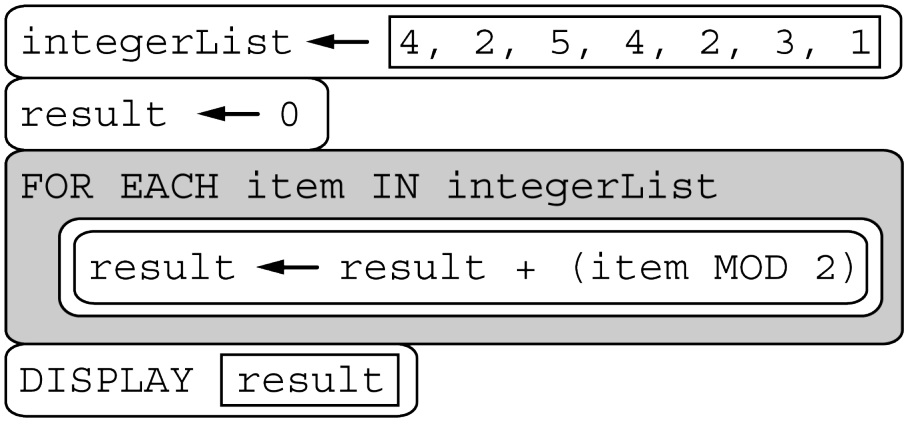
(A) `x = 1, y = 2, z = 3`

(B) `x = 1, y = 3, z = 2`

(C) `x = 2, y = 3, z = 1`

(D) `x = 3, y = 2, z = 1`

55. Consider the following code segment.



What value is displayed as a result of executing the code segment?

(A) `3`

(B) `4`

(C) `9`

(D) `12`

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

56. Shoppers at a mall were asked whether they preferred wearing gloves or mittens in cold weather. Shoppers' preferences were stored in the list `voteList` as strings, with the string `"Gloves"` representing a preference for gloves and the string `"Mittens"` representing a preference for mittens.

The following code segment is intended to traverse the list and display the number of shoppers who chose gloves and the number of shoppers who chose mittens.

```
numGlovesVotes ← 0
numMittensVotes ← 0
<MISSING CODE>
{
     IF(vote = "Gloves")
     {
          numGlovesVotes ← numGlovesVotes + 1
     }
     ELSE
     {
          numMittensVotes ← numMittensVotes + 1
     }
}
DISPLAY(numGlovesVotes)
DISPLAY(" shoppers chose gloves and")
DISPLAY(numMittensVotes)
DISPLAY(" shoppers chose mittens.")
```

Which of the following should replace `<MISSING CODE>` so that the code segment works as intended?

(A) `IF(vote ≤ LENGTH(voteList))`

(B) `FOR EACH vote IN voteList`

(C) `REPEAT LENGTH(voteList) TIMES`

(D) `REPEAT UNTIL(vote > LENGTH(voteList))`

57. Consider the following code segment. Assume that `index1` is a number between `1` and `LENGTH(theList)`, inclusive, and `index2` is a number between `2` and `LENGTH(theList) - 1`, inclusive.

```
theList ← [9, -1, 5, 2, 4, 8]
x ← theList[index1] + theList[index2]
```

What is the largest possible value that the variable `x` can have after the code segment executes?

(A) `17`

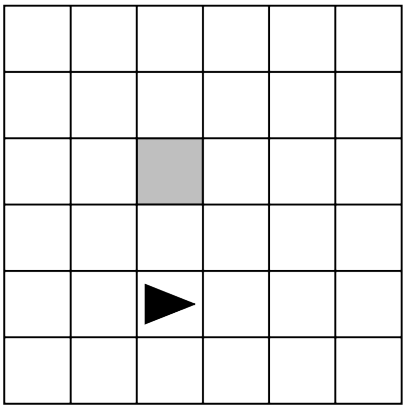
(B) `14`

(C) `11`

(D) `4`

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

58. The following grid contains a robot represented as a triangle, which is initially facing right.



The following code segment is intended to move the robot to the gray square.

```
<MISSING STATEMENT>
{
     REPEAT 4 TIMES
     {
          MOVE_FORWARD()
          ROTATE_RIGHT()
     }
     ROTATE_LEFT()
     MOVE_FORWARD()
     ROTATE_RIGHT()
}
```

Which of the following can be used as a replacement for `<MISSING STATEMENT>` so that the code segment works as intended?

(A) `REPEAT 1 TIMES`

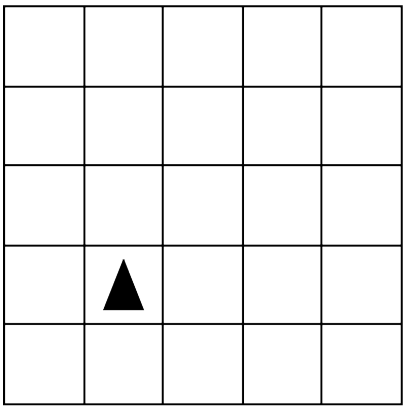
(B) `REPEAT 2 TIMES`

(C) `REPEAT 3 TIMES`

(D) `REPEAT 4 TIMES`

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

59. The following question uses a robot in a grid of squares. The robot is represented as a triangle, which is initially facing toward the top of the grid.



The following code segment moves the robot around the grid. Assume that `n` is a positive integer.

```
Line 1: count ← 0
Line 2: REPEAT n TIMES
Line 3: {
Line 4:     REPEAT 2 TIMES
Line 5:     {
Line 6:         MOVE_FORWARD()
Line 7:     }
Line 8:     ROTATE_RIGHT()
Line 9: }
```

Consider the goal of modifying the code segment to count the number of squares the robot visits before execution terminates. Which of the following modifications can be made to the code segment to correctly count the number of squares the robot moves to?

(A) Inserting the statement `count ← count + 1` between line 6 and line 7

(B) Inserting the statement `count ← count + 2` between line 6 and line 7

(C) Inserting the statement `count ← count + 1` between line 8 and line 9

(D) Inserting the statement `count ← count + n` between line 8 and line 9

60. A code segment is intended to transform the list `utensils` so that the last element of the list is moved to the beginning of the list.

For example, if `utensils` initially contains `["fork", "spoon", "tongs", "spatula", "whisk"]`, it should contain `["whisk", "fork", "spoon", "tongs", "spatula"]` after executing the code segment.

Which of the following code segments transforms the list as intended?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

(A)
```
len ← LENGTH(utensils)
temp ← utensils[len]
REMOVE(utensils, len)
APPEND(utensils, temp)
```

(B)
```
len ← LENGTH(utensils)
REMOVE(utensils, len)
temp ← utensils[len]
APPEND(utensils, temp)
```

(C)
```
len ← LENGTH(utensils)
temp ← utensils[len]
REMOVE(utensils, len)
INSERT(utensils, 1, temp)
```

(D)
```
len ← LENGTH(utensils)
REMOVE(utensils, len)
temp ← utensils[len]
INSERT(utensils, 1, temp)
```

61. A game is played by moving a game piece left or right along a horizontal game board. The board consists of spaces of various colors, as shown. The circle represents the initial location of the game piece.

Yellow	Black	Green	Green	Red	Yellow	Black	Black	Yellow	Black
									●

The following algorithm indicates how the game is played. The game continues until the game is either won by landing on the red space or lost when the piece moves off either end of the board.

Step 1: Place a game piece on a space that is not red and set a counter to 0.

Step 2: If the game piece is on a yellow space, move the game piece 3 positions to the left and go to step 3. Otherwise, if the game piece is on a black space, move the game piece 1 position to the left and go to step 3. Otherwise, if the game piece is on a green space, move the game piece 2 positions to the right and go to step 3.

Step 3: Increase the value of the counter by 1.

Step 4: If game piece is on the red space or moved off the end of the game board, the game is complete. Otherwise, go back to step 2.

If a game is begun by placing the game piece on the rightmost black space for step 1, what will be the value of the counter at the end of the game?

