Lecture 1: Concepts & Basics of C++ Programming

Today’s

Today we are going to cover -

- Basics of ‘C’- Recap
- Loops in ‘C’ -Recap
- Your Knowledge check

MCQ Questions

Let’s Get Started-

Problem - 1

Q. Spreadsheet or Excel is which kind of software?

A. OS

B. System software

C. Application software

D. None of the above

solution- 1

Q. Spreadsheet or Excel is which kind of software?

A. OS

B. System software

C. Application software

D. None of the above

Hint : Layered view of computer

Application Programs
Word-Processors, Spreadsheets,
Database Software, IDEs,
etc...

System Software
Compilers, Interpreters,Preprocessors, etc
Operating System, Device Drivers

Machine with all its hardware

Problem - 2

Which of the following is machine dependent and non- portable languages?

1. Assembly language
2. Machine language
3. High level language

A. 1 & 3
B. 2 & 3
C. 1 & 2
D. All

solution- 2

Which of the following is machine dependent and non- portable languages?

1. Assembly language
2. Machine language
3. High level language

A. 1 & 3
B. 2 & 3
C. 1 & 2
D. All

Hint: Solution

- Machine Language
  - Uses binary code
  - Machine-dependent
  - Not portable
- Assembly Language
  - Uses mnemonics
  - Machine-dependent
  - Not usually portable
- High-Level Language (HLL)
  - Uses English-like language
  - Machine independent
  - Portable (but must be compiled for different platforms)
  - Examples: Pascal, C, C++, Java, Fortran, . . .

