Al-Mustaqbal University

College of Engineering Technology

Cybersecurity Techniques Engineering Department

Programming Essential

Lecture 4

Operators, Increment and Decrement

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Objectives

By the end of this lecture, students will be able to:

Identify common **C++ operators**

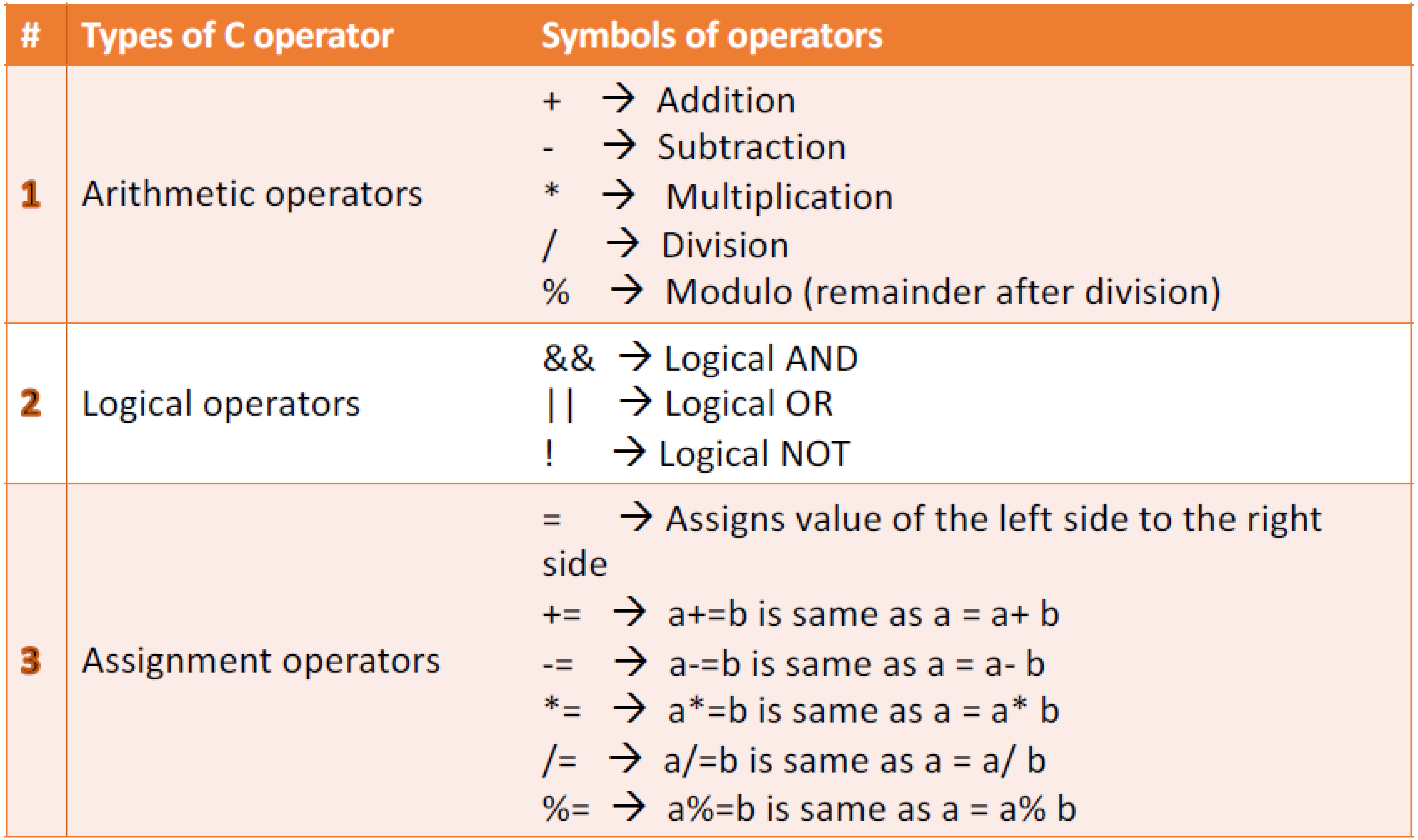
Use **arithmetic and assignment operators**