(A) 2

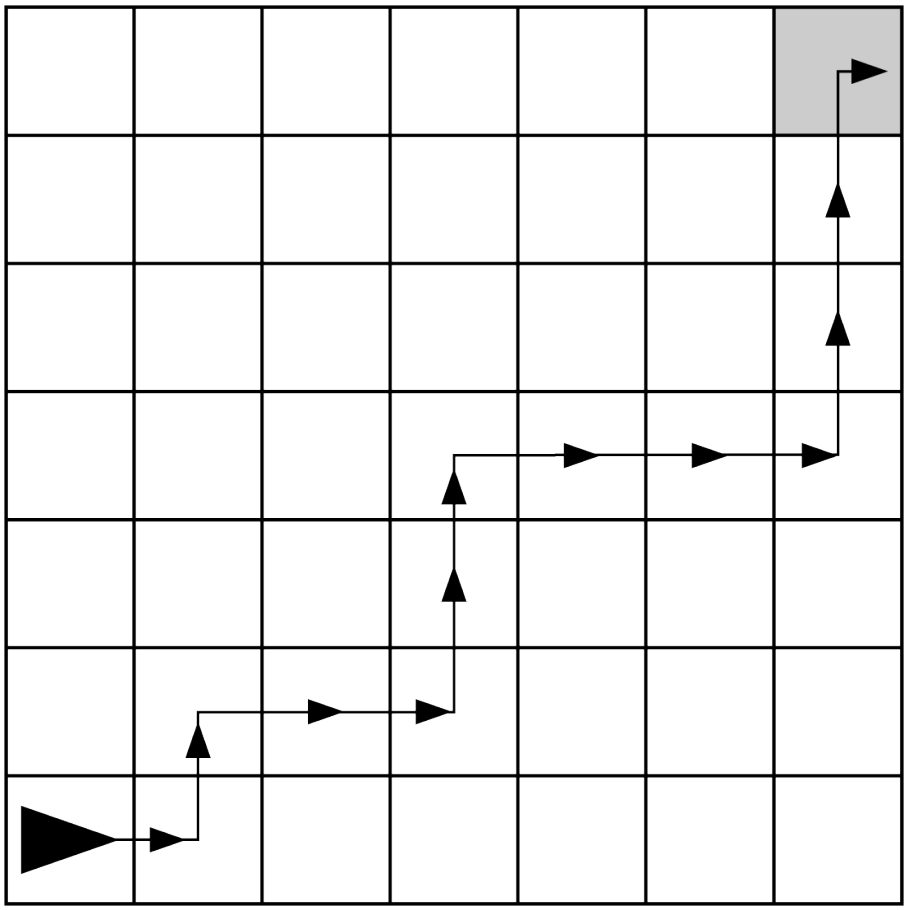
(B) 3

(C) 4

(D) 5

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

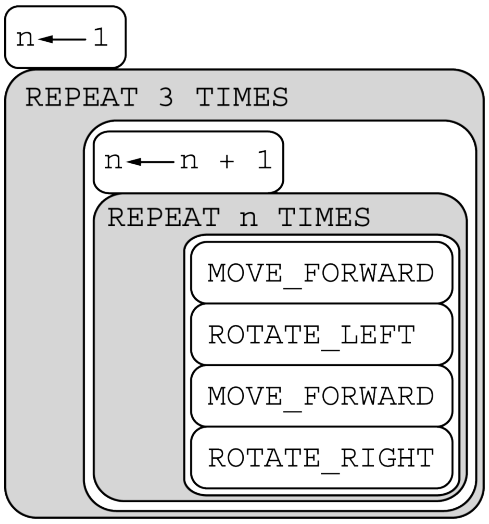
62. The following grid contains a robot represented as a triangle. The robot is initially facing right.



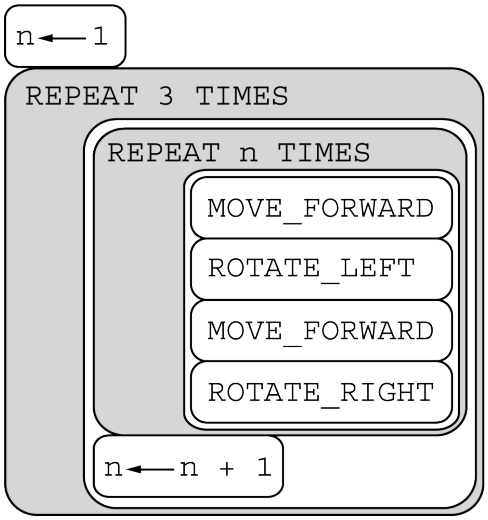
Which of the following code segments can be used to move the robot to the gray square along the path indicated by the arrows?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

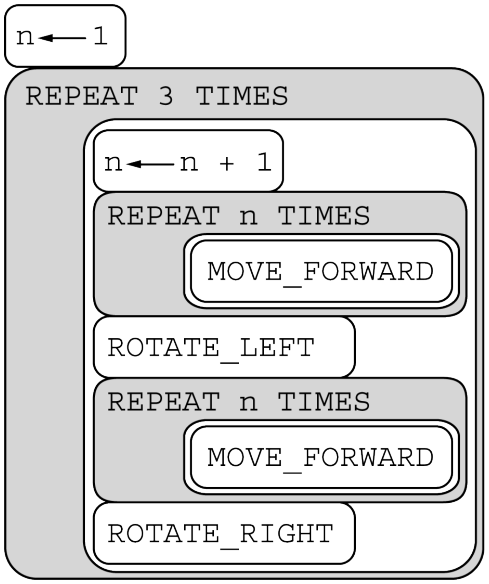
(A)



(B)

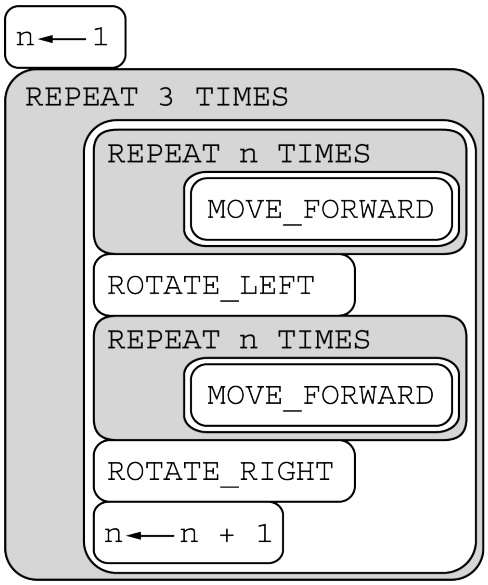


(C)



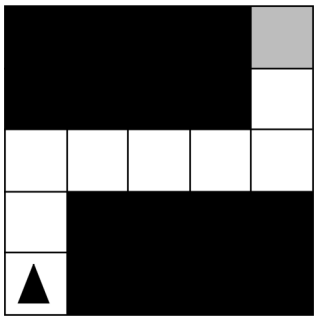
AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

(D)

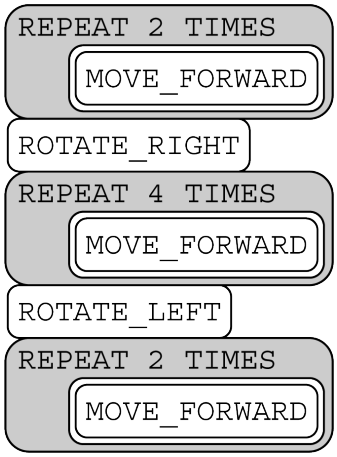


AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

63. The following grid contains a robot represented as a triangle, which is initially in the bottom-left square of the grid and facing the top of the grid. The robot can move into a white or a gray square but cannot move into a black region.



The following code segment implements an algorithm that moves the robot from its initial position to the gray square and facing the top of the grid.



When the robot reaches the gray square, it turns around and faces the bottom of the grid. Which of the following changes, if any, should be made to the code segment to move the robot back to its original position in the bottom-left square of the grid and facing toward the bottom of the grid?

(A) Interchange the `ROTATE_RIGHT` and the `ROTATE_LEFT` blocks.

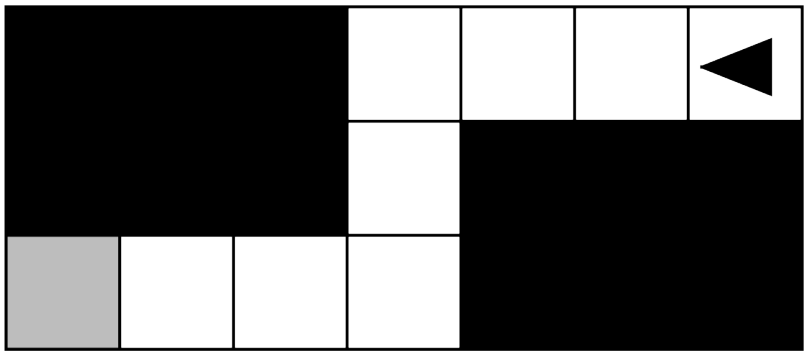
(B) Replace `ROTATE_RIGHT` with `ROTATE_LEFT`.

(C) Replace `ROTATE_LEFT` with `ROTATE_RIGHT`.

(D) No change is needed; the algorithm is correct as is.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

64. The following grid contains a robot represented as a triangle, which is 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.



Which of the following code segments can be used to move the robot to the gray square?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

(A)

```
REPEAT 3 TIMES
{
     MOVE_FORWARD()
}
REPEAT 2 TIMES
{
     MOVE_FORWARD()
}
REPEAT 3 TIMES
{
     MOVE_FORWARD()
}
```

(B)

```
REPEAT 8 TIMES
{
     MOVE_FORWARD()
}
```

(C)

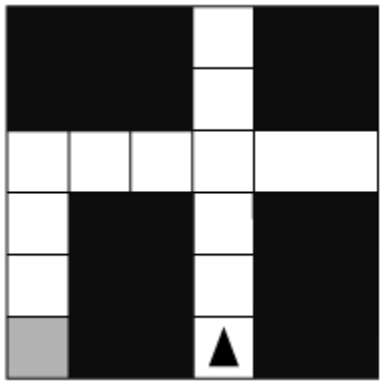
```
REPEAT 3 TIMES
{
     MOVE_FORWARD()
}
ROTATE_LEFT()
REPEAT 2 TIMES
{
     MOVE_FORWARD()
}
ROTATE_LEFT()
REPEAT 3 TIMES
{
     MOVE_FORWARD()
}
```

(D)

```
REPEAT 3 TIMES
{
     MOVE_FORWARD()
}
ROTATE_LEFT()
REPEAT 2 TIMES
{
     MOVE_FORWARD()
}
ROTATE_RIGHT()
REPEAT 3 TIMES
{
     MOVE_FORWARD()
}
```