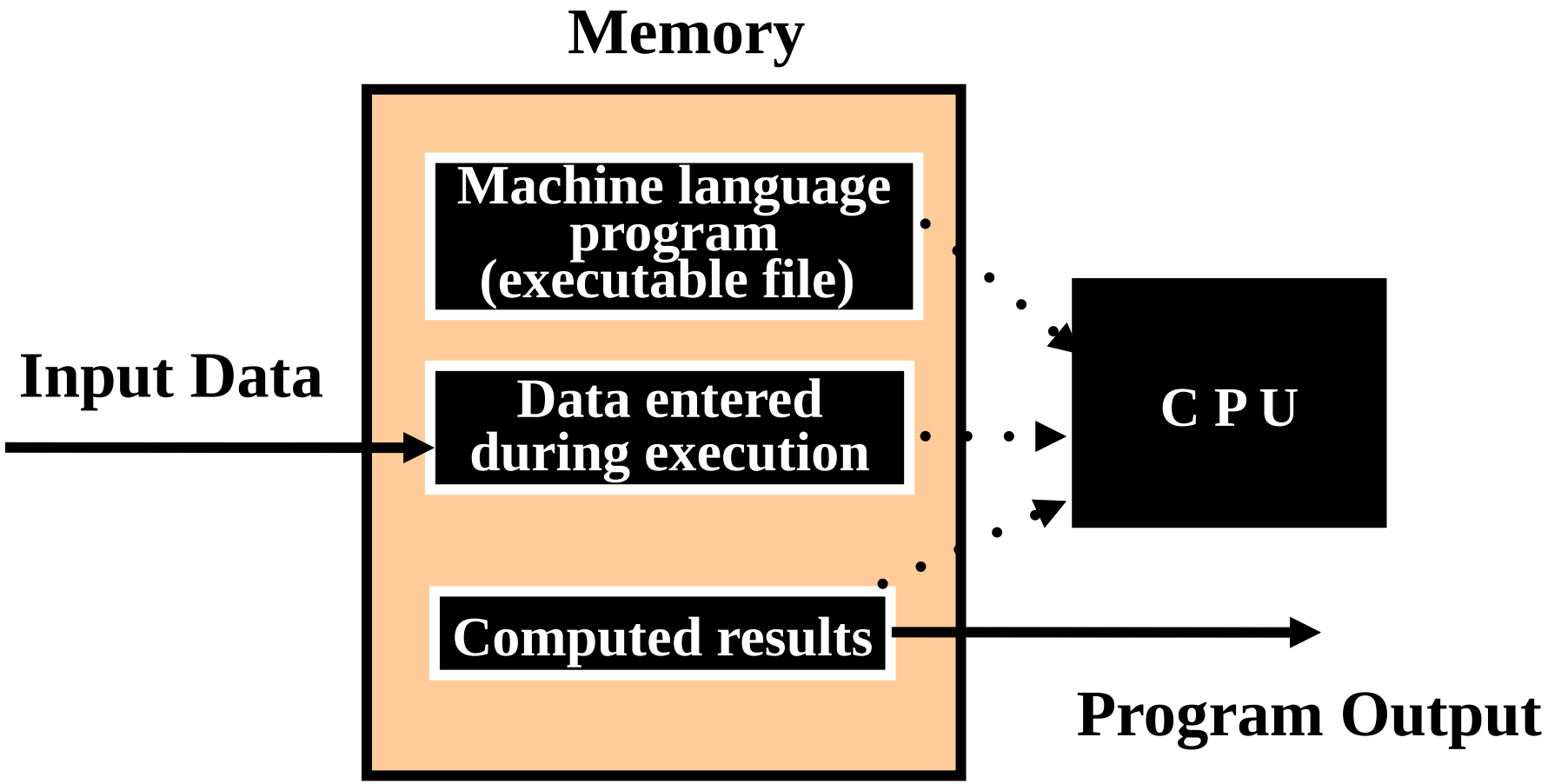
Source code/object code/

- **Source program**
  - The form in which a computer program, written in some formal programming language, is written by the programmer.
- **Object program**
  - Output from the compiler (Files with extension ‘.obj’)
  - Equivalent machine language translation of the source program into object code or machine code
- **Executable program**
  - Output from linker/loader (Files with extension ‘.exe’)
  - Machine language program linked with necessary libraries & other files

Linker

- A program that pulls other programs together so that they can run.
- Most programs are very large and consist of several modules.
- Even small programs use existing code provided by the programming environment called libraries.
- The linker pulls everything together, makes sure that references to other parts of the program (code) are resolved.

How program runs?



Problem - 4

What types of errors do you encounter while executing C program?

1. Syntax errors
2. Logical errors
3. Runtime errors

A. 1
B. 2
C. 3
D. All

solution- 4

What types of errors do you encounter while executing C program?

1. Syntax errors
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A. 1
B. 2
C. 3
D. All

Hint:Solution

- Syntax Errors:
  - Errors in grammar of the language
- Runtime error:
  - When there are no syntax errors, but the program can’t complete execution
    - Divide by zero
    - Invalid input data
- Logical errors:
  - The program completes execution, but delivers incorrect results
  - Incorrect usage of parentheses

Problem - 5

Which one is better to use: Compiler or interpreter?

A. Compiler
B. Interpreter
C. Both
D. Depends on the requirement

solution- 5

Which one is better to use: Compiler or interpreter?

A. Compiler
B. Interpreter
C. Both
D. Depends on the requirement

Hint : solution

- Compilation:
  - Syntax errors caught before running the program
  - Better performance
  - Decisions made once, at compile time
- Interpretation:
  - Better diagnostics (error messages)
  - More flexibility
  - Supports **late binding** (delaying decisions about program implementation until runtime)
    - Can better cope with PLs where type and size of variables depend on input
  - Supports creation/modification of program code on the fly (e.g. Lisp, Prolog)

Problem - 6

Which of the following is basic data type?

1. **Int**
2. **Char**
3. **double**
4. **Float**

A. 1,2
B. 1,2,4
C. All
D. 1,2,3

Solution- 6

Which of the following is basic data type?

