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IT1010 – Introduction to Programming

Lecture 3 – Operators in C

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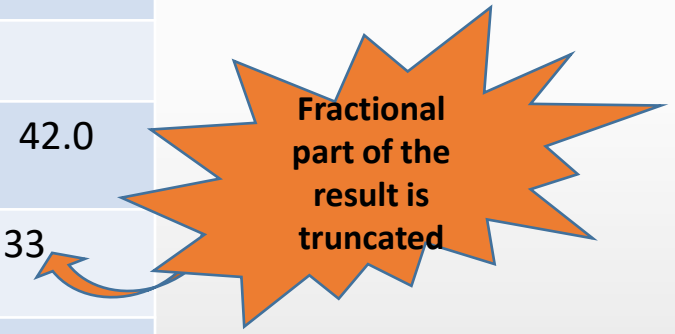
Objectives

- At the end of the Lecture students should be able to
  - Use arithmetic operators in C programs.
  - Correctly apply the precedence of arithmetic operators
  - Use relational operators in C programs.
  - Use logical operators in C programs

Arithmetic Operators

Operation	Arithmetic Operator	C Expression	Example
Addition	+	no1 + 8	5 + 6 = 11
Subtraction	-	value – no2	7 - 2 = 5
Multiplication	*	qty * price	4 * 10.5 = 42.0
Division	/	tot / 3	100 / 3 = 33
Remainder	%	no1 % no2	10 % 3 = 1



Arithmetic operators are binary operators.

Operator Precedence and Associativity

- Operator precedence establishes the priority of an operator in relationship to all other operators.
- Parentheses can be used to modify the normal order of execution of an expression.
- Operator associativity establishes the order in which operators of the same precedence are to be executed.

Operator Precedence of Arithmetic Operators

Order	Operator(s)	Associativity
1	() Parentheses	Left to right
2	* Multiplication / Division % Remainder	Left to right
3	+ Addition - Subtraction	Left to right

Example

74 / 10 % 2 * 5 – 10 % (5 – 1)

74 / 10 % 2 * 5 – 10 % 4 → parentheses

7 % 2 * 5 – 10 % 4
1 * 5 – 10 % 4 } multiplication, division, remainder according to associativity
5 - 10 % 4
5 - 2
3 → subtraction

Quiz

- Find the result of the following expressions

Q1

```
y = 2 * 5 * 5 + 3 * 5 + 7;
```

Q2

```
y = -75 / 25 + 5 * 3 + 2 / 3
```

Equality and Relational Operators

Equality and relational operators test the relationship between two expressions and yields true or false

Operation	Operator	C Expression
equal to	==	x == y
not equal to	!=	x != y
greater than	>	x > 30
less than	<	x < y
greater than or equal to	>=	x >= (6 + y)
less than or equal to	<=	x <= y

A Common error is to use assignment operator (=) instead of the equivalence operator (==)

Operator Precedence Revisited

Order	Operator(s)	Associativity
1	()	Left to right
2	!	Right to left
3	* / %	Left to right
4	+ -	Left to right
5	< <= > >=	Left to right
6	== !=	Left to right
7	=	Right to left

Quiz

Assume no1 = 5 and no2 = 4. Determine whether the following expressions yield a *true* or *false*

Q1
no1 == -5

Q2
no1 != no2

Q3
no1 > (no2 + 1)

Q4
no1 >= (no2 + 1)

Q5
no1 <= 12

Q7
no1 == no2

Logical Operators

Used to form more complex conditions by combining simple conditions.

Operation	Operator	C Expression
Logical AND	&&	gender = 1 && age >= 65
Logical OR	||	semesterAverage >= 90 || finalExam >= 90
Logical NOT	!	! (grade == 'F')

Cast operator

- Cast operators force the conversation of a value to a specified type. It is called **explicit** conversion.
- It is formed by placing parentheses around a data type name.

Format:

(type) expression

Example

```
int total = 203;
int count= 5;
float average;

average = ( float ) total / count;
```

Converting between types implicitly

- Arithmetic expressions can be evaluated only in which the operands' data types are identical. To ensure this, the compiler performs an operation called implicit conversion on selected operands.

Example: In an expression containing the data types int and float, copies of *int* operands are made and promoted to *float.*

Assignment Operators

- There are several assignment operators for abbreviating assignment expressions.

variable = *variable* operator *expression*;

can be written as

variable operator= *expression;*

where operator is one of the binary operators +, -, *, / or %

Example

```
c = c + 3;   // this is same as c += 3;
```

Increment and Decrement operators

++ increment operator

-- decrement operator

k = ++n; // prefix increment : n = n + 1; then k = n;

k = n++; // postfix increment : k = n; then n = n + 1;

k = --n; // prefix decrement : n = n - 1; then k = n;

k = n--; // postfix decrement : k = n; then n = n - 1;

Quiz

Find the result of following C statements if no = 10 and x = 5.