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

65. 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()
}
```

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

66. 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 ticket prices at a movie theater are given below.

Type of Ticket	Price (in dollars)
Regular	12
Child (ages 12 and below)	9
Senior (ages 60 and above)	9

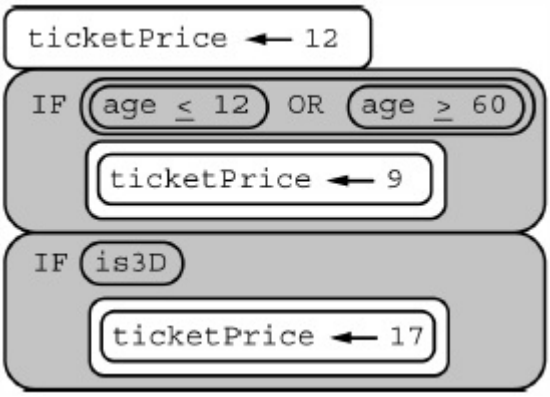
Additional $5 fee for 3-D movies

A programmer is creating an algorithm to set the value of `ticketPrice` based on the information in the table. The programmer uses the integer variable `age` for the age of the moviegoer. The Boolean variable `is3D` is `true` when the movie is 3-D and `false` otherwise.

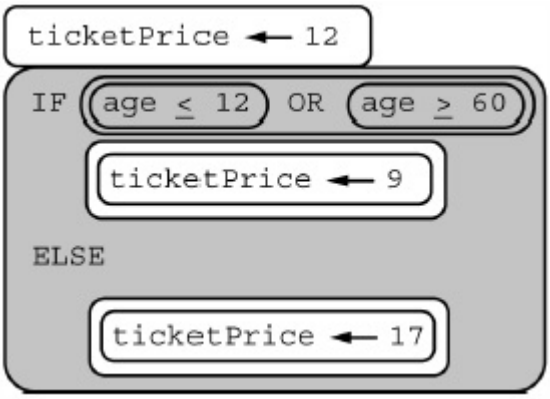
Which of the following code segments correctly sets the value of `ticketPrice` ?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

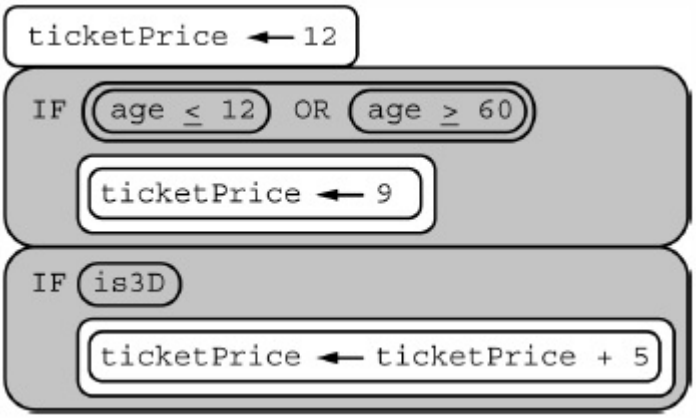
(A)



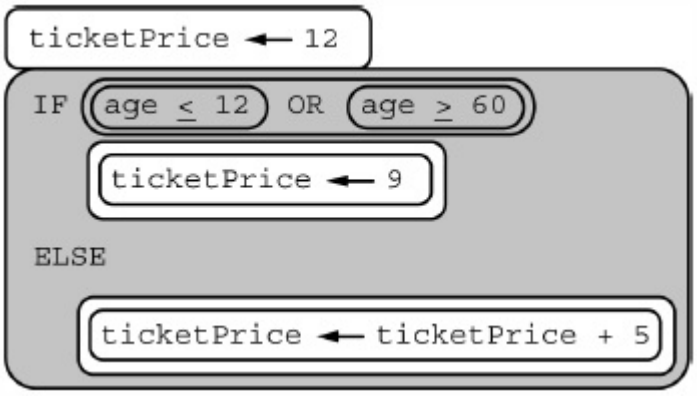
(B)



(C)

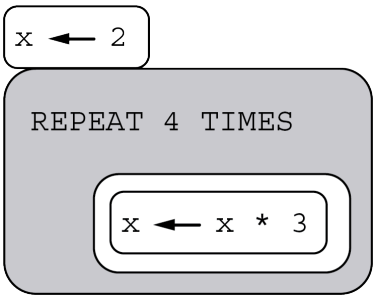


(D)



AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

67. Consider the following program.



Which of the following expressions represents the value stored in the variable `x` as a result of executing the program?

(A) `2 * 3 * 3 * 3`

(B) `2 * 4 * 4 * 4`

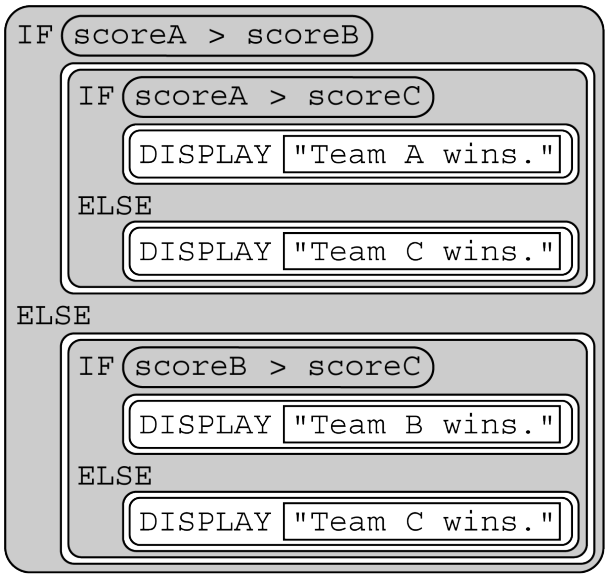
(C) `2 * 3 * 3 * 3 * 3`

(D) `2 * 4 * 4 * 4 * 4`

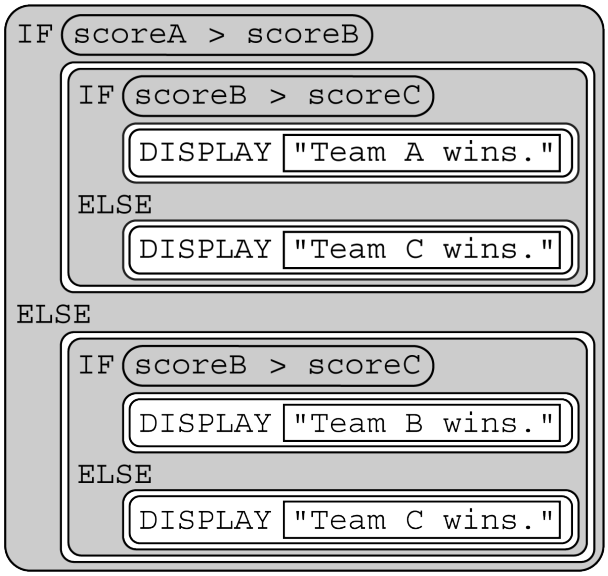
68. Three teams (Team A, Team B, and Team C) are participating in a trivia contest. Let `scoreA` represent the number of correct questions for Team A, `scoreB` represent the number of correct questions for Team B, and `scoreC` represent the number of correct questions for Team C. Assuming no two teams get the same number of correct questions, which of the following code segments correctly displays the team with the highest number of correct questions?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

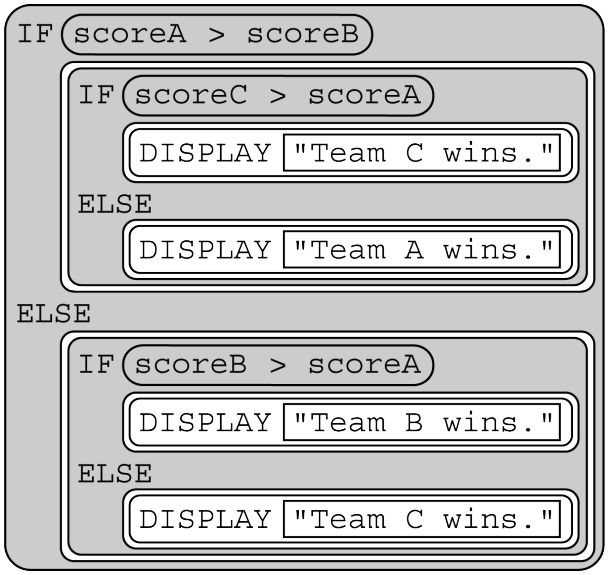
(A)



(B)

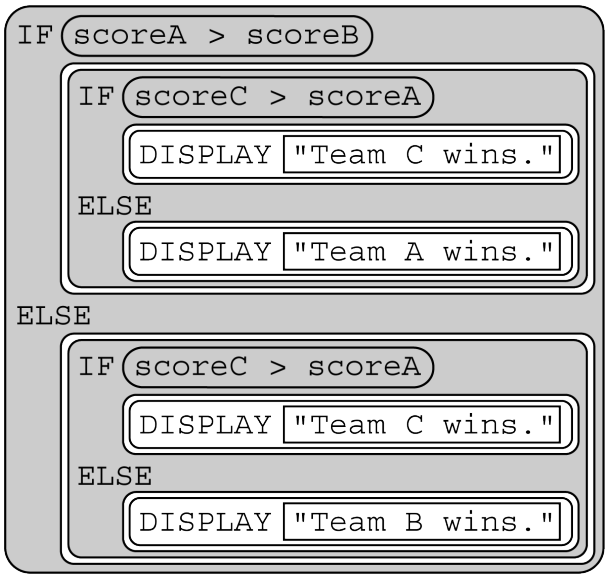


(C)



AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

(D)



AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

69. A numeric test score is to be converted to a letter grade of A, B, or C according to the following rules: A score greater than 90 is considered an A; a score between 80 and 90, inclusive, is considered a B; and any other score is considered a C.

Which of the following code segments will assign the correct letter grade to `grade` based on the value of the variable `score`?

I.