1. **Int**
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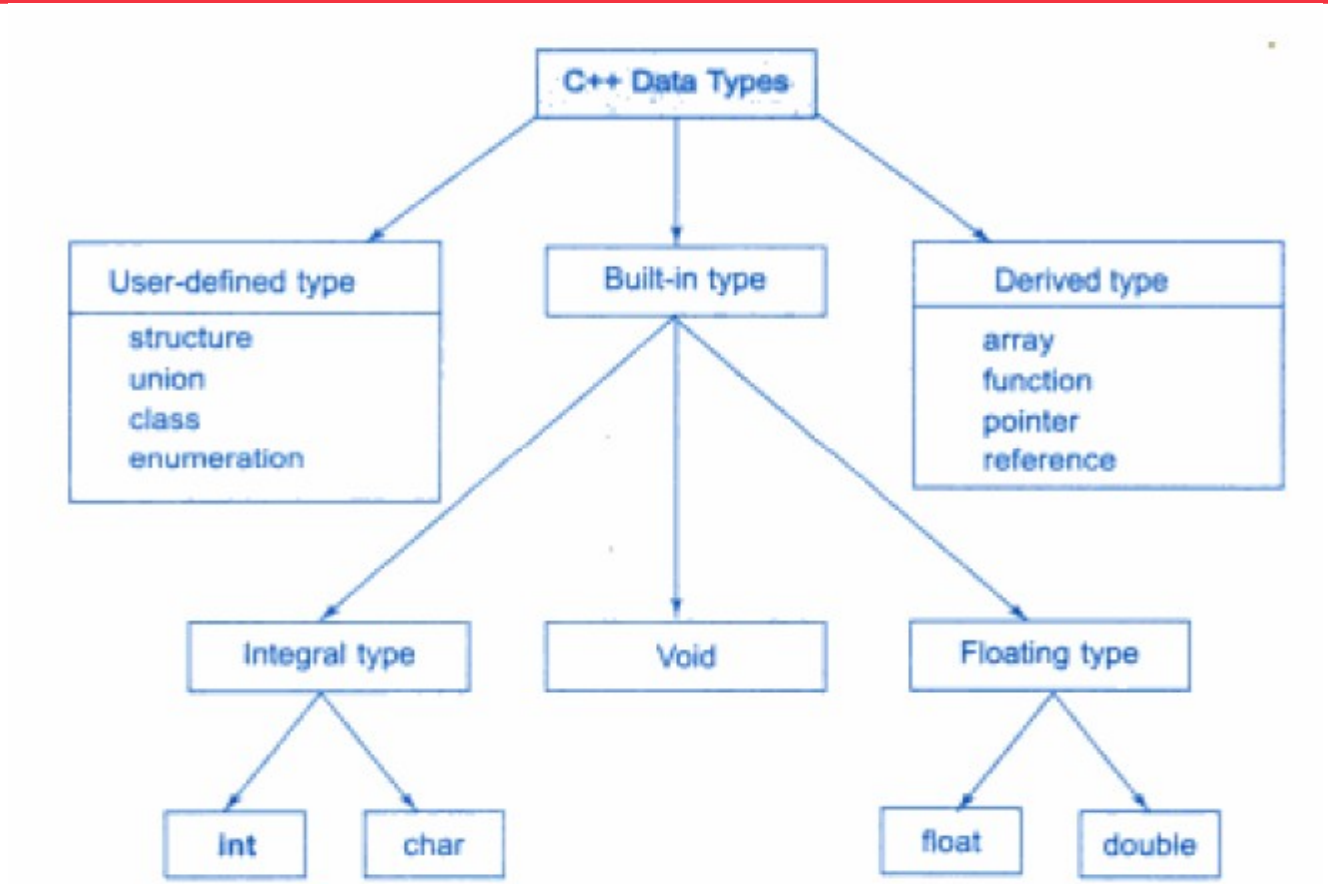
Solution


C++ Data Types
User-defined type
structure
union
class
enumeration
Built-in type
Derived type
array
function
pointer
reference
Integral type
Void
Floating type
int
char
float
double

Operator precedence and

Category	Operator	Associativity
Postfix	() [] -> . ++ - -	Left to right
Unary	+ - ! ~ ++ - - (type)* & sizeof	Right to left
Multiplicative	* / %	Left to right
Additive	+ -	Left to right
Shift	<< >>	Left to right
Relational	< <= > >=	Left to right
Equality	== !=	Left to right
Bitwise AND	&	Left to right
Bitwise XOR	^	Left to right
Bitwise OR	|	Left to right
Logical AND	&&	Left to right
Logical OR	||	Left to right
Conditional	?:	Right to left
Assignment	= += -= *= /= %=>>= <<= &= ^= |=	Right to left
Comma	,	Left to right

Simple C++ program

C

```
/* my first program in C */
#include <stdio.h>


int main()
{
   printf(“Welcome to C....\
   n");
   return 0;
}
```

