مدخل إلى الخوارزميات والبرمجة هندسة الميكاترونيكس سنة أولى

مدرس المقرر: د.عيسى الغنام 2023-2024

Lecture No. 2

C++ Data Types And Variables

1-2 Data types:

Variables are containers for storing data values. In C++, there are different types of variables (defined with different keywords), for example:

	TYPE NAME	MEMORY USED	NOTE
numerical	short (also called short int)	2 bytes	-32,768 to 32,767
	int	4 *bytes*	-2,147,483,648 to 2,147,483,647 int is a type for storing integer (whole) numbers. -2^31 to 2^31-1
	long (also called long int)	4 *bytes*	
	float	4 *bytes*	The range of float type in the C++ can represents values ranging from approximately: -3.4 x 10^38 and 3.4 x 10^38
	double	8 *bytes*	The double type stores floating point (decimal) numbers.
	long double	12 *bytes*	
	unsigned	4 *bytes*	0 to 4294967295=2^32-1
text	char	1 *byte*	All ASCII characters (Can also be used as an integer type)

	string	24 *bytes*	character sequences wrapped in double quotes (e.g., "Hello World!").
logical	bool	1 *byte*	true , false The bool type stores Boolean values of true or false.

- يجب التصريح عن كل المعطيات قبل استخدامها في البرنامج.
- إعطاء المعطيات قيم ابتدائية في تعليمة التصريح

In short:

1. int - stores integers (whole numbers), without decimals, such as 123 or -123
2. double - stores floating point numbers, with decimals, such as 19.99 or -19.99
3. char - stores single characters, such as 'a' or 'B'. Char values are surrounded by single quotes
4. string - stores text, such as "Hello World". String values are surrounded by double quotes
5. bool - stores values with two states: true or false

2-2 Variables Names:

The general rules for naming variables are:

- Names can contain letters, digits and underscores
- Names must begin with a letter or an underscore (_). It cannot begin with a number.
- Names are case sensitive (myVar and myvar are different variables)
- Names cannot contain whitespaces.
- Reserved words (like C++ keywords, such as int) cannot be used as names
- Names Cannot have a symbol, or special characters like !, #, %, etc. expect (_ $)

3-2 Declaring a single variable:

To create a variable, specify the type and assign it a value:

Syntax: data_type variableName = value;

Where data_type is one of C++ types (such as int), and variableName is the name of the variable (such as **x** or **myName**). The equal sign is used to assign values to the variable. To create a variable that should store a number, look at the following example:

int myNum = 15;
cout << myNum;
 	
//Here, myNum is a variable of the int data
//type, and we have assigned an integer
//value 15 to it.
	int myNum;
	myNum = 15;
	cout << myNum;
		int myNum = 15; // myNum is 15
		myNum = 10; // Now myNum is 10
		cout << myNum; // Outputs 10

```
int myNum = 5;            // Integer (whole number without decimals)
double myFloatNum = 5.99;   // Floating point number (with decimals)
char myLetter = 'D';       // Character
string myText = "Hello";    // String (text)
bool myBoolean = true;      // Boolean (true or false)
```

4-2 Declaring multiple variables:

Syntax: *data_type variableName1, variableName2, variableName3;*

int x = 5, y = 6, z = 50; **cout << x + y + z;**	**int x, y, z;** **x = y = z = 50;** **cout << x + y + z;**

