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Name

1.

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.

Which of the following are benefits of using well-named variables in a computer program?

Select two answers.

A The program will run faster.

B The program will be easier for people to read.

C The program will have a greater data storage capacity.

D The program will be easier to modify in the future.

2.

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 uses the variables `start`, `end`, and `current`.

```
start ← 1
end ← 20
current ← 3
start ← current
current ← current + 1
DISPLAY (start)
DISPLAY (current)
```

What is displayed as a result of executing the program?

A) 1 3

B) 3 3

C) 3 4

D) 4 4

3. Consider the following code segment, which uses the variables r, s, and t.

```
r ← 1
s ← 2
t ← 3
r ← s
s ← t
DISPLAY (r)
DISPLAY (s)
```

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

A) 1 1

B) 1 2

C) 2 3

D) 3 2

4. A teacher is writing a code segment that will use variables to represent a student's name and whether or not the student is currently absent. Which of the following variables are most appropriate for the code segment?

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(A) A string variable named `s` and a Boolean variable named `a`

(B) A string variable named `s` and a numeric variable named `n`

(C) A string variable named `studentName` and a Boolean variable named `isAbsent`

(D) A string variable named `studentName` and a numeric variable named `numAbsences`

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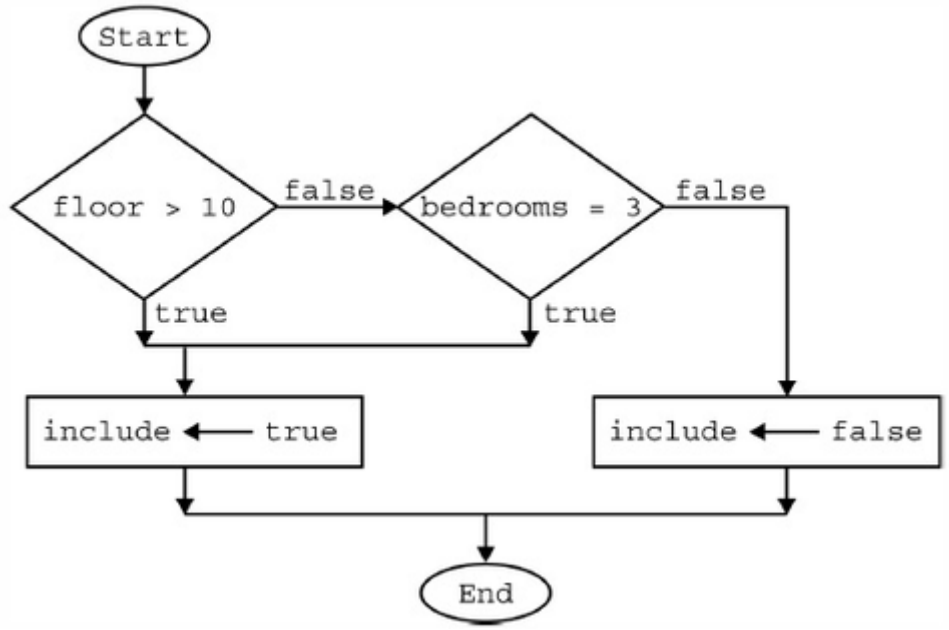
5.

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 flowchart is a way to visually represent an algorithm. The flowchart below is used by an apartment rental Web site to set the variable `include` to `true` for apartments that meet certain criteria.

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?

(A) `include ← (floor > 10) OR (bedrooms = 3)`

(B) `include ← (floor > 10) AND (bedrooms = 3)`

(C) `include ← (floor ≤ 10) OR (bedrooms = 3)`

(D) `include ← (floor ≤ 10) AND (bedrooms = 3)`

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6. The following table shows the value of `expression` based on the values of `input1` and `input2`.

Value of `input1`	Value of `input2`	Value of `expression`
`true`	`true`	`false`
`true`	`false`	`true`
`false`	`true`	`true`
`false`	`false`	`true`

Which of the following expressions are equivalent to the value of `expression` as shown in the table?

Select two answers.

A `(NOT input1) OR (NOT input2)`

B `(NOT input1) AND (NOT input2)`

C `NOT (input1 OR input2)`

D `NOT (input1 AND input2)`

7.

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.

Which of the following Boolean expressions are equivalent to the expression `num ≥ 15`?

Select two answers.