```
grade ← "C"
IF (score > 90)
    grade ← "A"
ELSE
    grade ← "B"
```

II.

```
IF (score > 90)
    grade ← "A"
ELSE
    IF (score ≥ 80)
        grade ← "B"
    ELSE
        grade ← "C"
```

III.

```
IF (score < 80)
    grade ← "C"
ELSE
    IF (score ≤ 90)
        grade ← "B"
    ELSE
        grade ← "A"
```

(A) II only

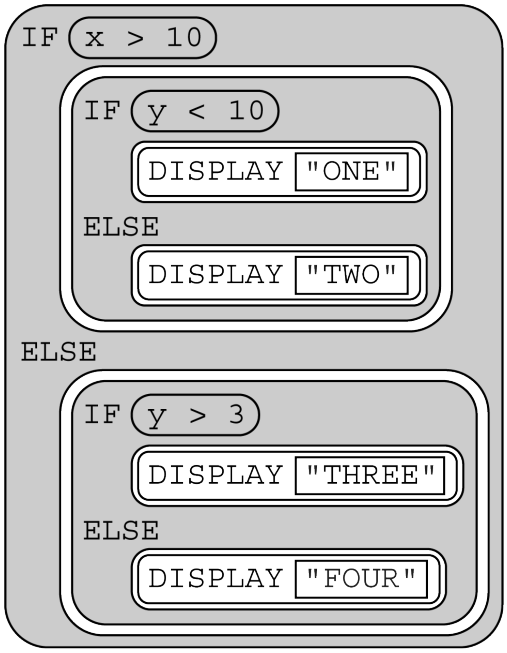
(B) I and II only

(C) I and III only

(D) II and III only

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

70. Consider the following code segment with integer variables `x` and `y`.



If `x` has a value of `7` and `y` has a value of `20`, what is displayed as a result of executing the code segment?

(A) `ONE`

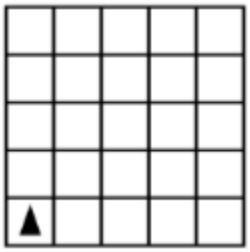
(B) `TWO`

(C) `THREE`

(D) `FOUR`

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

71. The question below uses a robot in a grid of squares. The robot is represented as a triangle, which is initially in the bottom-left square of the grid and facing toward the top of the grid.

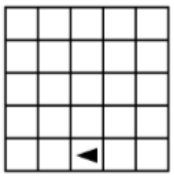


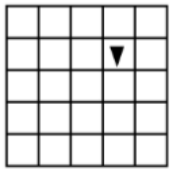
Code for the procedure *Mystery* is shown below. Assume that the parameter *p* has been assigned a positive integer value (e.g., 1, 2, 3, …).

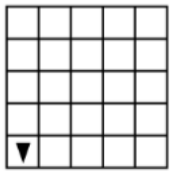
```
PROCEDURE Mystery (p)
    REPEAT p TIMES
        MOVE_FORWARD
        MOVE_FORWARD
        ROTATE_RIGHT
```

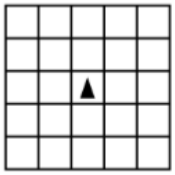
Which of the following shows a possible result of calling the procedure?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

(A) 

(B) 

(C) 

(D) 

72. In the following procedure, the parameter `n` is an integer greater than `2`.

```
PROCEDURE compute(n)
    result ← 1
    j ← 2
    REPEAT UNTIL (j > n)
        result ← result + j
        j ← j + 1
    RETURN result
```

Which of the following best describes the value returned by the procedure?

(A) The procedure returns nothing because it will not terminate.

(B) The procedure returns the value of `2 * n`.

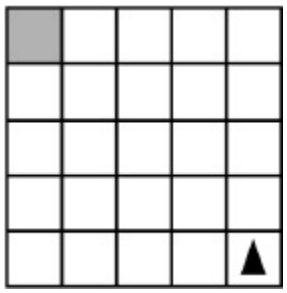
(C) The procedure returns the value of `n * n`.

(D) The procedure returns the sum of the integers from `1` to `n`.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

73. 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 question below uses a robot in a grid of squares. The robot is represented as a triangle, which is initially in the bottom-right square of the grid and facing toward the top of the grid.



Which of the following code segments can be used to move the robot to the gray square?

Select two answers.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

A