Apply **increment and decrement operators**

Write simple programs using **operators and variables**

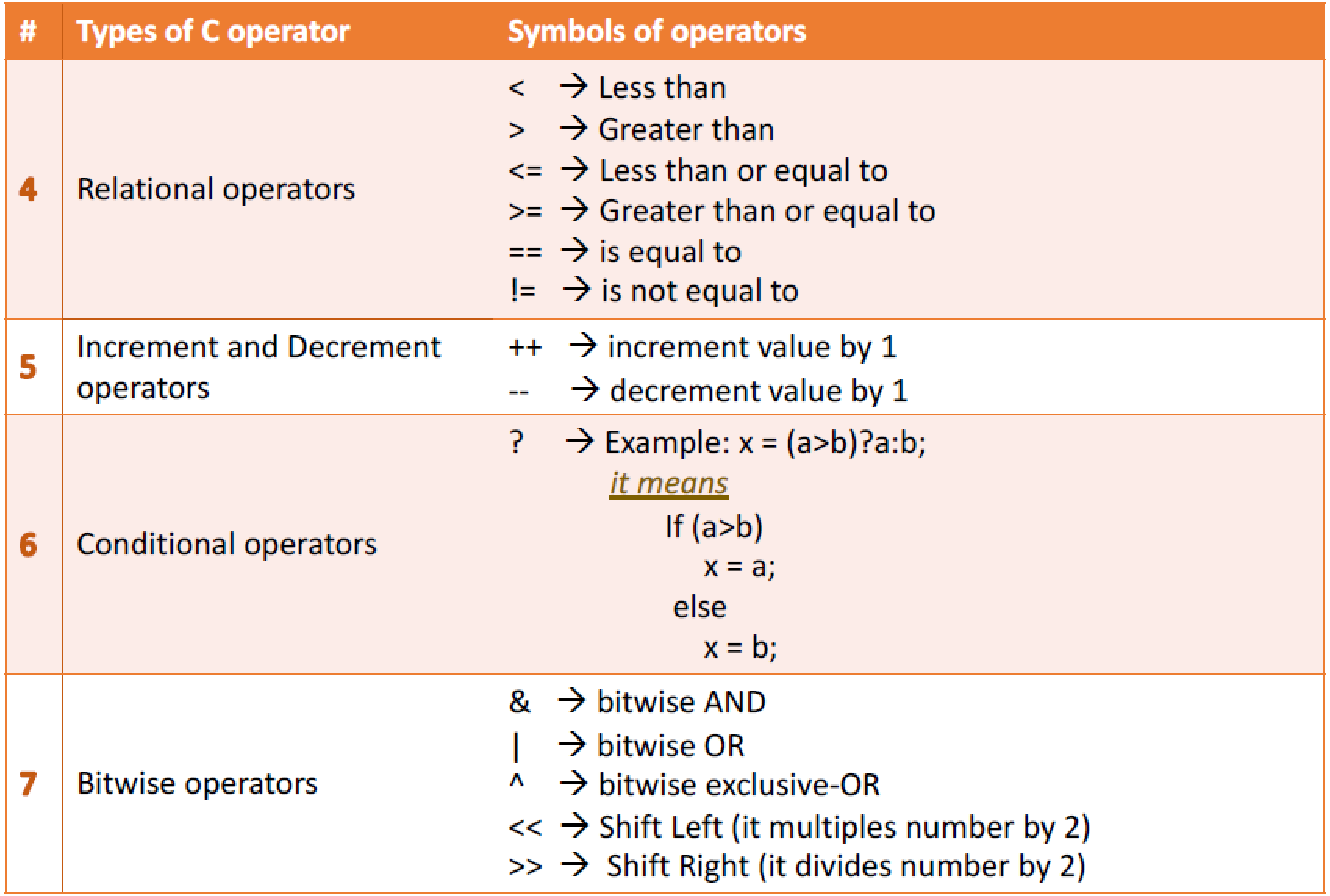
Operators in C++

The table below lists all possible operators that can be executed in C++ programming.



#	Types of C operator	Symbols of operators
1	Arithmetic operators	+ → Addition - → Subtraction * → Multiplication / → Division % → Modulo (remainder after division)
2	Logical operators	&& → Logical AND || → Logical OR ! → Logical NOT
3	Assignment operators	= → Assigns value of the left side to the right side += → a+=b is same as a = a+ b -= → a-=b is same as a = a- b *= → a*=b is same as a = a* b /= → a/=b is same as a = a/ b %= → a%=b is same as a = a% b

Operators in C++ (Cont..)