A `(num > 15) AND (num = 15)`

B `(num > 15) OR (num = 15)`

C `NOT (num < 15)`

D `NOT (num < 16)`

8.

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

A student is writing a program to model different real-world events using simulations. Which of the following simulations will generate a result that would best be stored using a Boolean variable?

A A simulation of flipping a fair coin

B A simulation of rolling a fair die (with sides numbered 1 through 6)

C A simulation of the temperature in a location over time

D A simulation of traffic patterns on a road

9. A program contains the following procedures for string manipulation.

Procedure Call	Explanation
`Concat (str1, str2)`	Returns a single string consisting of `str1` followed by `str2`. For example, `Concat ("key", "board")` returns `"keyboard"`.
`Substring (str, start, length)`	Returns a substring of consecutive characters from `str`, starting with the character at position `start` and containing `length` characters. The first character of `str` is located at position 1. For example, `Substring ("delivery", 3, 4)` returns `"live"`.

Which of the following can be used to store the string `"jackalope"` in the string variable `animal`?

Select two answers.

```
    animal ← Substring ("antelope", 5, 4)
A   animal ← Concat (animal, "a")
    animal ← Concat (Substring ("jackrabbit", 1, 4), animal)

    animal ← Substring ("antelope", 5, 4)
B   animal ← Concat ("a", animal)
    animal ← Concat (Substring ("jackrabbit", 1, 4), animal)

    animal ← Substring ("jackrabbit", 1, 4)
C   animal ← Concat (animal, "a")
    animal ← Concat (animal, Substring ("antelope", 5, 4))

    animal ← Substring ("jackrabbit", 1, 4)
D   animal ← Concat (animal, "a")
    animal ← Concat (Substring ("antelope", 5, 4), animal)
```

10. Assume that both lists and strings are indexed starting with index `1`.

The list `wordList` has the following contents.

`["abc", "def", "ghi", "jkl"]`

Let `myWord` be the element at index `3` of `wordList`. Let `myChar` be the character at index `2` of `myWord`. What is the value of `myChar`?

A `"e"`

B `"f"`

C `"h"`

D `"i"`

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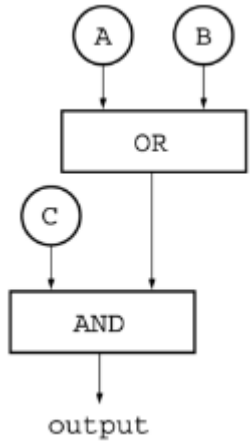
11. The diagram below shows a circuit composed of two logic gates labeled *OR* and *AND*. Each gate takes two inputs and produces a single output.



If the inputs *A* and *C* are both *true*, which of the following best describes the output of the *AND* gate?

(A) The output will be *true* no matter what the value of input *B* is.

(B) The output will be *false* no matter what the value of input *B* is.

(C) The output will be *true* if input *B* is *true*; otherwise it will be *false*.

(D) The output will be *false* if input *B* is true; otherwise it will be *true*.

12. The code fragment below is intended to display *"odd"* if the positive number *num* is odd.

```
IF <MISSING CONDITION>
    DISPLAY "odd"
```

Which of the following can be used to replace <MISSING CONDITION> so that the code fragment will work as intended?

A (num MOD 1) = 0

B (num MOD 1) = 1

C (num MOD 2) = 0

D (num MOD 2) = 1

13. An office building has two floors. A computer program is used to control an elevator that travels between the two floors. Physical sensors are used to set the following Boolean variables.

Variable	Description
`onFloor1`	set to `true` if the elevator is stopped on floor 1; otherwise set to `false`
`onFloor2`	set to `true` if the elevator is stopped on floor 2; otherwise set to `false`
`callTo1`	set to `true` if the elevator is called to floor 1; otherwise set to `false`
`callTo2`	set to `true` if the elevator is called to floor 2; otherwise set to `false`

The elevator moves when the door is closed and the elevator is called to the floor that it is not currently on. Which of the following Boolean expressions can be used in a selection statement to cause the elevator to move?

A *(onFloor1* AND *callTo2)* AND *(onFloor2* AND *callTo1)*

B *(onFloor1* AND *callTo2)* OR *(onFloor2* AND *callTo1)*

C *(onFloor1* OR *callTo2)* AND *(onFloor2* OR *callTo1)*

D *(onFloor1* OR *callTo2)* OR *(onFloor2* OR *callTo1)*

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14. 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`.