```
REPEAT 4 TIMES
{
   MOVE_FORWARD ()
   ROTATE_LEFT ()
   MOVE_FORWARD ()
   ROTATE_RIGHT ()
}
```

B

```
REPEAT 4 TIMES
{
   ROTATE_LEFT ()
   MOVE_FORWARD ()
   MOVE_FORWARD ()
   ROTATE_RIGHT ()
}
```

C

```
REPEAT 2 TIMES
{
   REPEAT 4 TIMES
   {
      MOVE_FORWARD ()
   }
   ROTATE_LEFT ()
}
```

D

```
REPEAT 2 TIMES
{
   REPEAT 2 TIMES
   {
      MOVE_FORWARD ()
      MOVE_FORWARD ()
      ROTATE_LEFT ()
   }
}
```

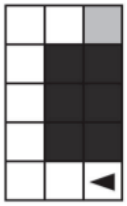
AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

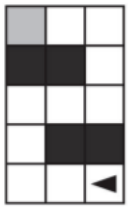
74. The program segment below is intended to move a robot in a grid to a gray square. The program segment uses the procedure *GoalReached*, which evaluates to *true* if the robot is in the gray square and evaluates to *false* otherwise. The robot in each grid is represented as a triangle and is initially facing left. The robot can move into a white or gray square but cannot move into a black region.

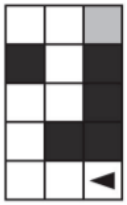
```
REPEAT UNTIL (GoalReached ())
{
   IF (CAN_MOVE (forward))
   {
      MOVE_FORWARD ()
   }
   IF (CAN_MOVE (right))
   {
      ROTATE_RIGHT ()
   }
   IF (CAN_MOVE (left))
   {
      ROTATE_LEFT ()
   }
}
```

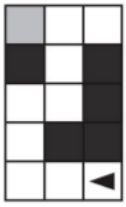
For which of the following grids does the program NOT correctly move the robot to the gray square?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

(A) 

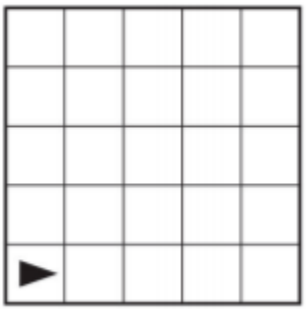
(B) 

(C) 

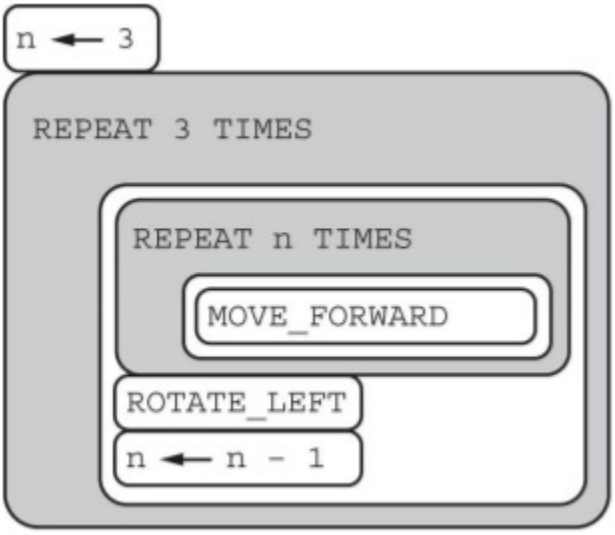
(D) 

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

75. The following question uses a robot in a grid of squares. The robot is represented as a triangle, which is initially in the bottom left square of the grid and facing right.

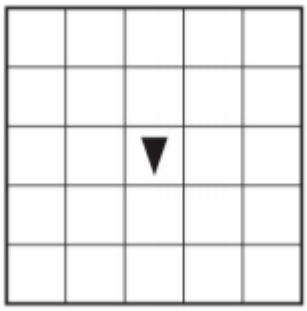


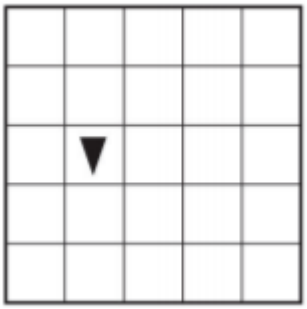
Consider the following code segment, which moves the robot in the grid.

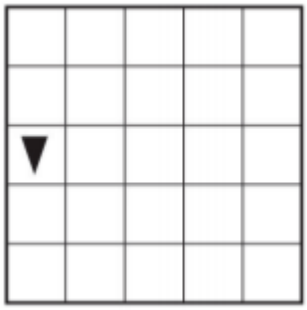


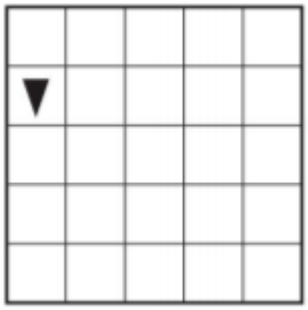
Which of the following shows the location of the robot after running the code segment?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

(A) 

(B) 

(C) 

(D) 

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

76. Ticket prices for a science museum are shown in the following table.

Type of Ticket	General Admission Cost (in dollars)	Guided Tour Cost (in dollars)
Regular (ages 13 and up)	8	10
Child (ages 12 and below)	6	8

A programmer is creating an algorithm to display the cost of a ticket based on the information in the table. The programmer uses the integer variable `age` for the age of the ticket recipient. The Boolean variable `includesTour` is `true` when the ticket is for a guided tour and is `false` when the ticket is for general admission.

Which of the following code segments correctly displays the cost of a ticket?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

(A)
```
cost ← 6
IF ((age > 12) OR includesTour)
{
     cost ← cost + 2
}
DISPLAY (cost)
```

(B)
```
cost ← 6
IF (age > 12)
{
     cost ← cost + 2
}
IF (includesTour)
{
     cost ← cost + 2
}
DISPLAY (cost)
```

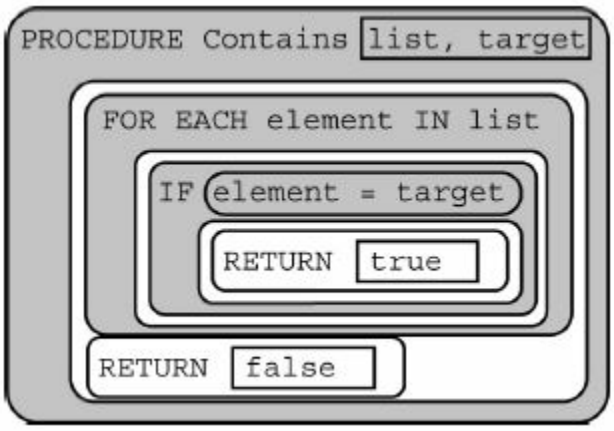
(C)
```
cost ← 6
IF (age > 12)
{
     IF (includesTour)
     {
         cost ← cost + 2
     }
}
DISPLAY (cost)
```

(D)
```
cost ← 6
IF (age > 12)
{
     cost ← cost + 2
}
ELSE
{
     IF (includesTour)
     {
         cost ← cost + 2
     }
}
DISPLAY (cost)
```

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

77. 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 procedure below searches for the value `target` in `list`. It returns `true` if `target` is found and returns `false` otherwise.



Which of the following are true statements about the procedure?

I. It implements a binary search.

II. It implements a linear search.

III. It only works as intended when `list` is sorted.

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

78. In the following statement, `val1`, `val2`, and `result` are Boolean variables.

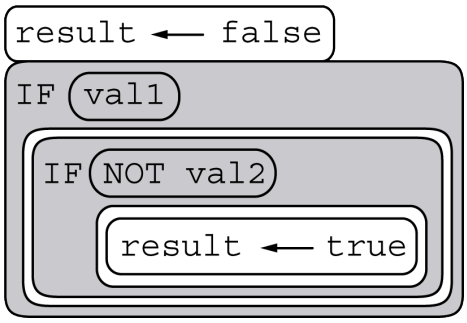
```
result ← val1 AND (NOT val2)
```

Which of the following code segments produce the same result as the statement above for all possible values of `val1` and `val2`?

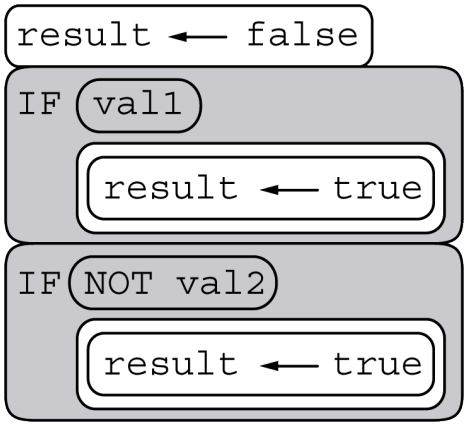
Select two answers.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

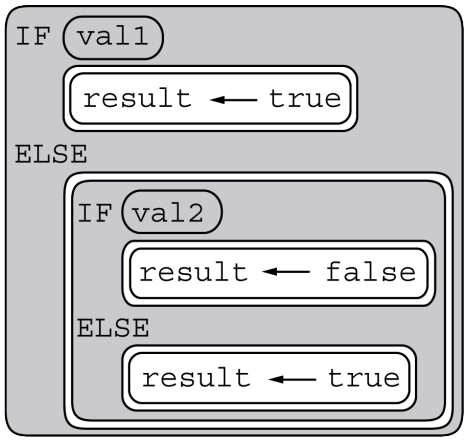
A



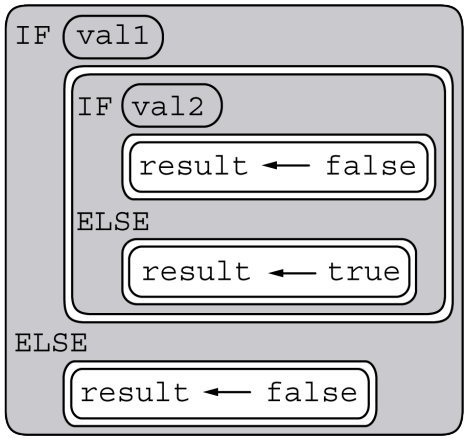
B



C



D



AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

79. In a certain video game, players are awarded bonus points at the end of a level based on the value of the integer variable `timer`. The bonus points are awarded as follows.

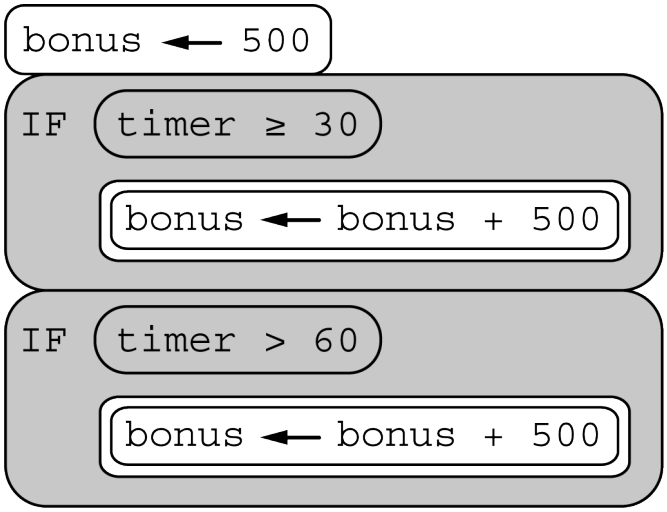
If `timer` is less than `30`, then `500` bonus points are awarded.
If `timer` is between `30` and `60` inclusive, then `1000` bonus points are awarded.
If `timer` is greater than `60`, then `1500` bonus points are awarded.

Which of the following code segments assigns the correct number of bonus points to `bonus` for all possible values of `timer`?

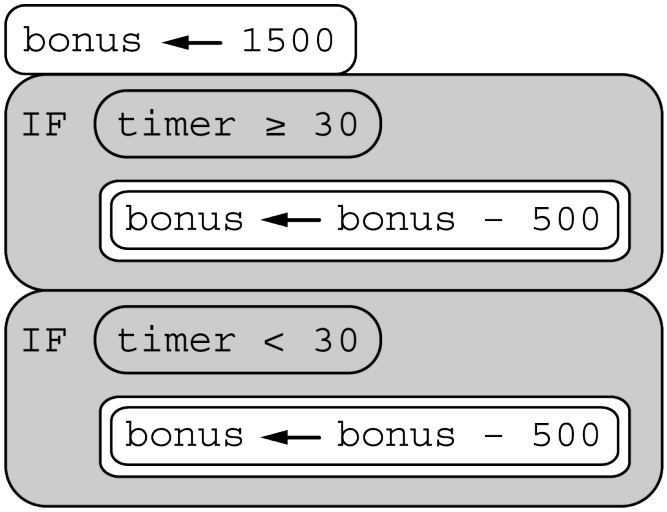
Select two answers.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

A

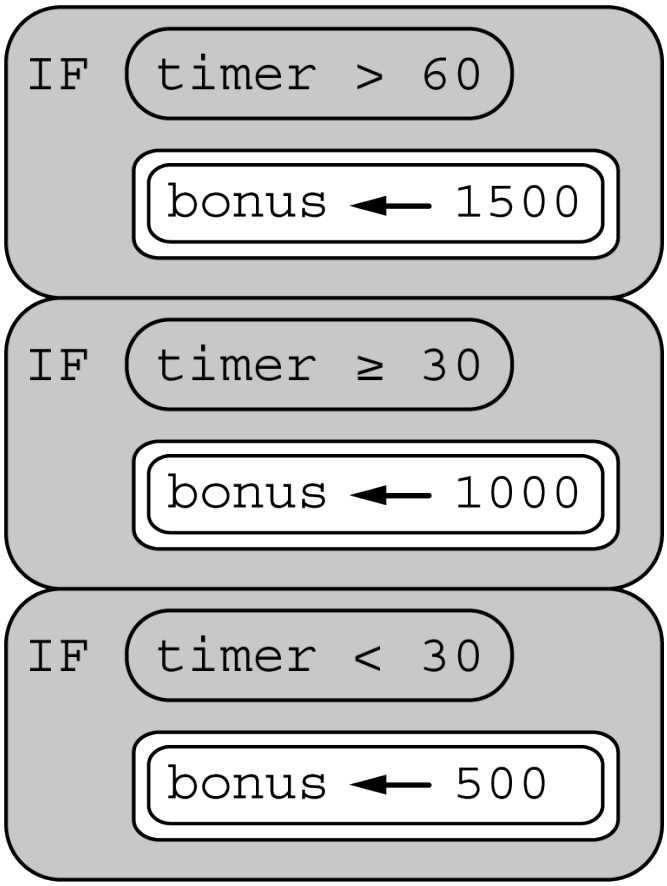


B

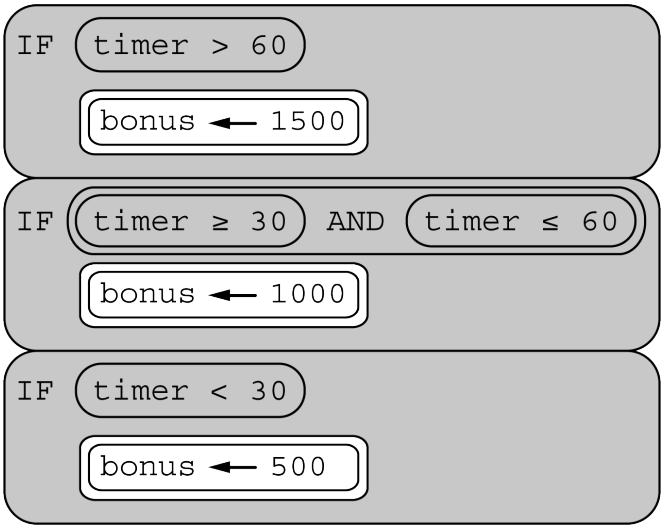


AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

C



D



80. In a certain video game, the variable `maxPS` represents the maximum possible score a player can earn. The maximum possible score depends on the time it takes the player to complete the game. The value of `maxPS` should be `30` if `time` is greater than `120` and `50` otherwise.

Which of the following code segments correctly sets the value of `maxPS` based on the value of `time` ?

Select two answers.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

A