C++

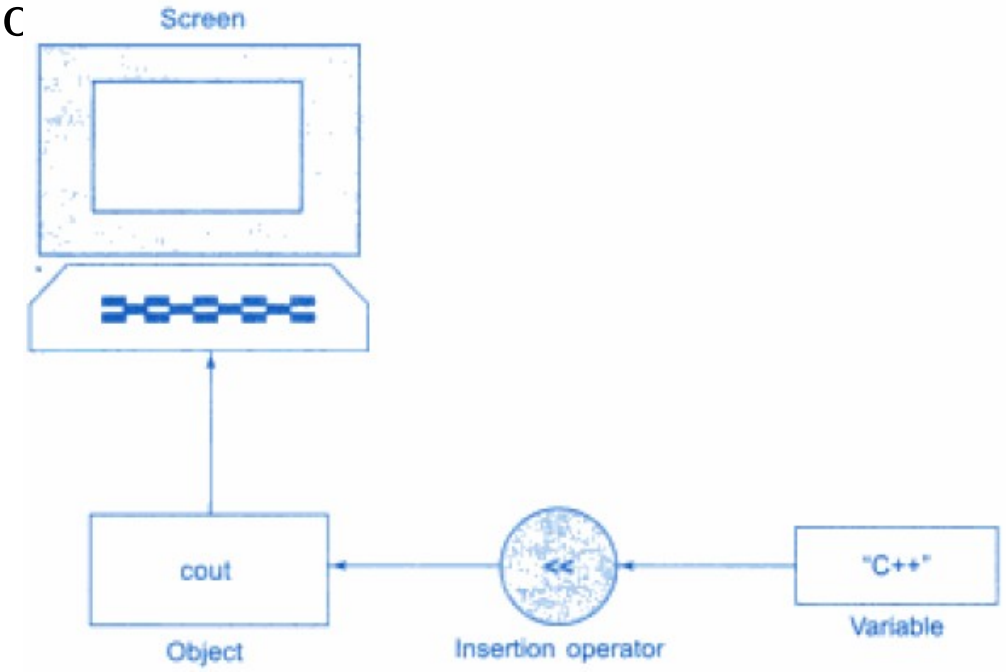
```
/*my first program in C++*/
#include<iostream>
using namespace std;
int main()
{
    cout<< “Welcome to C++
    .... \n”;
    return 0;
}
```

Output operator

- The statement

  cout<< “C++ is better than C. \n”;

- The statement causes the string in quotation marks to be displayed c



Question

- How to display value of variable a in c++ like following?
- Value of a = 5
- Hint : In c , printf(“Value of a= %d” , a);

Solution

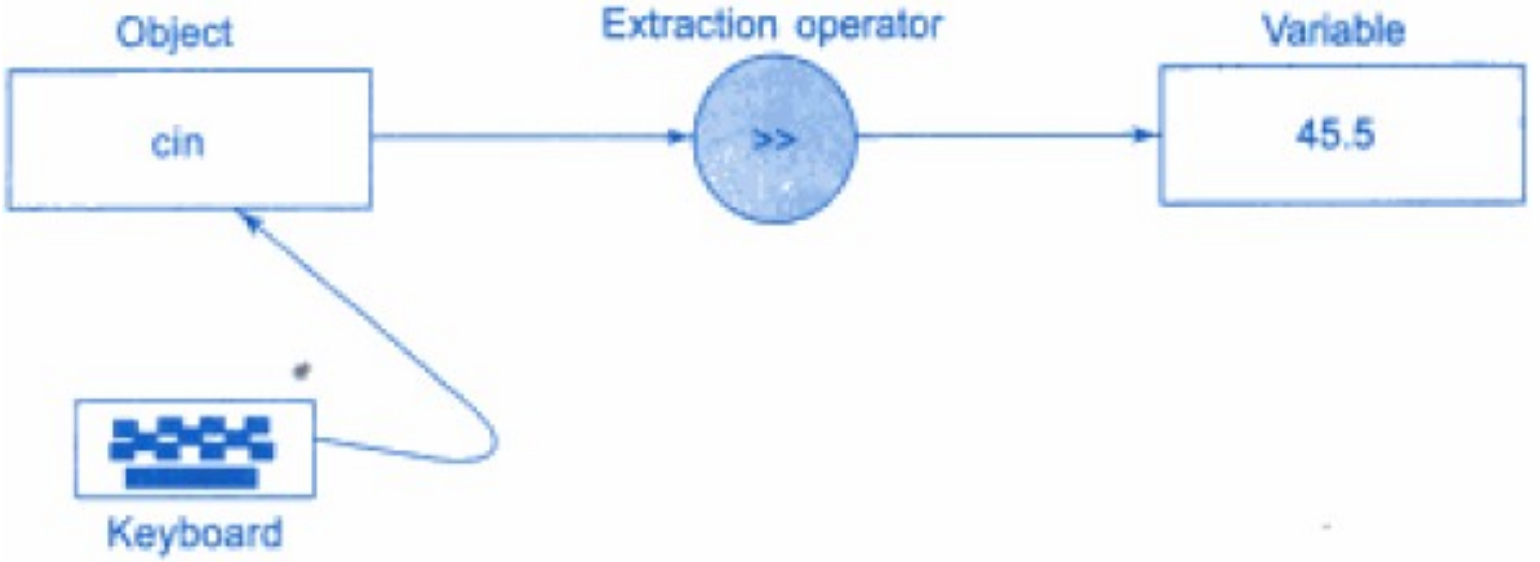
- How to display value of variable a in c++ like following?
- Value of a = 5
- Hint : In c , printf(“Value of a= %d” , a);
- cout<< “Value of a”<<a;