15. A programmer wants to determine whether a score is within 10 points of a given target. For example, if the target is 50, then the scores 40, 44, 50, 58, and 60 are all within 10 points of the target, while 38 and 61 are not.

Which of the following Boolean expressions will evaluate to `true` if and only if `score` is within `10` points of `target`?

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A `(score ≤ target + 10) AND (target + 10 ≤ score)`

B `(target + 10 ≤ score) AND (score ≤ target - 10)`

C `(score ≤ target - 10) AND (score ≤ target + 10)`

D `(target - 10 ≤ score) AND (score ≤ target + 10)`

16. The list `wordList` contains a list of 10 string values. Which of the following is a valid index for the list?

A `-1`

B `"hello"`

C `2.5`

D `4`

17. Consider the following procedures for string manipulation.

Procedure Call	Explanation
`concat(str1, str2)`	Returns a single string consisting of `str1` followed by `str2`. For example, `concat("key", "board")` returns `"keyboard"`.
`prefix(str, length)`	Returns the first `length` characters of `str` or `str` if `length` is greater than the number of characters in `str`. For example, `prefix("delivery", 3)` returns `"del"` and `prefix("delivery", 100)` returns `"delivery"`.

The variable `initials` is to be assigned a string consisting of the first letter of the string `firstName` followed by the first letter of the string `lastName`. Which of the following assigns the correct string to `initials`?

A `initials ← concat(prefix(firstName, 1), prefix(lastName, 1))`

B `initials ← concat(prefix(firstName, 2), prefix(lastName, 2))`

C `initials ← prefix(concat(firstName, lastName), 1)`

D `initials ← prefix(concat(firstName, lastName), 2)`

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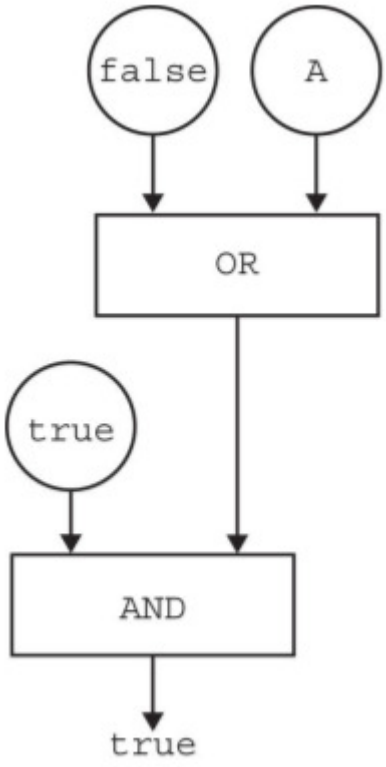
18. The figure below shows a circuit composed of two logic gates. The output of the circuit is *true*.



Which of the following is a true statement about input *A*?

(A) Input *A* must be *true.*

(B) Input *A* must be *false.*

(C) Input *A* can be either *true* or *false.*

(D) There is no possible value of input *A* that will cause the circuit to have the output *true*.

19. Which of the following code segments can be used to interchange the values of the variables `num1` and `num2` ?

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A
```
num1 ← num2
num2 ← num1
```

B
```
temp ← num1
num1 ← temp
num2 ← num1
```

C
```
temp ← num1
num2 ← num1
num1 ← temp
```

D
```
temp ← num1
num1 ← num2
num2 ← temp
```

20. The following procedures are available for string manipulation.

Procedure Call	Explanation
`substring(str, start, end)`	Returns a substring of consecutive characters of `str` starting with the character at position `start` and ending with the character at position `end`. The first character of `str` is considered position 1. For example, `substring("delivery", 3, 6)` returns `"live"`.
`concat(str1, str2)`	Returns a single string consisting of `str1` followed by `str2`. For example, `concat("key", "board")` returns `"keyboard"`.
`len(str)`	Returns the number of characters in `str`. For example, `len("key")` returns `3`.

A programmer wants to create a new string by removing the character in position `n` of the string `oldStr`. For example, if `oldStr` is `"best"` and `n` is `3`, then the new string should be `"bet"`. Assume that `1 < n < len(oldStr)`.

Which of the following code segments can be used to create the desired new string and store it in `newStr`?

Select two answers.