```
maxPS ← 50
IF (time > 120)
    maxPS ← 30
```

B

```
IF (time > 120)
    maxPS ← 30
maxPS ← 50
```

C

```
IF (time > 120)
    maxPS ← 50
ELSE
    maxPS ← 30
```

D

```
IF (time > 120)
    maxPS ← 30
ELSE
    maxPS ← 50
```

81. Consider the following code segment, which is intended to store ten consecutive even integers, beginning with `2`, in the list `evenList`. Assume that `evenList` is initially empty.

```
i ← 1
REPEAT 10 TIMES
{
     <MISSING CODE>
}
```

Which of the following can be used to replace `<MISSING CODE>` so that the code segment works as intended?

(A)
```
APPEND(evenList, i)
i ← i + 2
```

(B)
```
i ← i + 2
APPEND(evenList, i)
```

(C)
```
APPEND(evenList, 2 * i)
i ← i + 1
```

(D)
```
i ← i + 1
APPEND(evenList, 2 * i)
```

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

82. The code segment below uses the procedure *IsFound (list, item)*, which returns *true* if *item* appears in *list* and returns *false* otherwise. The list *resultList* is initially empty.

```
FOR EACH item IN inputList1
{
   IF (IsFound (inputList2, item)
   {
      APPEND (resultList, item)
   }
}
```

Which of the following best describes the contents of *resultList* after the code segment is executed?

(A) All elements in *inputList1* followed by all elements in *inputList2*

(B) Only elements that appear in both *inputList1* and *inputList2*

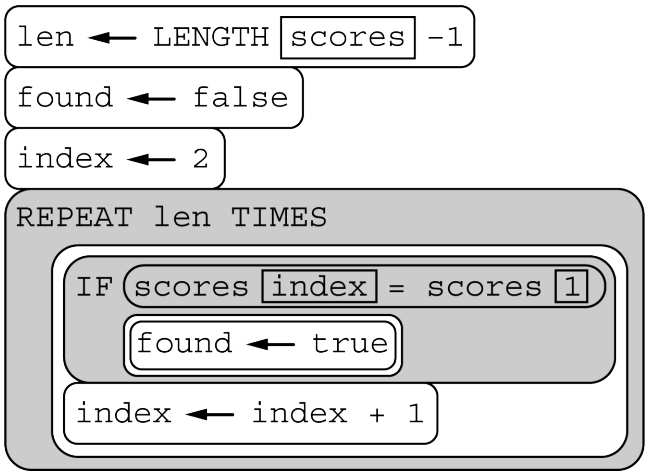
(C) Only elements that appear in either *inputList1* or *inputList2* but not in both lists

(D) Only elements that appear in *inputList1* but not in *inputList2*

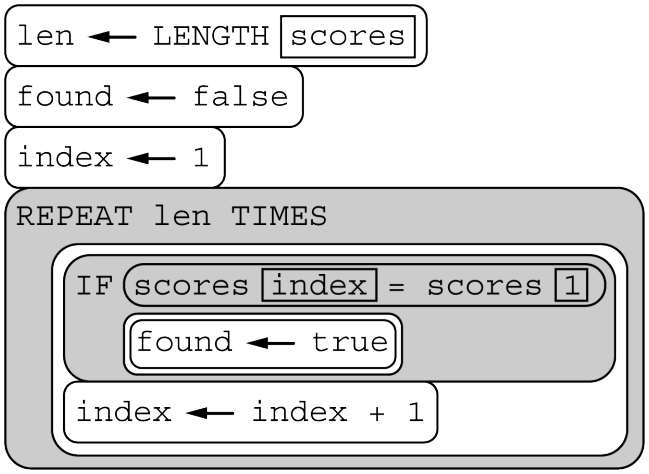
83. A teacher stores the most recent quiz scores for her class in the list `scores`. The first element in the list holds the maximum possible number of points that can be awarded on the quiz, and each remaining element holds one student's quiz score. Assume that `scores` contains at least two elements. Which of the following code segments will set the variable `found` to `true` if at least one student scored the maximum possible number of points on the quiz and will set `found` to `false` otherwise?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

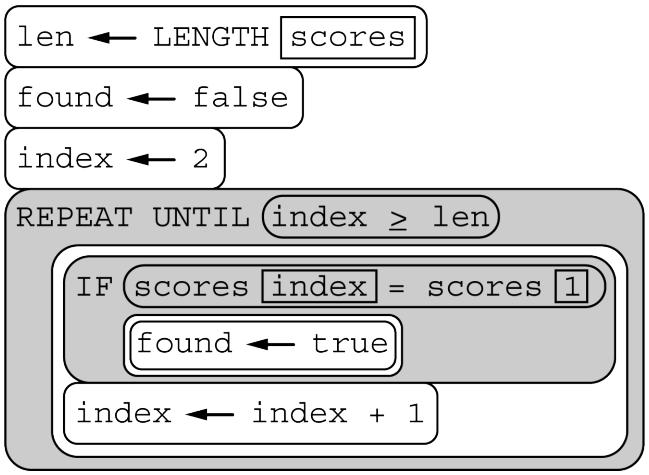
(A)



(B)

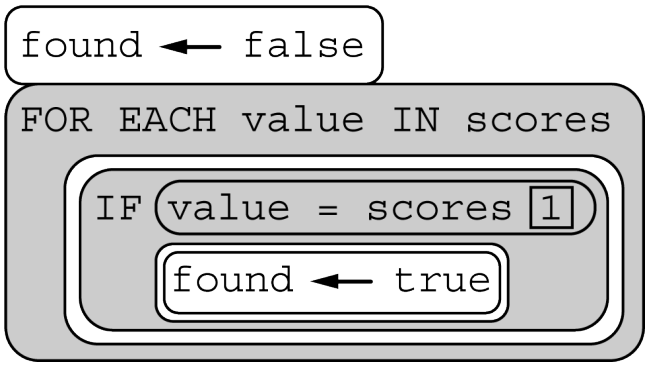


(C)



AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

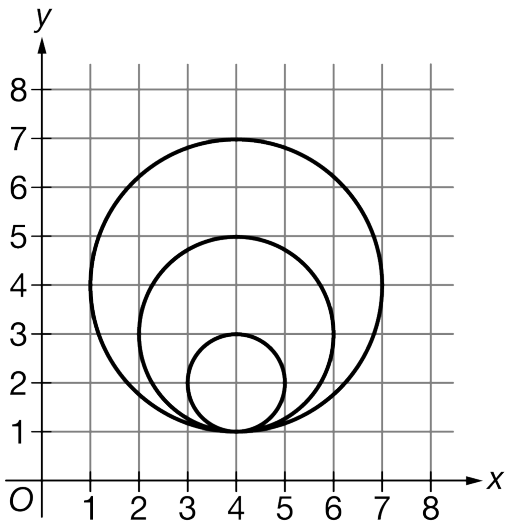
(D)



84. Consider the following procedure.

Procedure Call	Explanation
`drawCircle(xPos, yPos, rad)`	Draws a circle on a coordinate grid with center `(xPos, yPos)` and radius `rad`

The `drawCircle` procedure is to be used to draw the following figure on a coordinate grid.



Which of the following code segments can be used to draw the figure?

Select two answers.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

A

```
x ← 4
y ← 1
r ← 0
REPEAT 3 TIMES
{
     drawCircle(x, y, r)
     r ← r + 1
     y ← y + 1
}
```

B

```
x ← 4
y ← 1
r ← 0
REPEAT 3 TIMES
{
     r ← r + 1
     y ← y + 1
     drawCircle(x, y, r)
}
```

C