Q1

```
no  -= 4;
printf("%d", no);
```

Q2

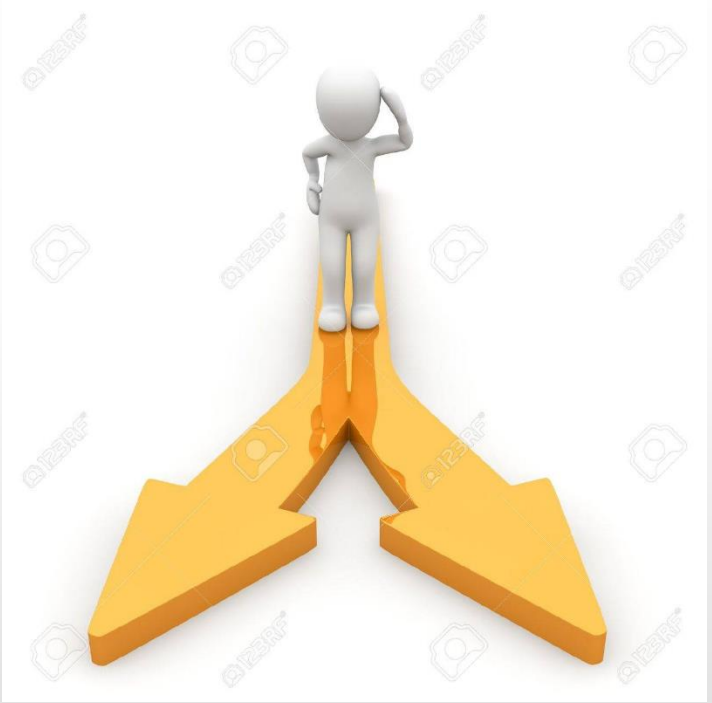
```
printf("%d\n",  x++);
printf("%d\n",  x);
```