Input operator

- The statement

  cin>> number;

  is an input statement and causes the program to wait for the user to type in a input.



Question

- How to accept value of variables a,b from user in c++ like following?
- Hint : In c , scanf(“%d%d” , &a, &b);

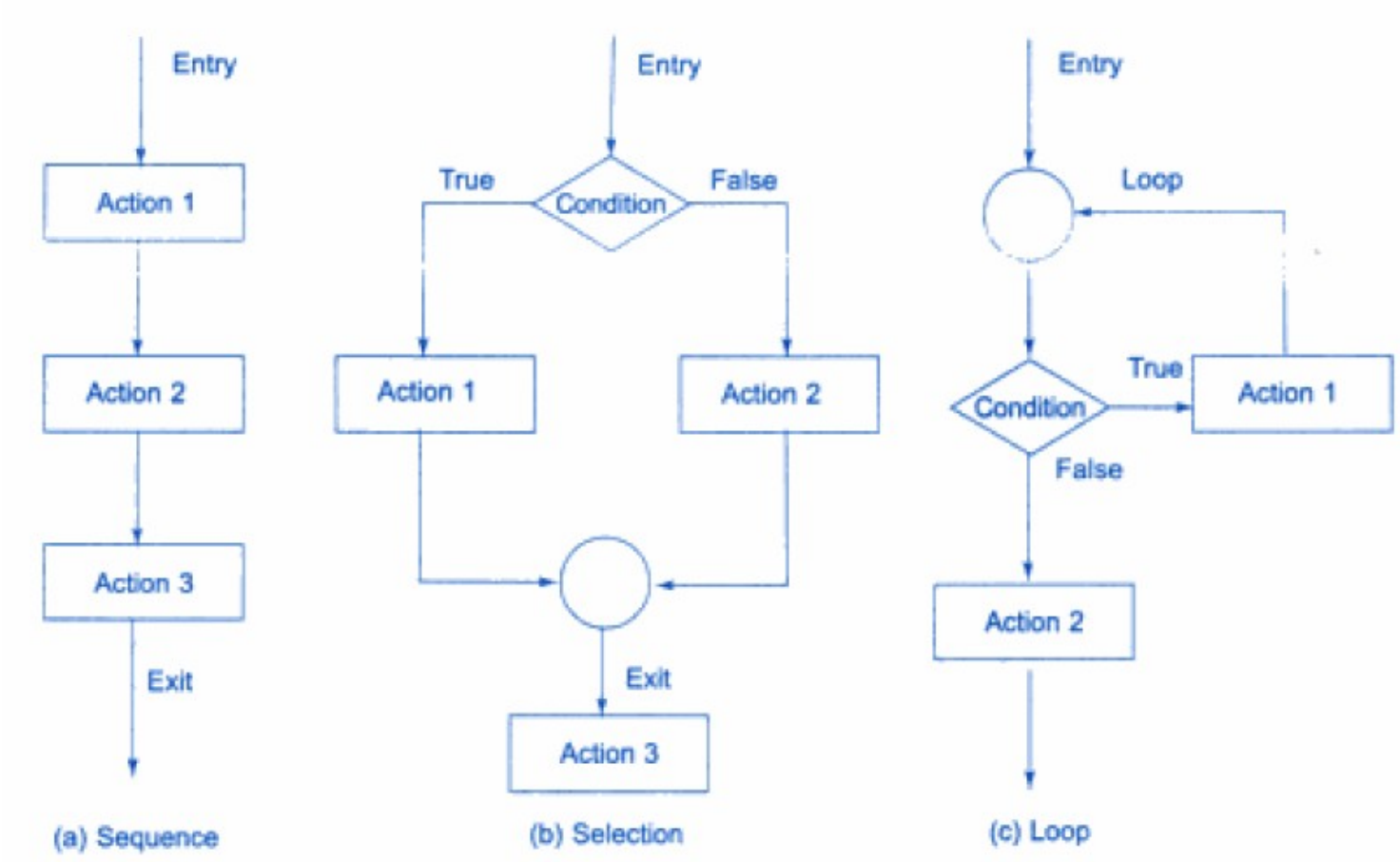
Solution

- How to accept value of variables a,b from user in c++ like following?
- Hint : In c , scanf(“%d%d” , &a, &b);
- cin>>a>>b;

Control structures

- One of the instructions, statements or groups of statements in a programming language which determines the sequence of execution of other instructions or statements is called control structure.
- In C++ there are three Control Structures.
  - Sequence Structure (straight line)
  - Selection Structure (branching)
  - Loop Structure (iteration or repetition)

Control Structures



Problem

Which are the following are selection structures(branching)?

1. **If**
2. **If else**
3. **Nested if**
4. **Switch**

A. 1,2
B. 1,2,3
C. All
D. 2,3,4

Solution

Which are the following are selection structures(branching)?

1. **If**
2. **If else**
3. **Nested if**
4. **Switch**

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D. 2,3,4

Selection Structure

- C++ programming language provides following types of selection statements.
  - if statements
  - if .. else statements
  - Nested if statements
  - switch statements

  - *To do: Learn Syntax of each of these types*

Selection Structure (Switch)

A **switch** statement allows a variable to be tested for equality against a list of values.
Each value is called a case, and the variable being switched on is checked for each case.
Syntax:

```
switch(expression){
    case constant-expression  :
       statement(s);
       break; //optional
    case constant-expression  :
       statement(s);
       break; //optional

    // you can have any number of case statements.
    default : //Optional
       statement(s);