```
x ← 4
y ← 4
r ← 3
REPEAT 3 TIMES
{
     drawCircle(x, y, r)
     y ← y - 1
     r ← r - 1
}
```

D

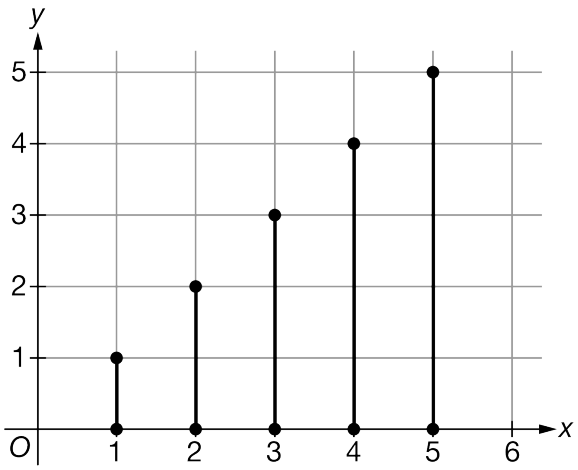
```
x ← 4
y ← 4
r ← 3
REPEAT 3 TIMES
{
     y ← y - 1
     r ← r - 1
     drawCircle(x, y, r)
}
```

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

85. Consider the following procedure.

Procedure Call	Explanation
`drawLine(x1, y1, x2, y2)`	Draws a line segment on a coordinate grid with endpoints at coordinates `(x1, y1)` and `(x2, y2)`

The `drawLine` procedure is to be used to draw the following figure on a coordinate grid.



Which of the following code segments can be used to draw the figure?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

(A)
```
xVal ← 1
yVal ← 0
len ← 1
REPEAT 5 TIMES
{
     drawLine(xVal, yVal, xVal, yVal + len)
     xVal ← xVal + 1
     len ← len + 1
}
```

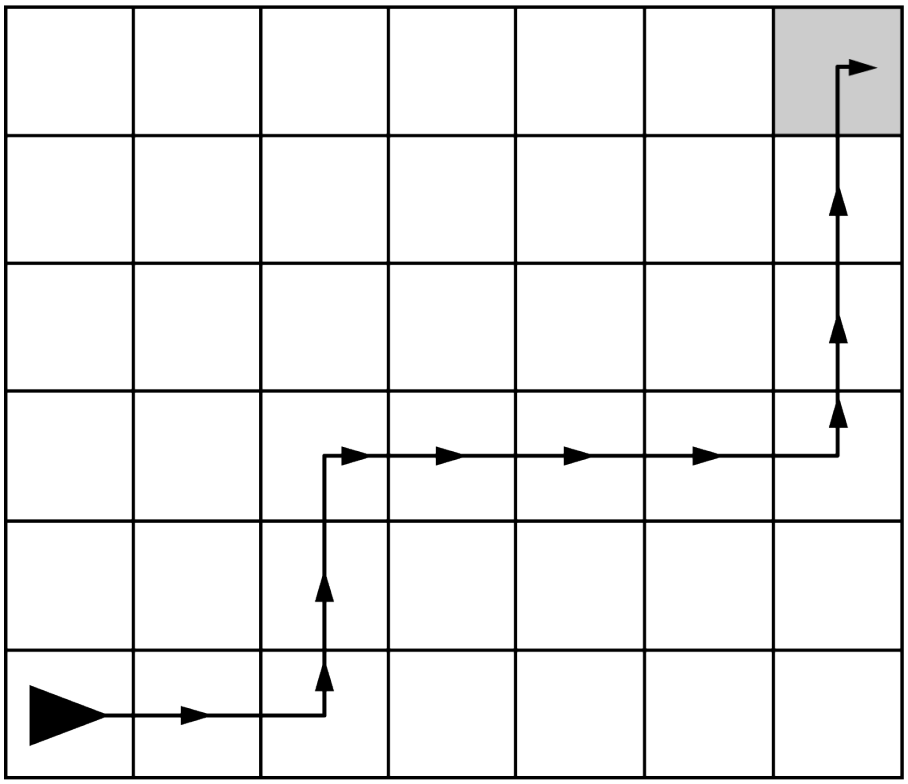
(B)
```
xVal ← 1
yVal ← 0
len ← 1
REPEAT 5 TIMES
{
     drawLine(xVal, yVal, xVal + len, yVal)
     yVal ← yVal + 1
     len ← len + 1
}
```

(C)
```
xVal ← 5
yVal ← 0
len ← 5
REPEAT 5 TIMES
{
     drawLine(xVal, yVal, xVal, yVal + len)
     xVal ← xVal - 1
}
```

(D)
```
xVal ← 5
yVal ← 0
len ← 5
REPEAT 5 TIMES
{
     drawLine(xVal, yVal, xVal + len, yVal)
     yVal ← yVal - 1
     len ← len - 1
}
```

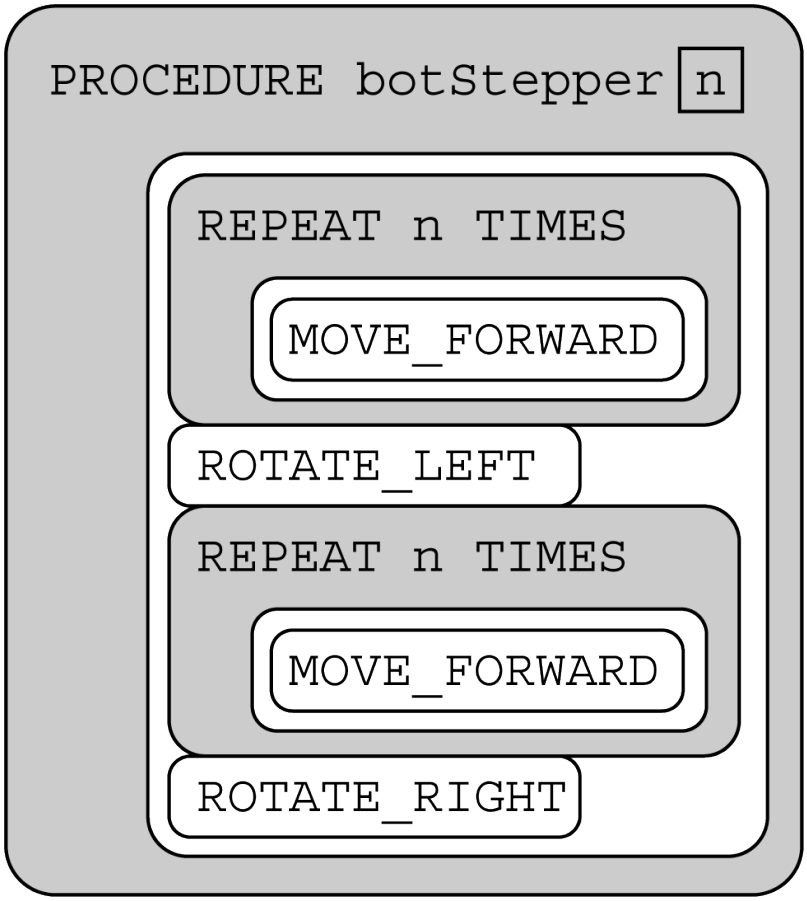
AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

86. The following question uses a robot in a grid of squares. The robot is represented by a triangle, which is initially facing right.



Consider the following procedure.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ



Which of the following code segments will move the robot to the gray square along the path indicated by the arrows?

(A)
```
botStepper 2
botStepper 3
```

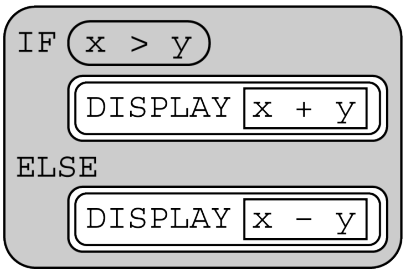
(B)
```
botStepper 3
botStepper 4
```

(C)
```
botStepper 2
MOVE_FORWARD
botStepper 3
```

(D)
```
botStepper 3
MOVE_FORWARD
botStepper 4
```

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

87. Consider the following code segment.



If the value of `x` is `3` and the value of `y` is `5`, what is displayed as a result of executing the code segment?

(A) `-2`

(B) `2`

(C) `8`

(D) Nothing will be displayed.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

88. Consider the following code segment.

```
result ← 1
IF(score1 > 500)
{
     result ← result + 1
     IF(score2 > 500)
     {
         result ← result + 1
     }
     ELSE
     {
         result ← result + 2
     }
}
ELSE
{
     result ← result + 5
     IF(score2 > 500)
     {
         result ← result + 1
     }
     ELSE
     {
         result ← result - 1
     }
}
```

If the value of `score1` is `350` and the value of `score2` is `210`, what will be the value of `result` after the code segment is executed?

(A) `3`

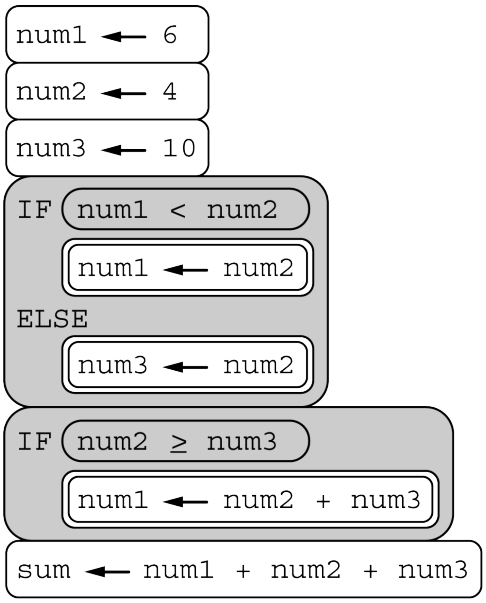
(B) `4`

(C) `5`

(D) `7`

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

89. Consider the following code segment.



What is the value of `sum` after the code segment is executed?

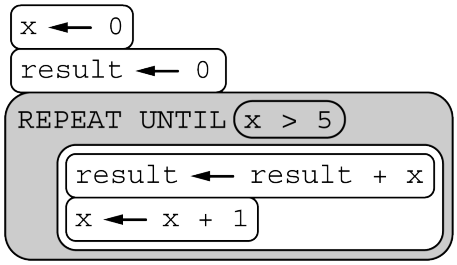
(A) `12`

(B) `14`

(C) `16`

(D) `18`

90. Consider the following code segment.



What is the value of `result` after the code segment is executed?

(A) `6`

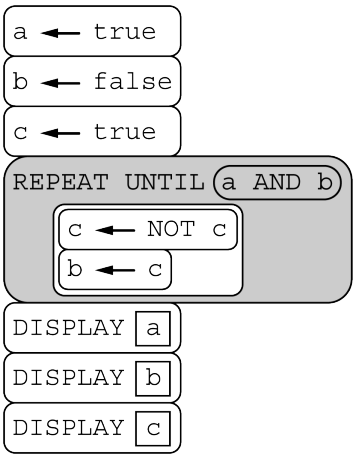
(B) `10`

(C) `15`

(D) `21`

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

91. Consider the following code segment.



What is displayed as a result of executing the code segment?

(A) `true false false`

(B) `true false true`

(C) `true true false`

(D) `true true true`

92. Consider the following code segment.