المثال الأول : أنماط المتحولات و حجمها:

```
#include <iostream>

using namespace std;

int main()
{
  int x=2147483647;
   //(-2^31)=-2147483648 to (2^31)-1=+2147483647
  cout <<"int:"<< sizeof(x)<<"byte\t"<<x<<endl<<"----------------------\n";
```

```
//////////////////////////////////////////////////////////////
  long z=-2147483648;
  //-[(2^31)]=-2147483648 to [(2^31)-1]=+2147483647
  cout <<"long:"<< sizeof(z)<<"byte\t"<<z<<endl<<"----------------------\n";
//////////////////////////////////////////////////////////////
  short y=-32768;
  //-[((2^16)/2)]=-32768 to [((2^16)/2)-1]=+32767
  cout <<"short:"<< sizeof(y)<<"byte\t"<<y<<endl<<"----------------------\n";
//////////////////////////////////////////////////////////////
  float r=2.147;
  cout <<"float:"<< sizeof(r)<<"byte\t"<<r<<endl<<"----------------------\n";
//////////////////////////////////////////////////////////////
  double h=500.14754;
  cout <<"double:"<< sizeof(h)<<"byte\t"<<h<<endl<<"----------------------\n";
//////////////////////////////////////////////////////////////
  long double j=500.14754;
  cout <<"long double:"<< sizeof(j)<<"byte\t"<<j<<endl<<"----------------------\n";
//////////////////////////////////////////////////////////////
  char q='srrrh';
  cout <<"char:"<< sizeof(q)<<"byte\t"<<q<<endl<<"----------------------\n";
//////////////////////////////////////////////////////////////
  bool p=0;//p=1//p=0
  cout <<"bool:"<< sizeof(p)<<"byte\t"<<p<<endl<<"----------------------\n";
//////////////////////////////////////////////////////////////
  string ss="sggggnnnnnnnnnnnnnnnnnn nnnnnnnnnrrr4554555hgjjjfh";
  cout <<"string:"<< sizeof(ss)<<"byte\t"<<ss<<endl<<"----------------------\n";
  return 0;
}
```

```
"E:\0.SCIENCE\0.courses\1.programming languages\c++\0 course\bycodeblocks\course 2023\1
int:4byte        2147483647
------------------------
long:4byte       -2147483648
------------------------
short:2byte      -32768
------------------------
float:4byte      2.147
------------------------
double:8byte     500.148
------------------------
long double:12byte       500.148
------------------------
char:1byte       h
------------------------
bool:1byte       0
------------------------
string:24byte    sggggnnnnnnnnnnnnnnnnn nnnnnnnnnrrr4554555hgjjjfh
------------------------

Process returned 0 (0x0)   execution time : 0.750 s
Press any key to continue.
```

المثال الثاني : أسماء المتحولات

```
#include <iostream>

using namespace std;

int main()

{

/* أسماء المتحولات */

//   int 1x=5;

   int x2=3;

//   int float=6

  float _x=88;

//   double h#y=6;

  double h_y=6;

  char X2='A';

  cout<<X2<<"  "<<x2;
```

```
  return 0;

}
```

```
"F:\essa\mechatronic\mecha\work\c++\١٣\٢\٢٠١٢ ...
A    3
Process returned 0 (0x0)   execution time : 0.172 s
Press any key to continue.
```

المثال الثالث : تتابعات الهروب escape sequences

```
#include <iostream>


using namespace std;


int main()

{

   cout << "Hello\tworld!\nmy\tname\a" << endl;

   cout << "Hello\tworld!\b \nmy\tname\a" << endl;

   cout <<"\"code blocks\"\?\\\\";

   return 0;

}
```

```
"E:\0.SCIENCE\0.courses\1.programming languages\c++\0 course\bycc
Hello    world!
my       name
Hello    world
my       name
"code blocks"?\\
Process returned 0 (0x0)   execution time : 0.918 s
Press any key to continue.
```

1. \\ – Backslash: Represents a single backslash (\) in the output.
2. \' – Single Quote: Represents a single quote (') character.
3. \" – Double Quote: Represents a double quote (") character.

4. \n – Newline: Inserts a line break.
5. \t – Horizontal Tab: Inserts a horizontal tab space.
6. \r – Carriage Return: Moves the cursor to the beginning of the current line.
7. \b – Backspace: Moves the cursor one position back.
8. \f – Form Feed: Advances the cursor to the next page or form feed.
9. \v – Vertical Tab: Inserts a vertical tab space.
10. \a – Alert: Produces a system alert or beep sound.
11. \? – Question Mark: Represents a question mark (?) character.
12. \ooo – Octal Number: Represents a character using its octal value, where 'ooo' is a 1- to 3-digit octal number.
13. \xhh – Hexadecimal Number: Represents a character using its hexadecimal value, where 'hh' is a 1- to 2-digit hexadecimal number.

انتهت المحاضرة