A
```
left ← substring(oldStr, 1, n - 1)
right ← substring(oldStr, n + 1, len(oldStr))
newStr ← concat(left, right)
```

B
```
left ← substring(oldStr, 1, n + 1)
right ← substring(oldStr, n - 1, len(oldStr))
newStr ← concat(left, right)
```

C
```
newStr ← substring(oldStr, 1, n - 1)
newStr ← concat(newStr, substring(oldStr, n + 1, len(oldStr)))
```

D
```
newStr ← substring(oldStr, n + 1, len(oldStr))
newStr ← concat(newStr, substring(oldStr, 1, n - 1))
```

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21.

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 `NAND` gate is a type of logic gate that produces an output of `false` only when both of its two inputs are `true`. Otherwise, the gate produces an output of `true`. Which of the following Boolean expressions correctly models a `NAND` gate with inputs `P` and `Q` ?

(A) `(NOT P) AND (NOT Q)`

(B) `(NOT P) AND Q`

(C) `NOT (P AND Q)`

(D) `NOT (P OR Q)`

22. Consider the following code segment.

```
firstList ← ["guitar", "drums", "bass"]
secondList ← ["flute", "violin"]
thirdList ← []
thirdList ← firstList
firstList ← secondList
secondList ← thirdList
```

What are the contents of `secondList` after the code segment is executed?

(A) `[]`

(B) `["guitar", "drums", "bass"]`

(C) `["flute", "violin"]`

(D) `["flute", "violin", "guitar", "drums", "bass"]`

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23. 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

24. Consider the following code segment.

```
integerList ← [4, 2, 5, 4, 2, 3, 1]
result ← 0
FOR EACH item IN integerList
    result ← result + (item MOD 2)
DISPLAY [result]
```

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

(A) 3

(B) 4

(C) 9

(D) 12

25. A programmer completes the user manual for a video game she has developed and realizes she has reversed the roles of goats and sheep throughout the text. Consider the programmer's goal of changing all occurrences of "goats" to "sheep" and all occurrences of "sheep" to "goats." The programmer will use the fact that the word "foxes" does not appear anywhere in the original text.

Which of the following algorithms can be used to accomplish the programmer's goal?

(A) First, change all occurrences of "goats" to "sheep."
Then, change all occurrences of "sheep" to "goats."

(B) First, change all occurrences of "goats" to "sheep."
Then, change all occurrences of "sheep" to "goats."
Last, change all occurrences of "foxes" to "sheep."

(C) First, change all occurrences of "goats" to "foxes."
Then, change all occurrences of "sheep" to "goats."
Last, change all occurrences of "foxes" to "sheep."

(D) First, change all occurrences of "goats" to "foxes."
Then, change all occurrences of "foxes" to "sheep."
Last, change all occurrences of "sheep" to "goats."

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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.

A snack bar has a frequent customer program in which every 10th purchase is free. Customers are enrolled in the program when they make their first purchase. A programmer is writing a program to implement the frequent customer program. In one code segment, `cost` is set to `0` for every 10th purchase by a given customer. The programmer will use the procedure `GetCount (customerID)`, which returns the total number of

purchases a customer has made since enrolling in the frequent customer program, including his or her first purchase.

Which of the following code segments will set `cost` to `0` for every 10th purchase a customer makes after enrolling in the frequent customer program?

A
```
count ← GetCount (customerID)
IF (count / 10 = 0)
{
   cost ← 0
}
```

B
```
count ← GetCount (customerID)
IF (NOT (count / 10 = 0))
{
   cost ← 0
}
```

C
```
count ← GetCount (customerID)
IF (count MOD 10 = 0)
{
   cost ← 0
}
```

D
```
count ← GetCount (customerID)
IF (NOT (count MOD 10 = 0))
{
   cost ← 0
}
```

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27. To be eligible for a particular ride at an amusement park, a person must be at least 12 years old and must be between 50 and 80 inches tall, inclusive.

Let `age` represent a person's age, in years, and let `height` represent the person's height, in inches. Which of the following expressions evaluates to `true` if and only if the person is eligible for the ride?

(A) `(age ≥ 12) AND ((height ≥ 50) AND (height ≤ 80))`

(B) `(age ≥ 12) AND ((height ≤ 50) AND (height ≥ 80))`

(C) `(age ≥ 12) AND ((height ≤ 50) OR (height ≥ 80))`

(D) `(age ≥ 12) OR ((height ≥ 50) AND (height ≤ 80))`

28. Consider the following code segment.

```
x ← 25
y ← 50
z ← 75
x ← y
y ← z
z ← x
```

Which of the variables have the value `50` after executing the code segment?

