Introduction to Computing

Lecture 4

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Variables, Data types and User Input

C++ Variables

“ Variables are containers for storing data values ”

- Common data types
  - `int` - integer numbers
  - `char` - characters
  - `float` - floating point numbers

We will talk about this in detail

- Declare variables with name and data type before use

```
int integer1;
int integer2;
int sum;
```

- Can declare several variables of same type in one declaration
  - Comma-separated list

```
int integer1, integer2, sum;
```

C++ Variables

- Can declare and assign it a value in one instruction

```
int integer1 = 1;
```

C++ Variables – Example Code

Declare and assign value to a variable

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

int main()
{
    int myNum = 15;
    cout << myNum;
    return 0;
}
```

Declare a variable without assigning the value, and assign the value later

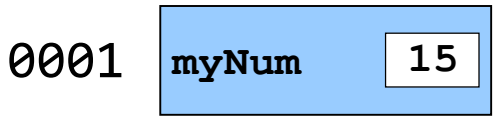
```
#include <iostream>
using namespace std;

int main()
{
    int myNum;
    myNum = 15;
    cout << myNum;
    return 0;
}
```

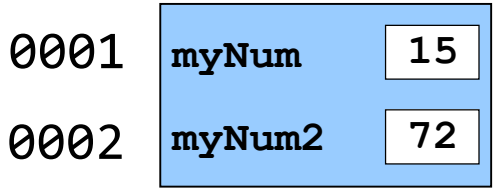
Memory Concepts

- Variable names (**Identifier**)
  - Correspond to actual locations in computer's memory
  - Every variable has ***name***, ***type***, ***size*** and ***value***
  - When new value placed into variable, overwrites previous value

```
int myNum = 15;
```




```
int myNum2 = 72;
```



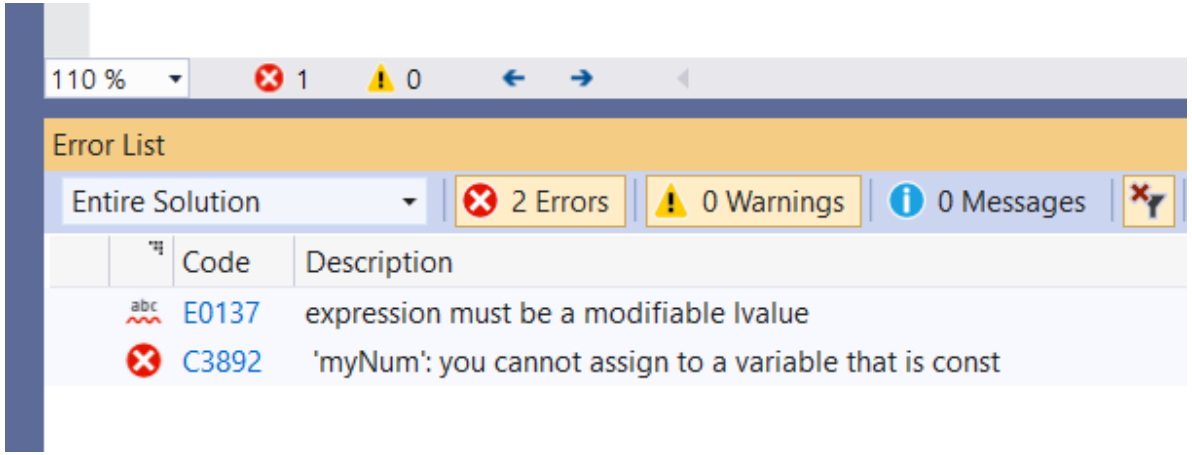
Constant Variables

- Add `const` keyword if you don't want others (or yourself) to change values
- This will declare the variable as "constant", which means unchangeable and read-only

Example:

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

int main()
{
    const int myNum = 15;
    myNum = 10;
    cout << myNum;
    return 0;
}
```



C++ Data types

The data type specifies the size and type of information the variable will store:

Data Type	Size	Description
int	4 bytes	Stores whole numbers, without decimals
float	4 bytes	Stores fractional numbers, containing one or more decimals. Sufficient for storing 7 decimal digits
double	8 bytes	Stores fractional numbers, containing one or more decimals. Sufficient for storing 15 decimal digits
boolean	1 byte	Stores true or false values
char	1 byte	Stores a single character

C++ Variables – Example Code

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

int main()
{
    int myNum = 5;               // Integer (whole number)
    float myFloatNum = 5.99;     // Floating point number
    double myDoubleNum = 9.98;   // Floating point number
    char myLetter = 'D';         // Character
    bool myBoolean = true;       // Boolean

    cout << myNum << "\n";
    cout << myFloatNum << "\n";
    cout << myDoubleNum << "\n";
    cout << myLetter << "\n";
    cout << myBoolean << "\n";

    return 0;
}
```

float vs. double

The **precision** of a floating point value indicates how many digits the value can have after the decimal point. The precision of `float` is only six or seven decimal digits, while `double` variables have a precision of about 15 digits. Therefore it is safer to use `double` for most calculations.

C++ User Input (cin)

cin is a predefined variable that reads data from the keyboard with the extraction operator (**>>**)

Remember “<<“ is called **insertion operator**

Example:

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

int main()
{
    int x;
    cout << "Type a number: "; // Type a number
    and press enter
    cin >> x; // Get user input from the
    keyboard
    cout << "Your number is: " << x;
    return 0;
}
```

Exercise

Write a C++ program to print

```
*
**
***
****
```

on screen.

Write a C++ program which asks the user for their age, and then displays this back to them

```
Hello. How old are you? <age>

You are <age> years old
```

Exercise

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

int main()
{
    int age;

    cout << "Hello. How old are you?";
    cin >> age;
    cout << "You are "<< age <<" years old"
    << "\n";
    return 0;
}
```

Thanks a lot

If you are taking a Nap, **wake up**.....Lecture Over