Programming in C++ / 1st Stage   Diyala University - College of Engineering
Prepared by: Asst. lect. Ahmed Mahmood   Computer Engineering Department
                    Lecture 4

C++ PROGRAMMING LANGUAGE
INPUT & OUTPUT

1- Output using cout

- The identifier cout (pronounced "C out")
- Syntax ⟶ cout<<"phrases" or variables.
- The operator << is called the insertion or put to operator.
- Source file ⟶ **<iostream>**
- As you have seen, we can use cout to:

a- print texts

```
cout << "Hello World\n";
```

b- print the value of variable

```
int a=2;
cout << a;
```

c- print texts and values

```
cout << "a="<<a;
```

Example: Follow the following program and write the output.

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

int main()
{
    int item=1,q=15;
    float price,t1,t2,total;
    price=34.5;
    t1=q*price;
    cout<<"\n\n\tItem\tQty\tprice\t\tcost";
    cout<<"\n\t"<<item<<"\t"<<q<<"\t"<<price<<"\t\t"<<t1;
    item=2;
    q=27;
    price=123.25;
    t2=q*price;
    cout<<"\n\t"<<item<<"\t"<<q<<"\t"<<price<<"\t\t"<<t2;
    total=t1+t2;
    cout<<"\n\n\t\t\tTotal cost= "<<total<<" dinars\n";
    return 0;
}
```

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Output:

Example: Write a program to calculate the area of circle when (r=5.67).

```cpp
#include <iostream>
using namespace std;
int main()
{
    float r=5.67,pi=22./7,area;
    area=pi*r*r;
    cout<<"\nThe Area of circle= "<<area<<endl;
    return 0;
}
```

The setw Manipulator
Manipulators are instructions to the output stream that modify the output in various ways as endl and setw.
Setw Manipulator use to change the field width of output
Source file ⟶ <**iomanip**>

Example: without using setw

```cpp
#include <iostream>
using namespace std;
int main()
{
    long pop1=2425785, pop2=47, pop3=9761;
    cout << "LOCATION " << " "POPULATION" " << endl
        << "Portcity " << pop1 << endl
        << "Hightown " << pop2 << endl
        << "Lowville "<< pop3 << endl;
    return 0;
}
```

Output:

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Example: using setw

```
#include <iostream>
#include <iomanip> // for setw
using namespace std;
int main()
{
    long pop1=2425785, pop2=47, pop3=9761;
    cout << setw(8) << "LOCATION" << setw(12) << "POPULATION" << endl
        << setw(8) << "Portcity" << setw(12) << pop1 << endl
        << setw(8) << "Hightown" << setw(12) << pop2 << endl
        << setw(8) << "Lowville" << setw(12) << pop3 << endl;
    return 0;
}
```
Output:

```
LOCATION  POPULATION
Portcity     2425785
Hightown          47
Lowville        9761

Process returned 0 (0x0)   execution time : 0.806 s
Press any key to continue.
```

2- Input using cin

- The identifier cin (pronounced "C in")
- Syntax ———→ cin >> variables.
- The operator >> is the extraction or get from operator.
- Source file ———→ **<iostream>**
- we can use cout to:

Example: Follow the following program and write the output.

```
#include <iostream>
using namespace std;
int main()
{
    int ftemp; //for temperature in fahrenheit
    cout << "Enter temperature in fahrenheit: ";
    cin >> ftemp;
    int ctemp = (ftemp-32) * 5 / 9;
    cout << "Equivalent in Celsius is: " << ctemp<<'\n';
    return 0;
}
```
Output:

```
Enter temperature in fahrenheit: 32
Equivalent in Celsius is: 0

Process returned 0 (0x0)   execution time : 9.939 s
Press any key to continue.
```

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C++ PROGRAMMING LANGUAGE

Example: Write a program to calculate the area of circle.

```cpp
#include <iostream>
using namespace std;
int main()
{
    float pi=22./7,r,area;
    cout<<"\nEnter the value of radius: ";
    cin>>r;
    area=pi*r*r;
    cout<<"\nThe Area of circle= "<<area<<endl;
    return 0;
}
```

The #define Directive
For example, the line:
            #define PI 22./7
appearing at the beginning of your program specifies that the identifier PI will
be replaced by the text 3.14159 throughout the program.
Example: Rewrite the previous program by using The #define Directive. .

```cpp
#include <iostream>
#define PI 22./7
using namespace std;
int main()
{
    float r,area;
    cout<<"\nEnter the value of radius: ";
    cin>>r;
    area=PI*r*r;
    cout<<"\nThe Area of circle= "<<area<<endl;
    return 0;
}
```
Note: we can define the constant as follows:
        const float PI=22./7;
        float const PI=22./7;

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Example: Write a program to find the value of Y when:

$$Y=N+4Z-3C$$

```cpp
#include <iostream>
using namespace std;
int main()
{
    float Y,N,Z,C;
    cout<<"\nEnter the value of N,Z and C: ";
    cin>>N>>Z>>C;
    Y=N+4*Z-3*C;
    cout<<"\nY= "<<Y<<endl;
    return 0;
}
```

Example: Write a program to multiply two numbers entered by user.

```cpp
#include <iostream>
using namespace std;
int main()
{
    float a,b;
    cout<<"\nEnter the value of a and b: ";
    cin>>a>>b;
    cout<<"\na*b= "<<a*b<<endl;
    return 0;
}
```

Example: Write a program to calculate the area and volume of ball

$$A = 4\,\pi\,r^2 \qquad\qquad V = \frac{4}{3}\,\pi\,r^3$$

```cpp
#include <iostream>
#define PI 22./7
using namespace std;
int main()
{
    float r,A,V;
    cout<<"\nEnter the value of radius: ";
    cin>>r;
    A=4*PI*r*r;
    cout<<"\nThe Area of ball= "<<A<<endl;
    V=4/3*PI*r*r*r;
    cout<<"\nThe volume of ball= "<<V<<endl;
    return 0;
}
```

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Example: Write a program to calculate the number of months and weeks and day from a number of days entered by user.

```cpp
#include <iostream>
#define PI 22./7
using namespace std;
int main()
{
    int no_days, no_weeks, no_months;
    cout<<"\nEnter a number of days: ";
    cin>>no_days;
    no_months=no_days/30;
    no_days=no_days%30;
    no_weeks=no_days/7;
    no_days=no_days%7;
    cout<<no_months<<" months  "<<no_weeks<<" weeks  "<<no_days<<" days  "<<endl;
    return 0;
}
```

unsigned Data Types

By eliminating the sign of the character and integer types, you can change their range to start at 0 and include only positive numbers. This allows them to represent numbers twice as big as the signed type.

Keyword	Numerical Range	Bytes of Memory
unsigned char	0 to 255	1
unsigned short	0 to 65,535	2
unsigned int	0 to 4,294,967,295	4
unsigned long	0 to 4,294,967,295	4

```cpp
#include <iostream>
using namespace std;
int main()
{
    int signedVar = 1500000000; //signed
    unsigned int unsignVar = 1500000000; //unsigned
    signedVar = (signedVar * 2) / 3; //calculation exceeds range
    unsignVar = (unsignVar * 2) / 3; //calculation within range
    cout << "signedVar = " << signedVar << endl; //wrong
    cout << "unsignVar = " << unsignVar << endl; //OK
    return 0;
}
```