#	Types of C operator	Symbols of operators
4	Relational operators	< → Less than > → Greater than <= → Less than or equal to >= → Greater than or equal to == → is equal to != → is not equal to
5	Increment and Decrement operators	++ → increment value by 1 -- → decrement value by 1

6	Conditional operators	? → Example: x = (a>b)?a:b;
		it means
		If (a>b)
		x = a;
		else
		x = b;

7	Bitwise operators	& → bitwise AND | → bitwise OR ^ → bitwise exclusive-OR << → Shift Left (it multiples number by 2) >> → Shift Right (it divides number by 2)

Operators in C++ programming –Explanation

Arithmetic operators are two types

Unary operators: operators that operate on a single operator

Example

```
b = a++;
```

Binary operators: operators that operate with two operators

Example

```
c = a+b;
```

- + is the operator known as addition operator,

a and b are operands

The addition operator tells the compiler to add both of the operands a and b and put them in c variable

Logical operators:

The result of the operation of a logical operator is a **Boolean** value either *true* or *false*.
used to test one or more condition or make decisions

Operators in C++ programming –Explanation

Relational operators are used to compare two numbers and taking decisions based on their relation.

Relational expressions are used in decision statements such as ***if*** , ***for***.

Conditional operator: It takes three arguments, **condition? exp1:exp2** if condition is true then execute exp1 otherwise exp2 will be executed.

Bitwise Operators

Bitwise operators are used to perform operation bit by bit.

Bitwise operators may not be applied to float or double.

Assignment Operators in C++

The Assignment operators in C++ are some of the C Programming Operator, which are useful to assign the values or the result of an expression to the declared variables.

The equals (=) operator is the most commonly used assignment operator in C++.

For example:

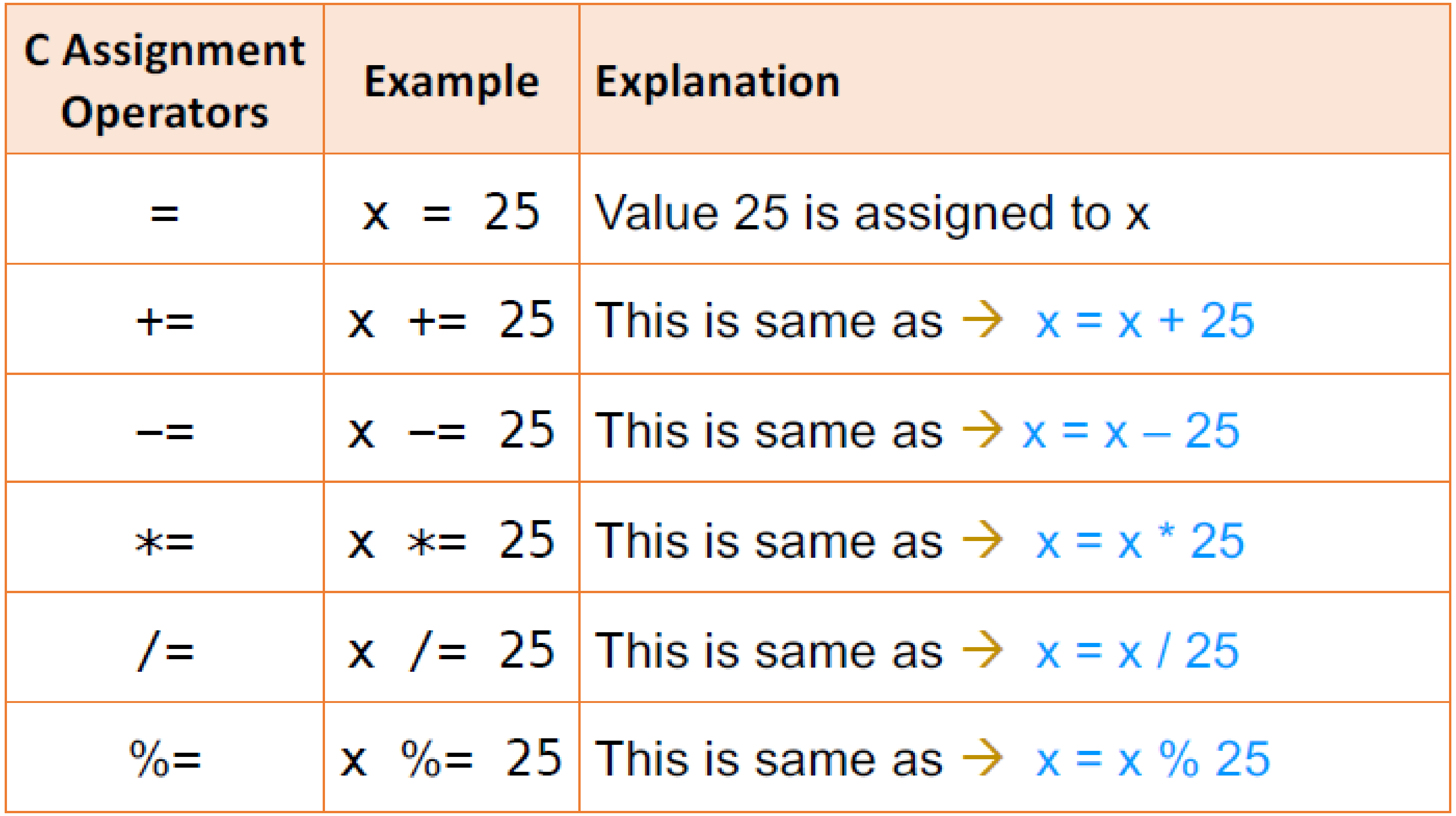
```
int i = 10;
```

Arithmetic operators –Example

```
#include <stdio.h>

int main() {

    int a = 9, b = 4, c;

    c = a+b;                      //addition + → (a+b=13)
    printf("a+b = %d \n", c);

    c = a-b;                      //subtraction - → (a-b=5)
    printf("a-b = %d \n", c);

    c = a*b;                      //multiplication * → (a*b=36)
    printf("a*b = %d \n", c);

    c = a/b;                      //division / → (a/b=2)
    printf("a/b = %d \n", c);

    c = a%b;                      //modulo % → (a%b=1)
    printf("Remainder when a divided by b = %d \n", c);

return 0;
}
```

Assignment Operators in C

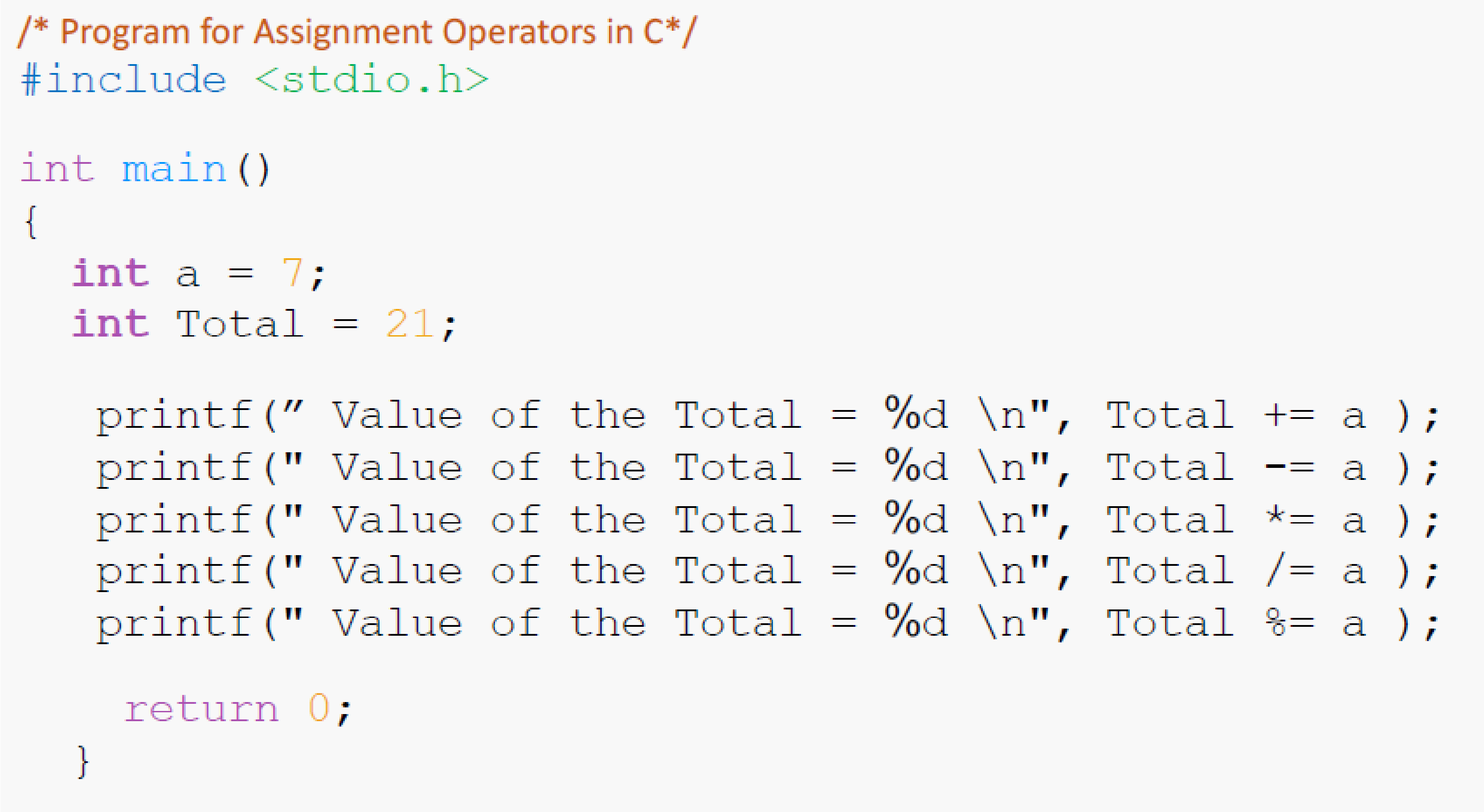
The below table displays all the assignment operators present in C Programming with an example.



