Chapter 2 : Instructions and Operators

A C program is a set of Instructions. Just like a recepie - which contains Instructions to prepare a particular Dish.

Types of Instructions

1> Type declaration Instruction
2> Arithmetic Instruction
3> Control Instruction

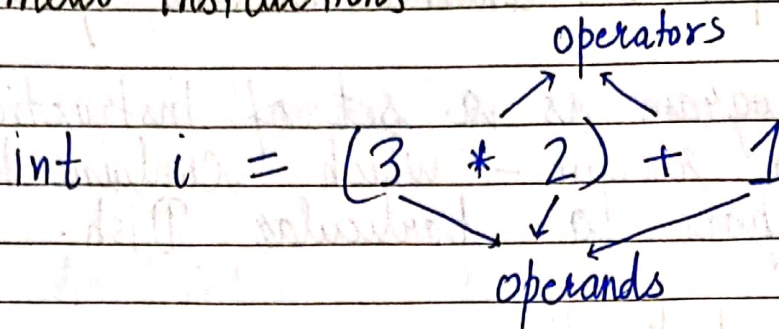## Type declaration Instruction

int a;
float b;

Other Variations :

int i = 10; int j = i; int a = 2
int j1 = a + j - i;

float b = a + 3; float a = 1.1 => ERROR! as we are trying to use a before defining it.

int a, b, c, d;
a = b = c = d = 30; ⇒ Value of a, b, c & d will be 30 each.

Arithmetic Instructions

$$\text{int } i = \underset{\text{operands}}{(3 \; \overset{\text{operators}}{*} \; 2) \; \overset{}{+} \; 1}$$

Operands can be int/float etc.
+ - * / are arithmetic operators

```
int b = 2, c = 3;
int z; z = b * c;     ✓ legal
int z;   b * c = z;   ✗ Illegal (Not allowed)
```

% → Modular division operator
% → Returns the remainder
% → cannot be applied on float
% → Sign is same as of numerator $(-5\%2 = -1)$

$$5\%2 = 1 \qquad -5\%2 = -1$$

Note :-

1) No operator is assumed to be present

```
int i = ab     → Invalid
int i = a * b  → valid
```

2) There is no operator to perform exponentiation in C. However we can use pow (x, y) from <math.h> (More later)

Type Conversion

An Arithmetic operation between

Int and Int → Int
Int and float → Float
Float and float → Float

$5/2$ → 2 $5.0/2$ → 2.5   } **Important!!**

$2/5$ → 0 $2.0/5$ → 0.4

Note :-

int a = 3.5; In this case 3.5 (float) will be demoted to 3 (int) because a is not able to store floats.

float a = 8; a will store 8.0
8 → 8.0 (promotion to float)

Quick Quiz:

Q int k = 3.0/9 Value of k? and why?

S 3.0/9 = 0.333.. but since k is an int, it cannot store floats & value 0.33 is demoted to 0.

Operator precedence In C

$3 * x - 8 * y$ is $(3x) - (8y)$ or $3(x - 8y)$?

In C language simple mathematical rules like BODMAS, no longer applies.

The answer to the above question is provided by operator precedence & associativity.

Operator precedence :- The following table lists the operator priority in C

Priority	Operators
1st	$*$ / %
2nd	+ -
3rd	=

Operators of higher priority are evaluated first in the absence of parenthesis.

Operator Associativity :- When operators of equal priority are present in an expression, the tie is taken care of by associativity.

$$x * y / z \implies (x * y) / z$$

$$x / y * z \implies (x / y) * z$$

*, / follows Left to right associativity

Control Instructions

Determines the flow of Control in a program

Four types of Control Instructions in C are:

1. Sequence Control Instruction
2. Decision Control Instruction
3. Loop Control Instruction
4. Case Control Instruction