}
```

Problem

```
#include <iostream>
using namespace std;

int main ()
{
    // local variable declaration:
    char grade = 'D';

    switch(grade)
    {
    case 'A' :
        cout << "Excellent!" << endl;
        break;
    case 'B' :
    case 'C' :
        cout << "Well done" << endl;
        break;
    case 'D' :
        cout << "You passed" << endl;
        break;
    case 'F' :
        cout << "Better try again" << endl;
        break;
    default :
        cout << "Invalid grade" << endl;
    }
    cout << "Your grade is " << grade << endl;

    return 0;
}
```

Problem

Which are the entry controlled loops in C?

1. For
2. while
3. Do..while

A. All

B. 1 ,2

C. 2,3

D. 1,3

Solution

Which are the entry controlled loops in C?

1. For
2. while
3. Do..while

A. All

B. 1 ,2

C. 2,3

D. 1,3

Solution

Which are the entry controlled loops in C?

1. For
2. while
3. Do..while

A. All

B. 1 ,2

C. 2,3

D. 1,3

Program output?

```
#include <iostream>
using namespace std;
int main()
{
    int a=10;
    while(a>20)
    {
            cout<<"value of a: "<<a<<endl;
            a++;
    }
    cout<<endl<<"end of program";
    return 0;
}
```

Program output

```
value of a: 10
value of a: 11
value of a: 12
value of a: 13
value of a: 14
value of a: 15
value of a: 16
value of a: 17
value of a: 18
value of a: 19
```

Program output?

```
#include <iostream>
using namespace std;
int main()
{
    int a=10;

    do
    {
            cout<<"value of a: "<<a<<endl;
            a++;
    }while(a>20);
    cout<<endl<<"end of program";
    return 0;
}
```

Program output

```
value of a: 10
value of a: 11
value of a: 12
value of a: 13
value of a: 14
value of a: 15
value of a: 16
value of a: 17
value of a: 18
value of a: 19
```

Program output?

```
#include <iostream>
using namespace std;
int main()
{
   for( int a=10; a<20;a++)
   {
       cout<<"value of a: "<<a<<endl;

    }
    return 0;
}
```

