C Programming Practice

Use this key to check answers and read the explanations.

1. Which C17 standard header supplies the names bool and true in the declaration bool active = true?
   - A. <stdbool.h>
   - B. <stddef.h>
   - C. <stdint.h>
   - D. <limits.h>

   Correct answer: A. <stdbool.h>
   In C17, stdbool.h defines bool as an alias for the built-in _Bool type. It also supplies the true and false macros.

2. Which declaration creates an int named limit that can be read but cannot be assigned a new value through its name?
   - A. static int limit = 12;
   - B. int limit = 12;
   - C. const int limit = 12;
   - D. unsigned int limit = 12;

   Correct answer: C. const int limit = 12;
   The const qualifier makes limit nonmodifiable through its name. Its initializer supplies the value 12.

3. What type does the ordinary C17 character constant 'Q' have?
   - A. char
   - B. int
   - C. unsigned char
   - D. double

   Correct answer: B. int
   An ordinary single-quoted character constant has type int. Its value comes from the chosen character in the execution character set.

4. What value does the C expression (3 < 5) + (6 == 6) produce?
   - A. 11
   - B. 1
   - C. 0
   - D. 2

   Correct answer: D. 2
   Both comparisons are true and each yields the int value 1. Adding those two results gives 2.

5. A C snippet starts with int choice = 0. It then runs if (-2) choice = 4; else choice = 8; What is the resulting value of choice?

A. 8
B. 4
C. 0
D. -2

Correct answer: B. 4
C executes the first branch of this if statement when the condition compares unequal to zero. The value -2 therefore selects the assignment of 4.

6. After the statements int n = 4; int written = n++; what are the values of written and n, in that order?

A. 4 and 5
B. 5 and 5
C. 5 and 4
D. 4 and 4

Correct answer: A. 4 and 5
The postfix expression n++ yields the old value 4 for written. By the end of that statement, n has increased to 5.

7. The int variables count and allowed both start at 0. The program evaluates int result = allowed && ++count. What are the resulting values of result and count?

A. 1 and 1
B. 0 and 1
C. 1 and 0
D. 0 and 0

Correct answer: D. 0 and 0
The left operand is zero, so && yields 0 and skips its right operand. The variable count stays at 0 because its increment never runs.

8. What is total after int total = 0; for (int n = 12; n > 0; n /= 2) { total += n; }?

A. 24
B. 21
C. 22
D. 18

Correct answer: C. 22
The loop adds 12, 6, 3, and 1. The next integer division changes n to 0, ending the loop with a total of 22.

9. The int score starts at 0. The program runs switch (2) { case 1: score += 1; break; case 2: score += 2; case 3: score += 4; break; default: score = 8; }. What is score afterward?

A. 6
B. 2
C. 4
D. 8

Correct answer: A. 6
Execution enters at case 2 and adds 2. It continues into case 3 and adds 4 before break exits the switch.

10. In C17, what are all five elements of the array declared by int counts[5] = {7, 3}?

A. [0, 0, 0, 7, 3]
B. [7, 3, 7, 3, 7]
C. [7, 3, 1, 1, 1]
D. [7, 3, 0, 0, 0]

Correct answer: D. [7, 3, 0, 0, 0]
The two explicit values initialize the first two elements. C initializes the remaining int elements to zero.

11. In the same block as int values[6] = {2, 4, 6, 8, 10, 12}, what is the value of sizeof values / sizeof values[0]?

A. 12
B. 3
C. 6
D. 24

Correct answer: C. 6
The numerator measures the whole array in bytes. The denominator measures one element, so their quotient gives the six-element count.

12. The function int addThree(int value) { value += 3; return value; } is called as int result = addThree(a), where a is an int set to 4. What are a and result afterward?

A. 7 and 7
B. 4 and 7
C. 4 and 4
D. 7 and 4

Correct answer: B. 4 and 7
The function receives the value of a in a local parameter. It updates that parameter and returns 7. The caller's a stays at 4.

13. Given struct Grid { int rows; int columns; }, the program declares struct Grid grid = {.columns = 3, .rows = 4}. What are grid.rows and grid.columns, in that order?

A. 4 and 0
B. 3 and 4
C. 0 and 3
D. 4 and 3

Correct answer: D. 4 and 3
The member names in the initializer determine where each value goes. Rows receives 4 and columns receives 3.

14. A struct Point has int members row and col. The program creates struct Point first = {2, 6} and struct Point next = first, then sets next.col = 3. What are first.col and next.col afterward?

A. 6 and 3
B. 3 and 3
C. 6 and 6
D. 3 and 6

Correct answer: A. 6 and 3
Initializing next from first copies the struct value into a separate object. The later assignment changes only the col member of next.

15. A struct Pair holds ints left and right. The function advance(struct Pair p, int step) adds step to p.left, adds the updated p.left to p.right, and returns p. A struct Pair value starts at (2, 1). A loop replaces it with advance's result first for step 1, then for step 2. What final pair does it hold?

A. (5, 8)
B. (3, 4)
C. (5, 9)
D. (2, 1)

Correct answer: C. (5, 9)
The first call returns (3, 4). The second uses that pair, raises left to 5, and adds 5 to right to get (5, 9).