C Assignment Operators	Example	Explanation
=	x = 25	Value 25 is assigned to x
+=	x += 25	This is same as → x = x + 25
−=	x −= 25	This is same as → x = x – 25
*=	x *= 25	This is same as → x = x * 25
/=	x /= 25	This is same as → x = x / 25
%=	x %= 25	This is same as → x = x % 25

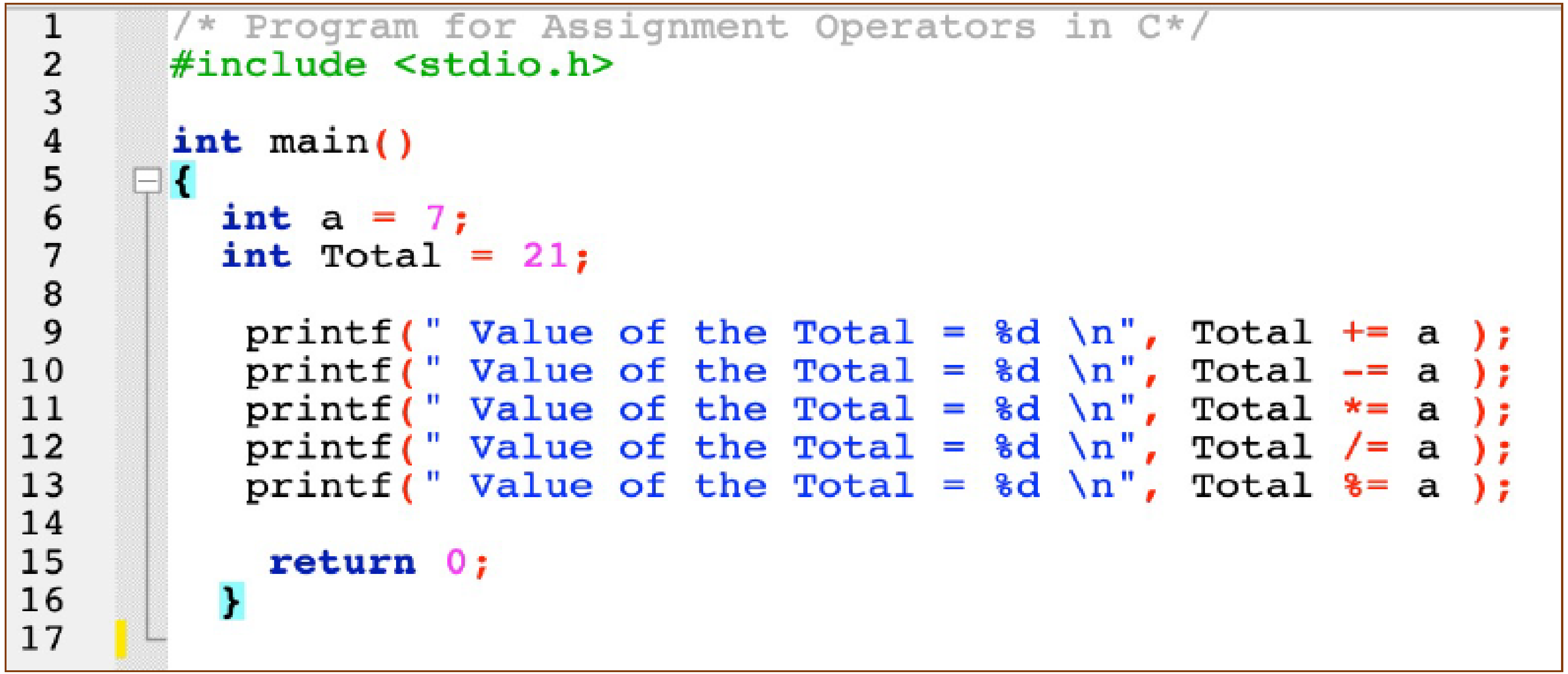
Assignment Operators in C + +–Example

In following Cb bassignment operators Program, two integer variables a and Total are used. And their values are 7 and 21, respectively. It shows the working functionality of all the Assignment Operators in Cb bProgramming Language.