Q3

```
printf("%d\n",  ++x);
printf("%d\n",  x);
```

Selection

- Obviously in the real world we make choices

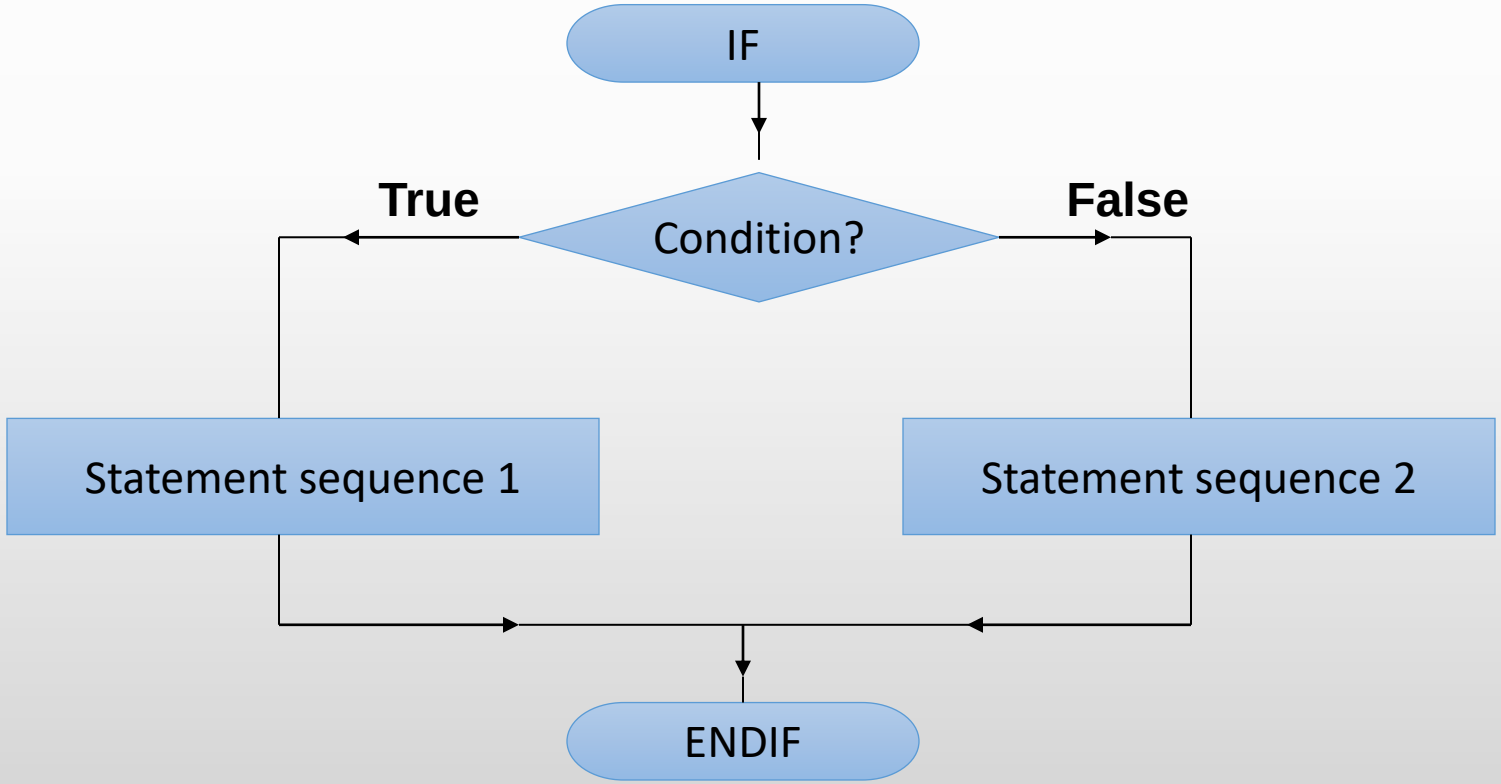


Selection

- In solving a problem we can make different choices depending on certain conditions - i.e. we make decisions
- The same can be done in programming as a part of decision making
- Note that even though selection is a separate construct to sequence, the two are combined in the overall solution, and remember that one doesn't replace the other

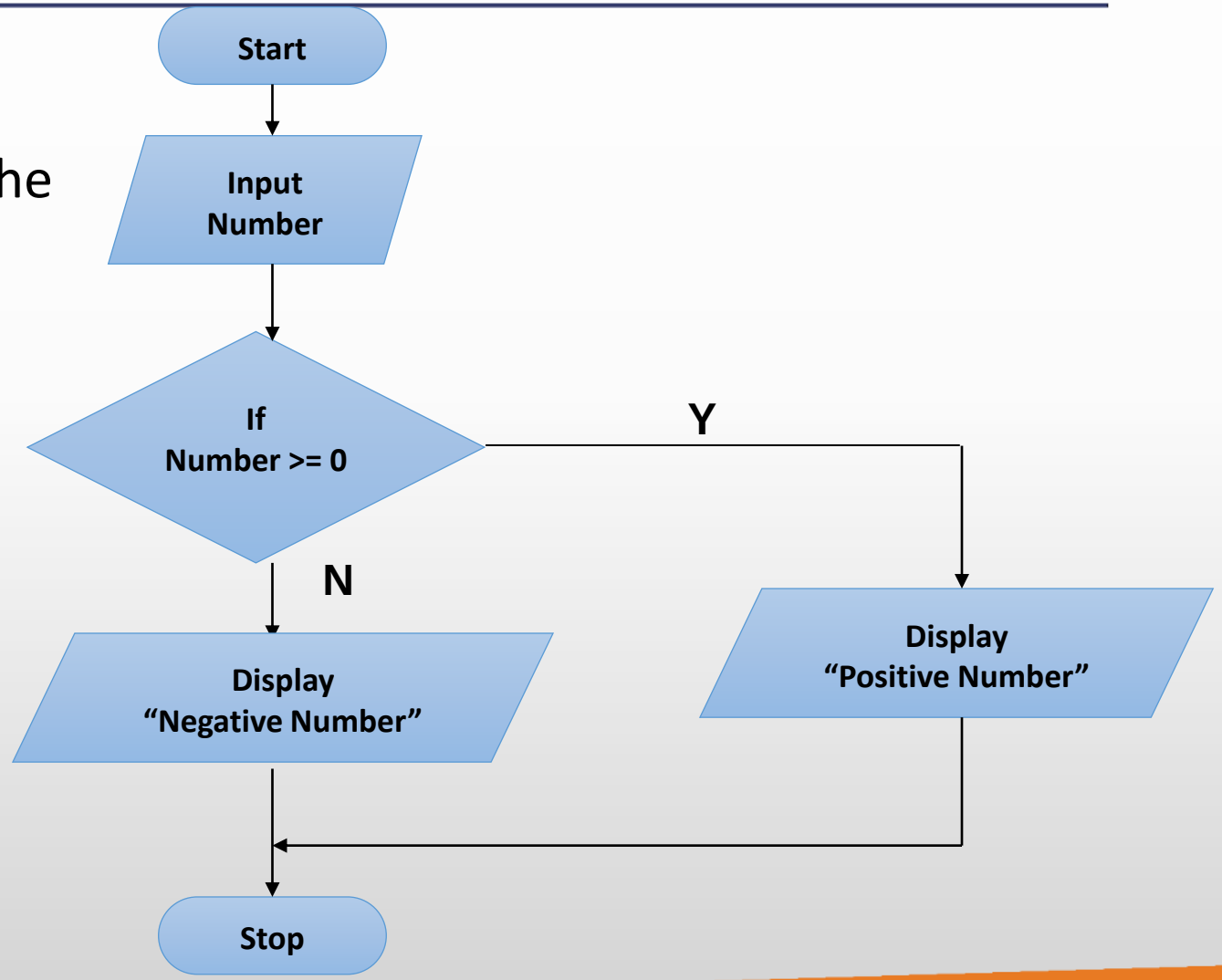
Selection

- There may be alternative steps that could be taken subject to a particular condition



Example - 01

- A flowchart to input a number from the keyboard and display whether the number is positive or negative.



Exercise

- Draw a flowchart to input two numbers from the keyboard and display the largest number.