1. Data Types

Question:
What is the size of an int data type in a 64-bit GCC compiler?

a) 2 bytes
b) 4 bytes
c) 8 bytes
d) Depends on the system

Answer: b) 4 bytes

Explanation:
In a 64-bit GCC compiler, the size of an int is typically 4 bytes.

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2. Control Structures

Question:
What will be the output of the following code?

```
int a = 5;

if (a = 0)

   printf("Zero");

else

   printf("Non-zero");
```

a) Zero
b) Non-zero
c) Compilation error
d) Runtime error

Answer: b) Non-zero

Explanation:
The condition if (a = 0) assigns 0 to a, which evaluates to false, so the else block executes, printing "Non-zero".

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3. Functions

Question:
Which of the following is true about functions in C?

a) Functions cannot return structures
b) Functions can return multiple values
c) Functions can be recursive
d) Functions cannot have default arguments

Answer: c) Functions can be recursive

Explanation:
In C, functions can call themselves, which is known as recursion.

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4. Arrays

Question:
What is the output of the following code?

```
int arr[5] = {1, 2, 3, 4, 5};

printf("%d", *(arr + 3));
```

a) 2
b) 3
c) 4
d) 5

Answer: c) 4

Explanation:
*(arr + 3) accesses the fourth element of the array, which is 4.

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5. Pointers

Question:
What will be the output of the following code?

```
int x = 10;

int *p = &x;

printf("%d", *p);
```

a) Address of x
b) 10
c) Garbage value
d) Compilation error

Answer: b) 10

Explanation:
*p dereferences the pointer p, which points to x, so it prints the value of x, which is 10.

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6. Strings

Question:
What is the output of the following code?

```
char str[] = "Hello";

printf("%c", *str);
```

a) H
b) e
c) l
d) o

Answer: a) H

Explanation:
*str dereferences the first character of the string, which is 'H'.

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7. Structures

Question:
Which of the following is the correct way to define a structure in C?

a) struct { int a; float b; };
b) struct S { int a; float b; };
c) structure S { int a; float b; };
d) struct S (int a; float b;);

Answer: b) struct S { int a; float b; };

Explanation:
Option b correctly defines a structure named S with two members.

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8. Recursion

Question:
What is the output of the following recursive function when called with fun(3)?

```
int fun(int n) {
   if (n == 0)
      return 0;
   else
      return n + fun(n - 1);
}
```

a) 3
b) 6
c) 9
d) 0

Answer: b) 6

Explanation:
The function computes the sum of numbers from n down to 0. So, 3 + 2 + 1 + 0 = 6.

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9. Sorting Algorithms

Question:
Which sorting algorithm has the best average-case time complexity?

a) Bubble Sort
b) Insertion Sort
c) Quick Sort
d) Selection Sort

Answer: c) Quick Sort

Explanation:
Quick Sort has an average-case time complexity of O(n log n), which is better than the others listed.

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10. Time Complexity

Question:
What is the time complexity of searching for an element in a balanced binary search tree (BST)?

a) O(1)
b) O(n)
c) O(log n)
d) O(n log n)

Answer: c) O(log n)

Explanation:
In a balanced BST, each comparison allows the operations to skip about half of the tree, leading to O(log n) time complexity.