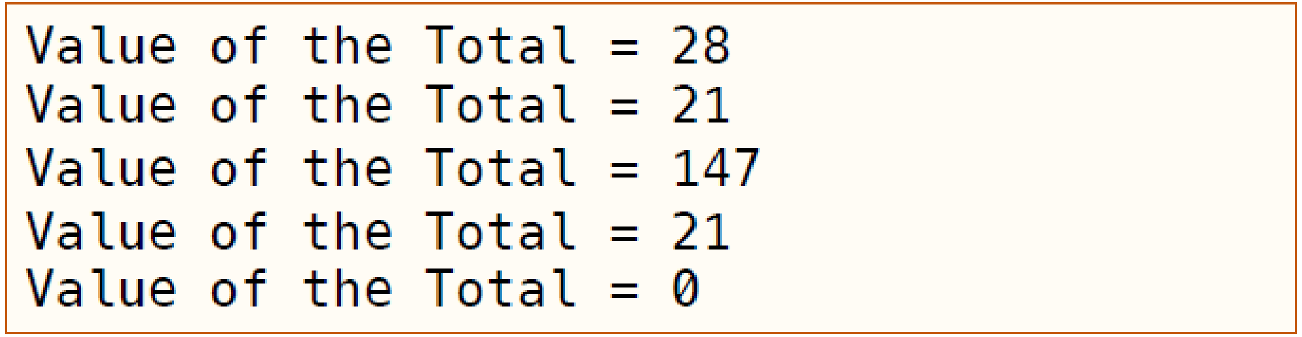
```
/* Program for Assignment Operators in C*/
#include <stdio.h>

int main()
{
  int a = 7;
  int Total = 21;

   printf(” Value of the Total = %d \n", Total += a );
   printf(" Value of the Total = %d \n", Total -= a );
   printf(" Value of the Total = %d \n", Total *= a );
   printf(" Value of the Total = %d \n", Total /= a );
   printf(" Value of the Total = %d \n", Total %= a );

    return 0;
  }
```

Assignment Operators in C + +–Example



```c
/* Program for Assignment Operators in C*/
#include <stdio.h>

int main()
{
  int a = 7;
  int Total  = 21;

   printf(" Value of the Total = %d \n", Total += a );
   printf(" Value of the Total = %d \n", Total -= a );
   printf(" Value of the Total = %d \n", Total *= a );
   printf(" Value of the Total = %d \n", Total /= a );
   printf(" Value of the Total = %d \n", Total %= a );

    return 0;
  }

```

output



```
Value of the Total = 28
Value of the Total = 21
Value of the Total = 147
Value of the Total = 21
Value of the Total = 0
```

Note :

- ➢ `\n` : means new line
- ➢ `\t` : means take a tab space then write

Assignment Operators in C++ –Example

The ***printf*** statements will perform C++ Programming Assignment operations on **a** and **Total** and then display the output (result).
Let us see the C Programming Operator functionality in this C Program

```
printf(" Value of the Total = %d \n ", Total += a );
```

Total += a
means → Total = Total + a = 21 + 7 = 28

```
printf(" Value of the Total = %d \n ", Total -= a );
```

Total -= a
means → Total = Total - a = 28 - 7 = 21

```
printf(" Value of the Total = %d \n ", Total *= a );
```

Total *= a
means → Total = Total * a = 21 * 7 = 147

Assignment Operators in C –Example

```
printf(" Value of the Total = %d \n ", Total /= a );
```

Total /= a

means → Total = Total / a = 147 / 7 = 21

```
printf(" Value of the Total = %d \n ", Total %= a );
```

Total %= a

means → Total = Total % a = 21 % 7 = 0 (the remainder of 21/7 is 0)

Increment and Decrement –Explanation

Increment → ++

a++ is postfix, the expression is evaluated first and then the value is incremented.

Example

```
a = 10;

b = a++; // after this statement, a = 11, b = 10
```

++a is prefix, the value is incremented first and then the expression is evaluated.

Example

```
a = 10;

b =++a; // after this statement, a = 11, b = 11
```

Increment and Decrement –Explanation

Decrement →

a-- is postfix, the expression is evaluated first and then the value is decremented.