(A) `x` only

(B) `y` only

(C) `x` and `z` only

(D) `x`, `y`, and `z`

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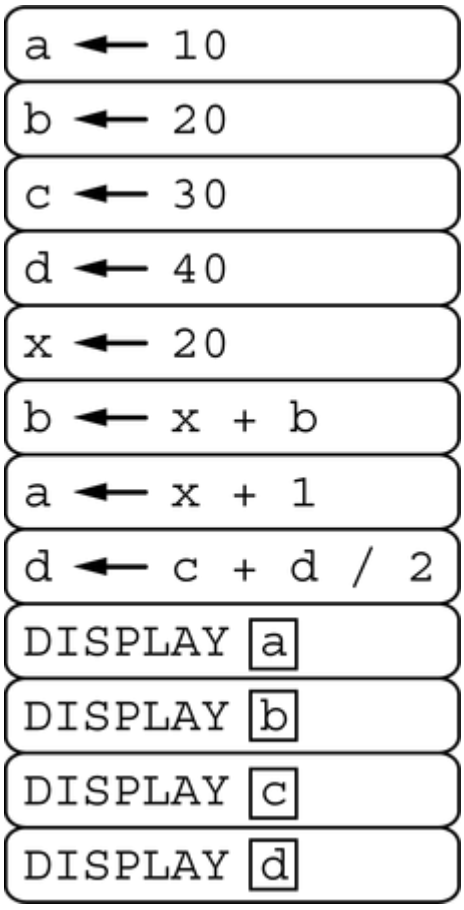
29. Consider the following code segment.



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

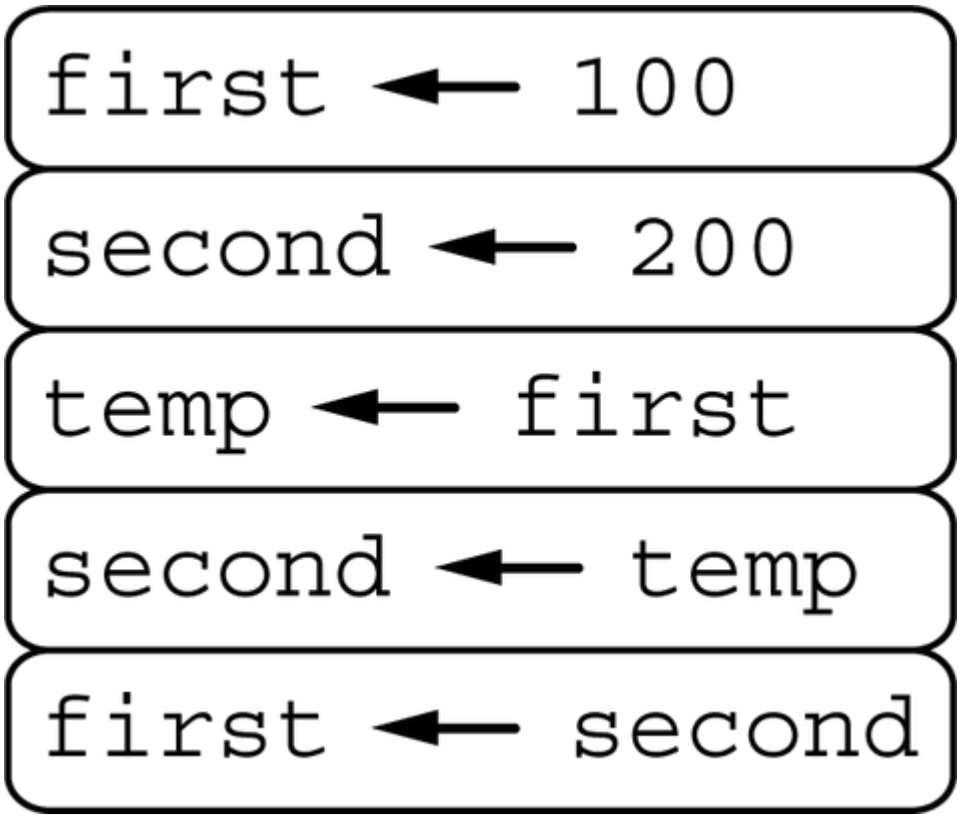
(A) 10 20 30 40

(B) 21 30 40 50

(C) 21 40 30 40

(D) 21 40 30 50

30. Consider the following code segment.



What are the values of `first` and `second` as a result of executing the code segment?

