In C, the increment operator ' ++ ' is used to increase the value of a variable by 1 . There are two forms of the increment operator:

1. Pre-increment
2. Post-increment.

## 1. Pre-increment (++x):

- Pre-increment increments the value of the variable before it is used in an expression.
- The syntax is $++x$.
- The value of $x$ is incremented by 1 , and the updated value is used in the expression.

Example:

```
#include <stdio.h>
int main() {
        int x = 5;
        // Pre-increment: increments the value of x before using it
        int y = ++x;
        printf("x: %d\n", x); // Output: x: 6
        printf("y: %d\n", y); // Output: y: 6
        return 0;
}
```

In this program, we have a variable $x$ initialized to 5 . Using the pre-increment operator $++x$, the value of $x$ is incremented by 1 before it is assigned to the variable $y$. Therefore, both $x$ and $y$ will have a value of 6 .

The output of this program will be:
$x: 6$
y: 6

## 2. Post-increment ( $x++$ ):

- Post-increment increments the value of the variable after it is used in an expression.
- The syntax is $x++$.
- The current value of $x$ is used in the expression, and then the value of $x$ is incremented by 1 .

Example:

```
#include <stdio.h>
int main() {
    int x = 5;
    // Post-increment: increments the value of x after using it
    int y = x++;
    printf("x: %d\n", x); // Output: x: 6
    printf("y: %d\n", y); // Output: y: 5
    return 0;
}
```

Here, the post-increment operator $x++$ is used. It assigns the current value of $x$ to $y$ and then increments the value of $x$ by 1 . As a result, $x$ becomes 6 while $y$ retains the original value of 5.

The output of this program will be:
$x: 6$
$y: 5$

## Difference between Pre and Post Increament

|  | Pre-increment $(++x)$ | Post-increment $(x++)$ |
| :--- | :--- | :--- |
| 1 | Increments the value of $x$ before use | Increments the value of $x$ after use |
| 2 | Uses the updated value of $x$ | Uses the current value of $x$ |
| 3 | Returns the updated value of $x$ | Returns the current value of $x$ |
| 4 | Example: | Example: |
|  | "'c | "‘c |
|  | int $x=5 ;$ | int $x=5 ;$ |
|  | int $y=++x ; / / y=6, x=6$ | int $y=x++; / / y=5, x=6$ |

## Pre And Post Increament Practice Problems

1. What is the value of " $x$ " after the following code snippet executes?
```
int x = 5;
```

x++;

Explanation: The initial value of " $x$ " is 5 . The post-increment operator ( $x++$ ) is applied to " $x$ ", which increments the value of " $x$ " by 1 . After the operation, the value of " $x$ " becomes 6 .

## 2. What is the value of " $y$ " after the following code snippet executes?

```
int y = 3;
int x = y++;
```

Explanation: The initial value of " $y$ " is 3 . The post-increment operator ( $y++$ ) is applied to " $y$ " during the assignment to " $x$ ". Therefore, the original value of " $y$ " (3) is assigned to " $x$ ", and then " $y$ " is incremented by 1 . After the operation, the value of " $y$ " becomes 4.

## 3. What is the value of " $x$ " after the following code snippet executes?

```
int x = 2;
int y = x++ + ++x;
```

Explanation: The initial value of " $x$ " is 2 . In the expression $x+++++x$, the post-increment operator $(x++)$ is applied to the first occurrence of " $x$ " and the pre-increment operator ( $++x$ ) is applied to the second occurrence of " $x$ ". The post-increment operator returns the original value of " $x$ " (2) and then increments " $x$ " by 1 . The pre-increment operator increments " $x$ " by 1 and returns the updated value (4). Therefore, the expression evaluates to $2+4$, resulting in 6. After the operation, the value of " $x$ " becomes 4.

## 4. What is the output of the following code snippet?

```
int x = 2;
System.out.println(x++);
System.out.println(x);
```

Explanation: The initial value of " $x$ " is 2 . In the first println statement, the post-increment operator $(x++)$ is applied to " $x$ ". The original value of " $x$ " $(2)$ is printed, and then " $x$ " is incremented by 1 . Therefore, the output is 2 . In the second printIn statement, the updated value of " $x$ " (3) is printed. Therefore, the output is 3 .

## 5. What is the value of " $y$ " after the following code snippet executes?

```
int y = 5;
int x = ++y + y++;
```

Explanation: The initial value of " $y$ " is 5 . In the expression $++y+y++$, the pre-increment operator $(++y)$ is applied to the first occurrence of " $y$ " and the post-increment operator $(y++)$ is applied to the second occurrence of " $y$ ". The pre-increment operator increments " $y$ " by 1 and returns the updated value (6). The post-increment operator returns the original value of " $y$ " (6) and then increments " $y$ " by 1 . Therefore, the expression evaluates to $6+6$, resulting in 12. After the operation, the value of " $y$ " becomes 7.