Example

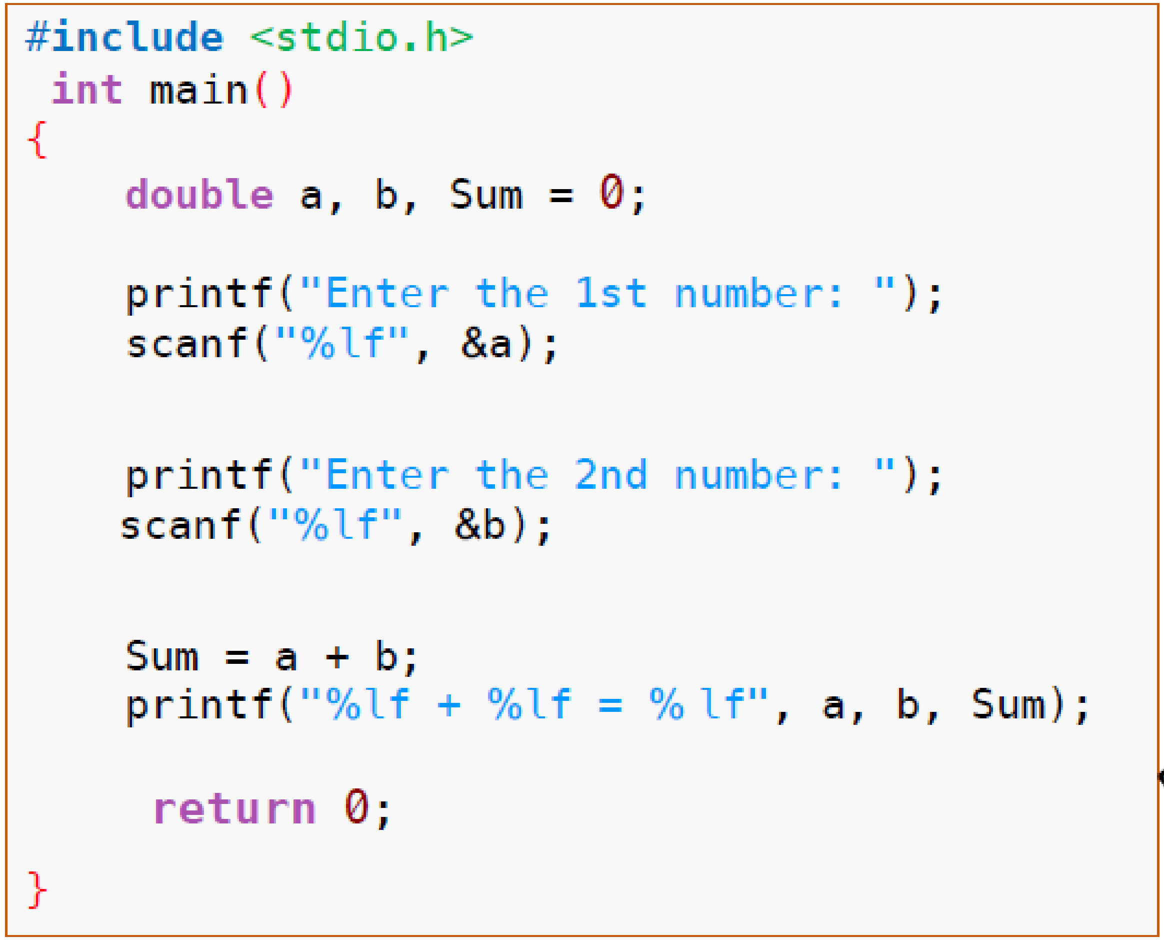
```
a = 10;
b = a--; // after this statement, a = 9, b = 10
```

--a is prefix, the value is decremented first and then the expression is evaluated.

Example

```
a = 10;
b = --a; // after this statement, a = 9, b = 9
```

Class #2 –Adding two double numbers

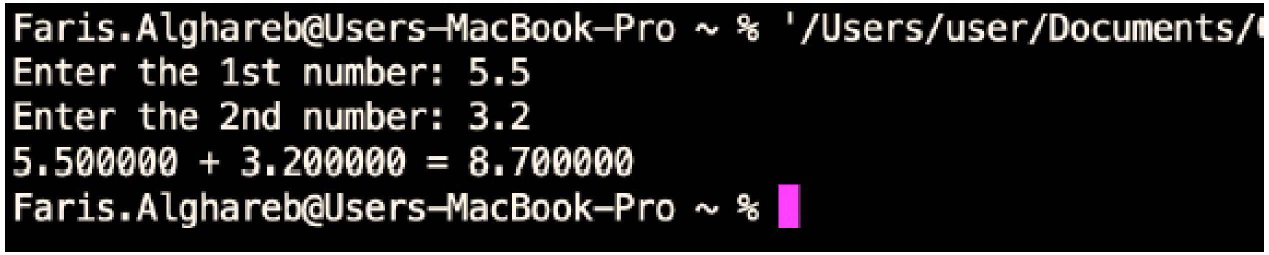


```c
#include <stdio.h>
 int main()
{
    double a, b, Sum = 0;

    printf("Enter the 1st number: ");
    scanf("%lf", &a);


    printf("Enter the 2nd number: ");
    scanf("%lf", &b);


    Sum = a + b;
    printf("%lf + %lf = % lf", a, b, Sum);

     return 0;
}
```

Output:

?

