Operators and Expressions

COMP 102 Lecture 3

Expression

- Expression is a combination of variables, constants and operator written according to syntax of the language
- Evaluation of expression
  - Every expression results in some value of certain type that can be assigned to a variable

Variable= expression

eg. x= y*3+ 2a

Operators

- Operator is a symbol that operates on certain type of data. eg. +, - , *
- Operands are object on which operation is performed.
- Types : Unary and Binary operation
- Classification of operators
  - Arithmetic Operators
  - Relational Operators
  - Logical Operators
  - Assignment Operators
  - Increment and Decrement Operators
  - Conditional Operators

Unary Operators

- Operators that act upon a single operand to produce a new value.
- Most common unary operation is unary minus
- Unary operators:
- Increments ++(increase by one)
- Decrements –(decrease by one)

Increment and Decrement Operators

- Increment operator : ++
  - Adds 1 to operand
  - eg. x++ is equivalent to x=x+1
- Decrement Operator : --
  - Subtracts - from operand
  - eg. x-- is equivalent to x=x-1
- Both are unary operators
- Two forms : Prefix and Postfix

Increment and Decrement Operators

- Prefix
  - eg. ++a;
  - First increment then assignment of values

    int t, m=2;

    t=++m;

    printf("t=%d m=%d",t,m);

    Output : t=3 m=3;
- Postfix
  - eg. a++;
  - First assignment then increment of values

    int t, m=2;

    t=m++;

    printf("t=%d m=%d",t,m);

    Output : t=2 m=3;

Arithmetic Operators

Operators	Meaning
+	Addition
-	Subtraction
*	Multiplication
/	Division
%	Modulo Division

Arithmetic Operators

- Integer arithmetic
  - When both the operands in a single arithmetic expression such as a+b are integers, the operation is called integer arithmetic
  - Integer arithmetic always yields an integer value

    e.g. if a=8 and b=3(both integers) then

    a - b = 5

    a + b = 11

    a * b = 24

    a / b = 2

    a % b = 2

Arithmetic Operators

- Real arithmetic
  - An arithmetic operation involving only real operands is called real arithmetic
  - Operator % can not be used in real arithmetic
  - Real arithmetic yields a real value

e.g. If x is defined as float, then we will have

$$x = 1.0/3.0 = 0.333333$$

Arithmetic Operators

- Mixed - mode arithmetic
  - An arithmetic operation involving one real and other integer operand is called mixed mode arithmetic
  - Mixed mode arithmetic always yields a real value

  e.g. 15 / 4.0 = 3.75

  whereas 15/4 = 3

Relational Operators

- Used for comparisons purpose
- C supports six relational operators listed below

Operator	Meaning
<	is less then
<=	is less then or equal to
>	is greater then
>=	is greater then or equal to
==	is equal to
!=	is not equal to

Relational Operators

- Relational Operators are used in decision operation such as if and while statement.

Example :

```
if(a>5)
        printf("a is greater than 5");

if(a!=10)
        printf("a is not equal to 10");
```

Logical Operators

- Used to compare or evaluate relational expression
- C has following logical Operators
  - && : Logical AND

```
if(a>b  &&  a==10)
        printf("a is greater than b and equals to 10");
else
        printf("a is not greater than b or not equals to 10 or both");
```

  - || : Logical OR

```
if(a>b  ||  a==10)
        printf("a is greater than b or equals to 10 or both ");
else
        printf("a is not greater than b and not equals to 10");
```

  - ! : Logical NOT

```
if( ! (a>b) )
        printf("a less than b or equal to b");
else
        printf("a is greater than b");
```

- Logical operators && and || are use for testing more than one condition and make decision

Assignment Operators

- Use assignment operator to assign result of an expression to a variable
- Operator evaluates the expression on the right and assigns the resulting value of variable on left

Variable Operator= expression

- Assignment Operators

  += -= *= /=

  int a=10;

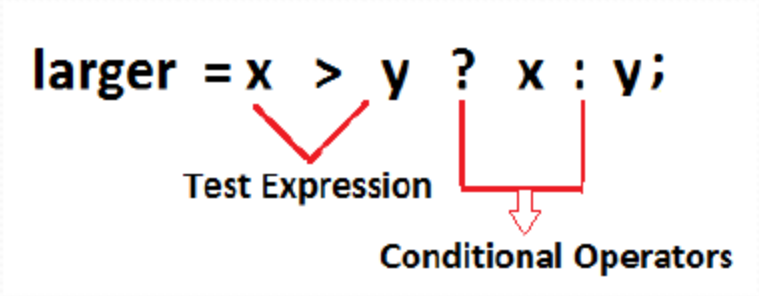
  eg. a+=5 is equivalent to a=a+5

Conditional Operators

- Consist of two symbols : question mark (?) and colon (:) which are called ternary operators

```
exp1 ? exp2 : exp3
```

- If exp1 is true exp2 is value of expression else exp3 is value of expression
- Example



Precedence of arithmetic Operators

- Operator Precedence is an **evaluation order** in which the operators within an expression are evaluated on the priority bases

Priority	Operators	Description
1st	* / %	multiplication, division, modular division
2nd	+ -	addition, subtraction
3rd	=	assignment

- Example: d=a + b * c

Library Functions:

- Carry out various commonly used operations and calculations.
- Library funtions : abs(i),tolower(c), toupper(c) sqrt(d), pow(d1,d2),printf(), scanf(),toascii(c)