(A) `first = 100, second = 100`

(B) `first = 100, second = 200`

(C) `first = 200, second = 100`

(D) `first = 200, second = 200`

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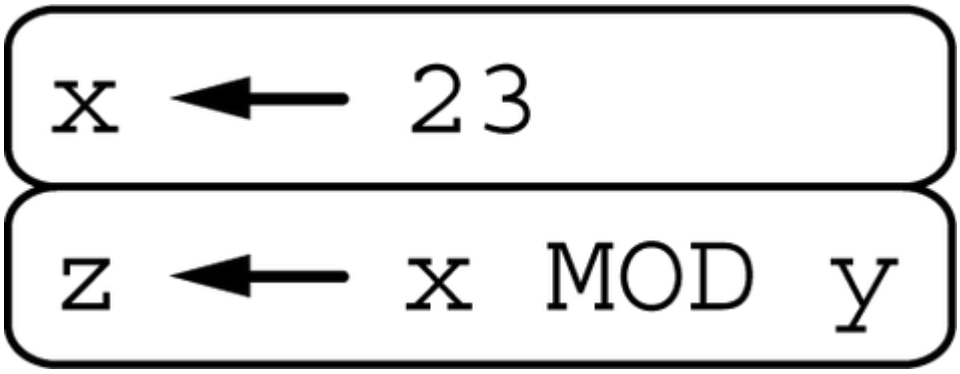
31. Consider the following code segment.



Which of the following initial values of the variable `y` would result in the variable `z` being set to `2` after the code segment is executed?

(A) 1

(B) 2

(C) 3

(D) 4

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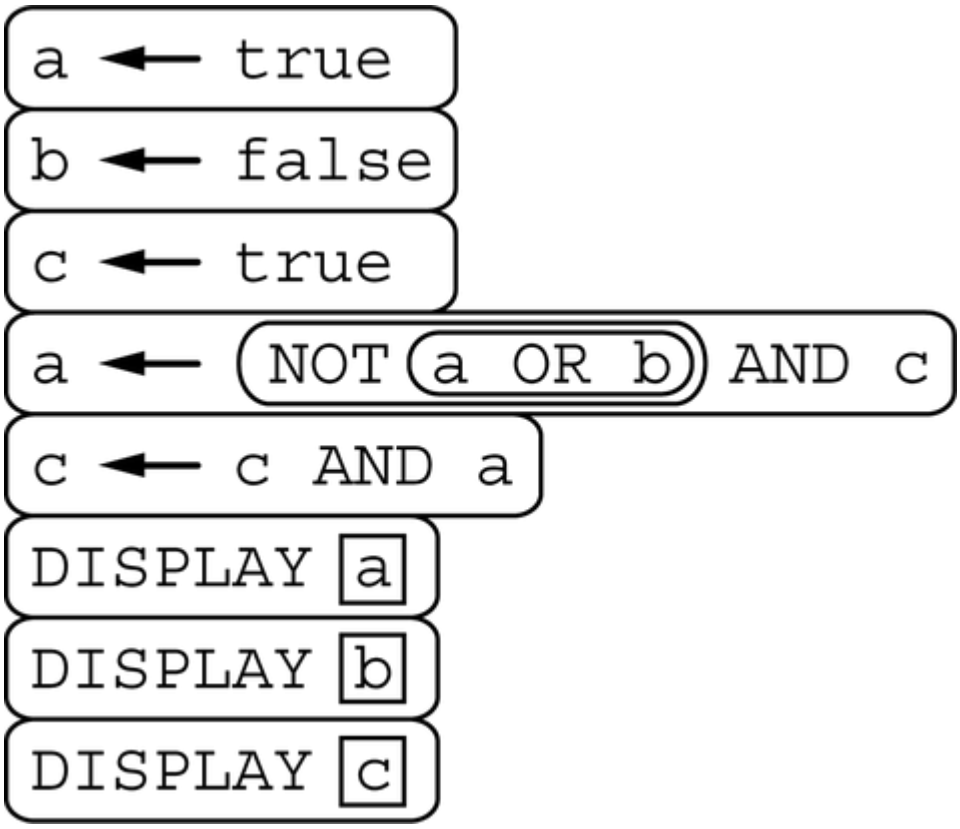
32. Consider the following code segment.



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

(A) `true true true`

(B) `false false false`

(C) `true false true`

(D) `false false true`