```
theList ← [-2, -1, 0, 1, 2]
count1 ← 0
count2 ← 0
FOR EACH value IN theList
{
     IF(value > 0)
     {
         count1 ← count1 + 1
     }
     ELSE
     {
         count2 ← count2 + 1
     }
}
```

What are the values of `count1` and `count2` as a result of executing the code segment?

(A) `count1 = 2, count2 = 2`

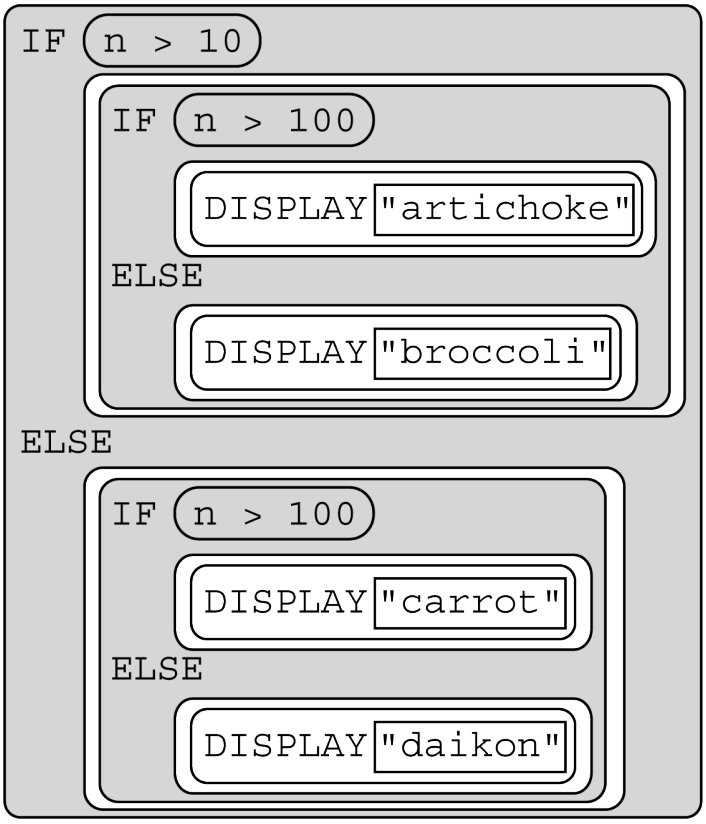
(B) `count1 = 2, count2 = 3`

(C) `count1 = 3, count2 = 2`

(D) `count1 = 5, count2 = 0`

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

93. In the following code segment, assume that the variable `n` has been initialized with an integer value.



Which of the following is NOT a possible value displayed by the program?

(A) `"artichoke"`

(B) `"broccoli"`

(C) `"carrot"`

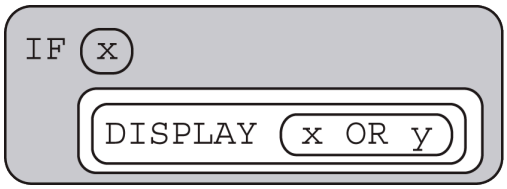
(D) `"daikon"`

94. Assume that the Boolean variable `x` is assigned the value `true` and the Boolean variable `y` is assigned the value `false`. Which of the following will display the value `true`?

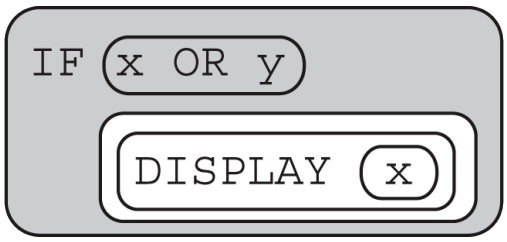
Select two answers.

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

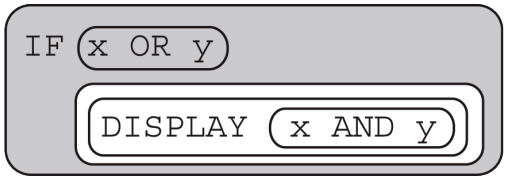
A



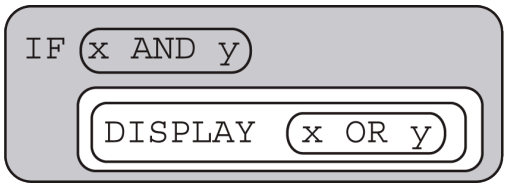
B



C

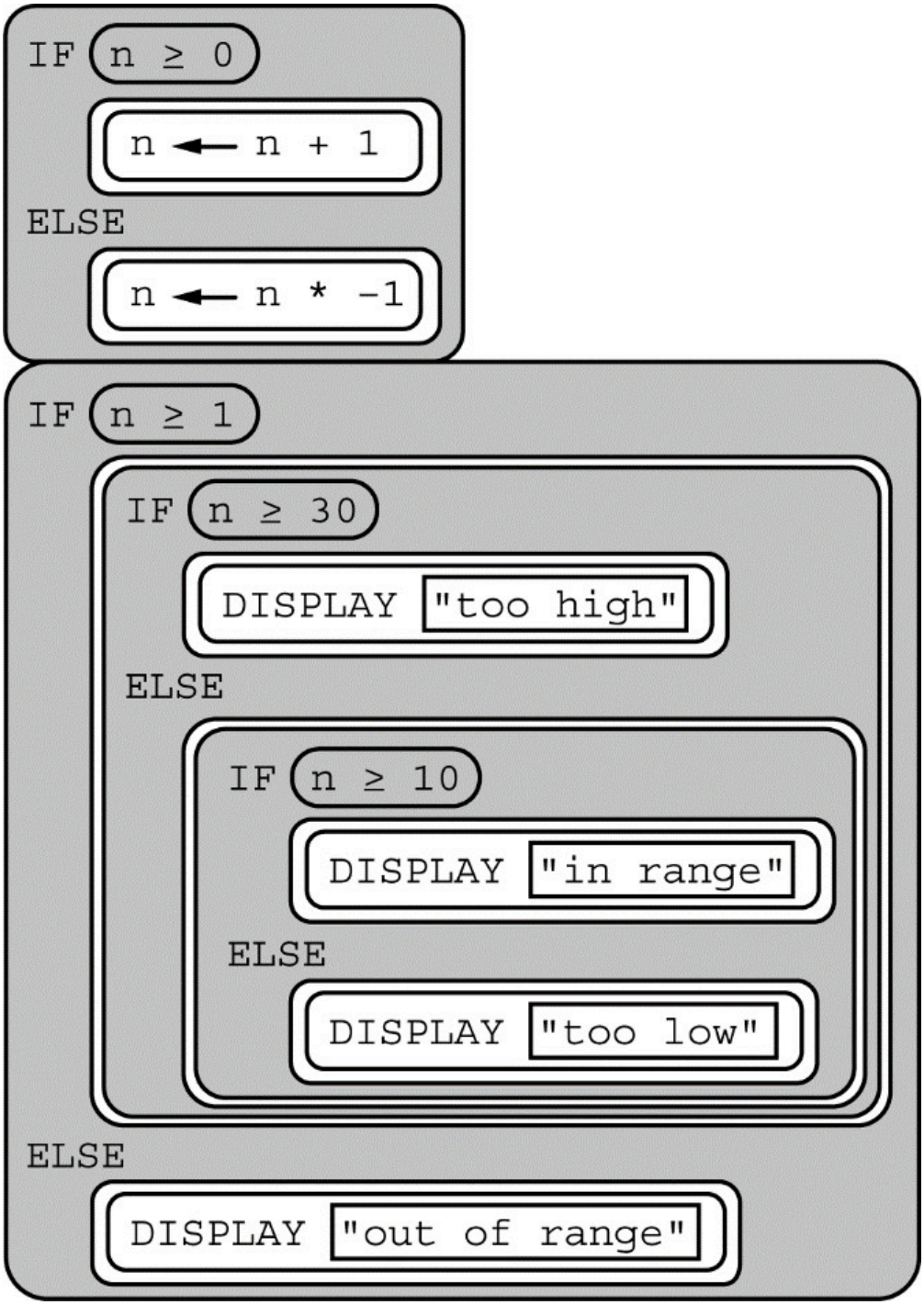


D



AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

95. In the following program, assume that the variable `n` has been initialized with an integer value.



Which of the following is NOT a possible value displayed by the program?

AP Principles 3.6, 3.7, 3.8, 3.9, 3.10 MCQ

(A) `too high`

(B) `in range`

(C) `too low`

(D) `out of range`