Build and run

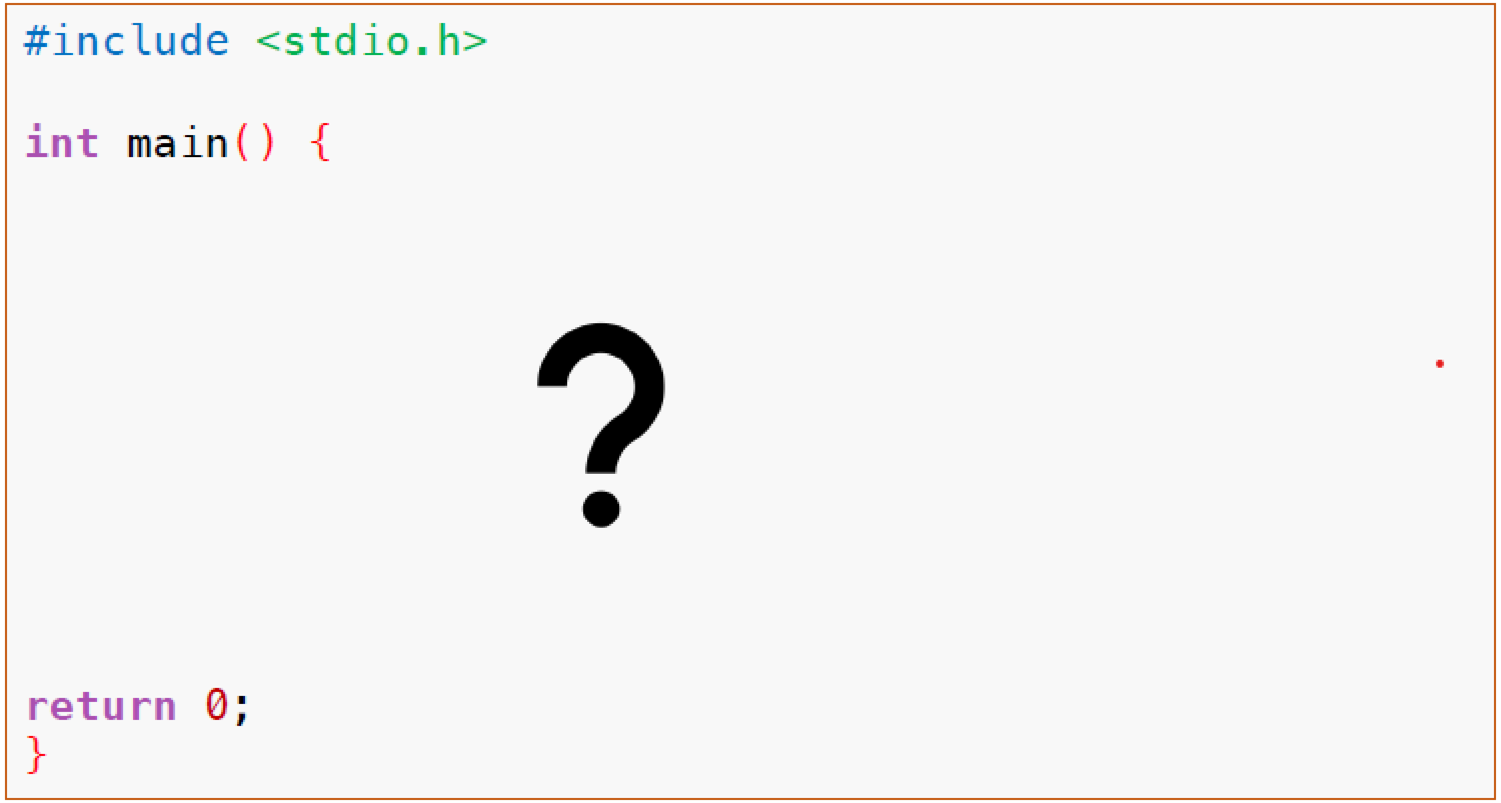


```
Faris.Alghareb@Users-MacBook-Pro ~ % '/Users/user/Documents/
Enter the 1st number: 5.5
Enter the 2nd number: 3.2
5.500000 + 3.200000 = 8.700000
Faris.Alghareb@Users-MacBook-Pro ~ %
```

Area calculation of a circle

Write a C program that reads the radius of a circle and and prints its area and circumference.

Ans:



```
#include <stdio.h>

int main() {



                ?



return 0;
}
```

THANK
YOU