## 6. What is the value of " $x$ " after the following code snippet executes?

```
int x = 3;
x = ++X + X++;
```

Explanation: The initial value of " $x$ " is 3 . In the expression $++x+x++$, the pre-increment
operator $(++x)$ is applied to the first occurrence of " $x$ " and the post-increment operator $(x++)$ is applied to the second occurrence of " $x$ ". The pre-increment operator increments " $x$ " by 1 and returns the updated value (4). The post-increment operator returns the original value of " $x$ " (4) and then increments " $x$ " by 1 . Therefore, the expression evaluates to $4+4$, resulting in 8 . After the operation, the value of " $x$ " becomes 4 .

## 7. What is the output of the following code snippet?

```
int x = 2;
System.out.println(++x + x++);
```

Explanation: The initial value of " $x$ " is 2 . In the println statement, the pre-increment operator $(++x)$ is applied to the first occurrence of " $x$ " and the post-increment operator ( $x++$ ) is applied to the second occurrence of " $x$ ". The pre-increment operator increments " $x$ " by 1 and returns the updated value (3). The post-increment operator returns the original value of "x" (3) and then increments " $x$ " by 1 . Therefore, the expression evaluates to $3+3$, resulting in 6 . The output will be 6 .

## 8. What is the value of " $y$ " after the following code snippet

## executes?

```
int x = 4;
int y = x++ + ++x;
```

Explanation: The initial value of " $x$ " is 4 . In the expression $x+++++x$, the post-increment operator $(x++)$ is applied to the first occurrence of " $x$ " and the pre-increment operator ( $++x$ ) is applied to the second occurrence of " $x$ ". The post-increment operator returns the original value of " $x$ " (4) and then increments " $x$ " by 1 . The pre-increment operator increments " $x$ " by 1 and returns the updated value (6). Therefore, the expression evaluates to $4+6$, resulting in 10. After the operation, the value of " $y$ " becomes 10.

## 9. What is the value of " $x$ " after the following code snippet executes?

```
int x = 10;
int y = x-- - --x;
```

Explanation: The initial value of " $x$ " is 10. In the expression $x---x$, the post-decrement operator ( $x-$ ) is applied to the first occurrence of " $x$ " and the pre-decrement operator $(-x)$ is applied to the second occurrence of " $x$ ". The post-decrement operator returns the original value of " $x$ " (10) and then decrements " $x$ " by 1 . The pre-decrement operator decrements " $x$ " by 1 and returns the updated value (8). Therefore, the expression evaluates to $10-8$,
resulting in 2 . After the operation, the value of " $x$ " becomes 8 .

## 10. What is the output of the following code snippet?

```
int x = 5;
System.out.println(x--);
System.out.println(x);
```

Explanation: The initial value of " $x$ " is 5 . In the first println statement, the post-decrement operator ( $x-$ ) is applied to " $x$ ". The original value of " $x$ " (5) is printed, and then " $x$ " is decremented by 1 . Therefore, the output is 5 . In the second println statement, the updated value of " $x$ " (4) is printed. Therefore, the output is 4.

## 11. What is the result of the expression

$$
x=5 ; y=++x ;
$$

a) $x=6, y=6$
b) $x=6, y=5$
c) $x=5, y=6$
d) $x=5, y=5$
12. What is the value of " $x$ " after the following code snippet executes?

```
int x = 3;
int y = x++;
```

a) 3
b) 4
c) 5
d) 6
13. What is the value of " $y$ " after the following code snippet executes?

```
int x = 2;
int y = x++ + ++x;
```

a) 4
b) 5
c) 6
d) 7
14. What is the output of the following code snippet?
int $x=5$;
System.out.println(x++);
System.out.println(x);
a) 5, 6
b) 6,6
c) 6,5
d) 5,5
15. What is the value of " $y$ " after the following code snippet executes?

```
int x = 2;
int y = x++ * ++x;
```

a) 4
b) 6
c) 8
d) 10
16. What is the value of " $x$ " after the following code snippet executes?

```
int x = 4;
x = x++ + ++x;
```

a) 7
b) 8
c) 9
d) 10
17. What is the output of the following code snippet?
int $x=1$;
System.out.println(++x + x++);
a) 4
b) 5
c) 6
d) 7
18. What is the value of " $y$ " after the following code snippet executes?

```
int x = 3;
int y = ++x + x++;
```

a) 7
b) 8
c) 9
d) 10
19. What is the value of " $x$ " after the following code snippet executes?

```
int x = 10;
int y = x-- - --x;
```

a) 8
b) 9
c) 10
d) 11
20. What is the output of the following code snippet?

```
int x = 5;
System.out.println(x--);
```

System.out.println(x);
a) 5, 4
b) 5,5
c) 4,4
d) 4,5

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