Program output

```
value of a: 10
value of a: 11
value of a: 12
value of a: 13
value of a: 14
value of a: 15
value of a: 16
value of a: 17
value of a: 18
value of a: 19
```

Nested loops

```
#include <iostream>
using namespace std;
int main()
{
   for( int a=1; a<5;a++)
    {
        for(int b=1;b<3;b++)
            cout<<"value of a: "<<a<<" "<<b<<endl;
        cout<<"value of b"<<b;
    }
    cout<<"value of b";
    cout<<endl<<"end of program";
    return 0;
}
```

Nested loops

Other kind of nesting is combination of the following

Do …while
For
while

Questions

What will be the value of y after second statement is executed?
a=5,b=3,m=6;
y=a*++b/2+m%2

Solution:

What will be the value of y after second statement is executed?
a=5,b=3,m=6;
y=a*++b/2+m%2

Operator precedence (highest to lowest):
1. '++', '--', '()', '[]'
2. '*', '/', '%'
3. '+', '-'

a*++b/2+m%2	
5*++3/2+6%2	Put values of a,b & m
5*4/2+6%2	Evaluate '++3'
20/2+6%2	Evaluate '5*4'
10+6%2	Evaluate '10'
10+0	Evaluate '6%2'
10	Evaluate '10+0'

Anwser :10.

Predict the output!

```
#include <iostream>
using namespace std;
int main()
{

int a;
int b=50, c=51;
a = ++b;
cout<<a<<" "<<b<<endl;
a=c--;
cout<<a<<" "<<c<<endl;
a=b+c;
cout<<a;
}
```

Predict the output!

Output:
51 51
51 50
101

Predict the output!

```
#include <iostream>
using namespace std;
int main ()
{       char c='c';
        switch (c)
        {
           case 'a':cout<<"A";
           default: cout<<"C";
           case 'b': cout<<"B";
        }
}
```

Predict the output!

```
#include <iostream>
using namespace std;
int main ()
{       char c='c';
        switch (c)
        {
           case 'a':cout<<"A";
           default: cout<<"C";
           case 'b': cout<<"B";
        }
}
```

Output: CB

Predict the output!

```
#include <iostream>
using namespace std;
int main ()
{
       int i=5;
      while(i=5)
      {
              cout<<i<<endl;
               i--;
      }
}
```

Coding Questions Time

1.Write a program in C++ to swap two numbers without taking third variable.

Sample Output:

Swap two numbers :

Input 1st number : 25
Input 2nd number : 39
After swapping the 1st number is : 39
After swapping the 2nd number is : 25

Coding Questions Time – For students

1. Write a program in C++ to convert temperature in Celsius to Fahrenheit.

Sample Output:

Convert temperature in Celsius to Fahrenheit :

Input the temperature in Celsius : 35

The temperature in Celsius : 35

The temperature in Fahrenheit : 95

Coding Questions Time

Write a program to check whether given character is a vowel, integer or special character using if-else statement.

Input: Enter a character : e /E
Output: ‘E’ is a vowel

Input: Enter a character: 7
Output: 7 is a digit

Input:Enter a character: &
output: & is a special character

Coding Questions Time – For students

Write a C++ program to accept marks of 5 subjects for a student. Calculate the total and percentage of marks, also decide grade of student depending on the percentage using nested if-else statement. Consider grade range as per your assumption.

Input : Enter marks of student:

Sub1: 80
Sub2:90
Sub3:85
Sub4:90
Sub5: 85

Output: Total marks =430 out of 500

Percentage marks: 86.0
Grade obtained : A

Coding Questions Time

1.Write a program in C++ to for menu driven calculator using switch case Statement

Menu:
+ Addition
- Subtraction
* multiplication
/ Division
Enter operator : -

Enter two operands:
3.4
8.4
Output:
3.4 - 8.4 = -5.0

Coding Questions Time

Write a C++ program to calculate factorial of a number using do-while loop.

Input:-5

Output:-120

Write a C++ program to reverse a number using while loop.

Input:-3674

Output:-4763

Coding Questions Time

3.Write a program to print the sum of all numbers in a digit using for loop.

Input:-2981

Output:-20

For students:

Write a program to find first N natural numbers. Also display their sum and sum of their sqaures using for loop.

Input: Enter the value of N: 15

Output: Sum of first 15 natural numbers : 120

Sum of squares of these numbers: 1240


Any
Questions ??

Thank You!

See you guys in next class.