Al-Mustaqbal University

College of Science

كلية العلـوم

قســـم علوم الذكاء الاصطناعي

المحاضرة الثالثة

Variables

المادة: أساسيات لغة CPP

المرحلة: الأولى

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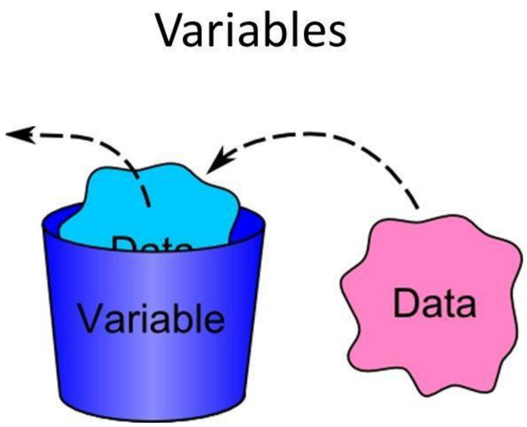
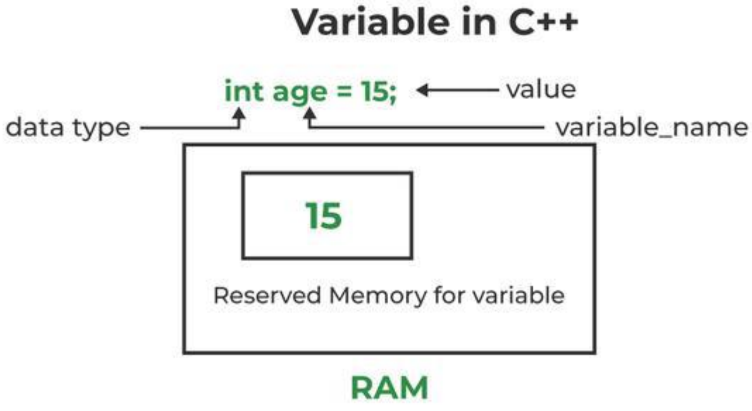
Variables

Variables are containers for storing data values.



- *In C++, variable is a name given to a memory location. It is the basic unit of storage in a program. The value stored in a variable can be accessed or changed during program execution.*



- *There are different types of variables (defined with different keywords), for example:*
- ***int** - stores integers (whole numbers), without decimals, such as 123 or -123*
- ***double** - stores floating point numbers, with decimals, such as 19.99 or -19.99*
- ***char** - stores single characters, such as 'a' or 'B'. Char values are surrounded by single quotes*
- ***string** - stores text, such as "Hello World". String values are surrounded by double quotes*
- ***bool** - stores values with two states: true or false*

Declaring (Creating) Variables

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

type variableName = value;

- *Where 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 code*

```
#include <iostream>
using namespace std;
int main() {
    int myNum = 15;
    cout << myNum;
    return 0;
}
```

- *You can also declare a variable without assigning the value, and assign the value later:*

```
int myNum;
myNum = 15;
cout << myNum;
```

- *Note that if you assign a new value to an existing variable, it will overwrite the previous value:*

```
int myNum = 15; // myNum is 15
     myNum = 10; // Now myNum is 10
     cout << myNum; // Outputs 10
```

Display Variables

- *The cout object is used together with the << operator to display variables. To combine both text and a variable, separate them with the << operator:*

```
#include <iostream>
using namespace std;
int main() {
    int myAge = 35;
    cout << "I am " << myAge << " years old.";
    return 0;
}
```

- *Output: I am 35 years old.*

Add Variables Together

- *To add a variable to another variable, you can use the + operator:*

```
#include <iostream>
using namespace std;
int main() {
    int x = 5;
    int y = 6;
    int sum = x + y;
    cout << sum;
    return 0;
}
```

- *Output: 11*

Declare Many Variables

- *To declare more than one variable of the same type, use a comma-separated list:*

```
#include <iostream>
using namespace std;
int main() {
    int x = 5, y = 6, z = 50;
    cout << x + y + z;
    return 0;
}
```

- *Output: 61*

One Value to Multiple Variables

- *You can also assign the same value to multiple variables in one line:*

```
#include <iostream>
using namespace std;
int main() {
    int x, y, z;
    x = y = z = 50;
    cout << x + y + z;
    return 0;
}
```

- *Output: 150*

Identifiers

- *All C++ variables must be identified with unique names. These unique names are called identifiers. Identifiers can be short names (like x and y) or more descriptive names (age, sum, totalVolume).*

```
// Good
int minutesPerHour = 60;
// OK, but not so easy to understand what m actually is
int m = 60;
```

Constants

- *When you do not want others (or yourself) to change existing variable values, use the const keyword (this will declare the variable as "constant", which means unchangeable and read-only):*

```
const int h = 5; // h will always be 5
h = 10; // error: assignment of read-only variable 'h'
```

- *You should always declare the variable as constant when you have values that are unlikely to change:*

```
const int minutesPerHour = 60;
const float PI = 3.14;
```

- ***Note: When you declare a constant variable, it must be assigned with a value:***

const *int minutesPerHour;*
minutesPerHour = 60; // error

Example 1

- ***Write a program that stores different data about a college student:***

```
#include <iostream>
using namespace std;
int main() {
  // Student data
  int studentID = 15;
  int studentAge = 23;
  float studentFee = 75.25;
  char studentGrade = 'B'; // Print variables using cout
   cout << "Student ID: " << studentID << "\n";
   cout << "Student Age: " << studentAge << "\n";
   cout << "Student Fee: " << studentFee << "\n";
   cout << "Student Grade: " << studentGrade << "\n";
   return 0;
}
----------------------------------------------------------------
Student ID: 15
Student Age: 23
Student Fee: 75.25
Student Grade: B
```

Example 2

- ***Write a program to calculate the area of a rectangle (by multiplying the length and width)***

```
#include <iostream>
using namespace std;
int main() {
  // Student data
  // Create integer variables
  int length = 4;
  int width = 6;
  int area;
  // Calculate the area of a rectangle
  area = length * width; // Print the variables
  cout << "Length is: " << length << "\n";
  cout << "Width is: " << width << "\n";
  cout << "Area is: " << area << "\n";
  return 0;
}
------------------------------------------------------------
----
Length is: 4
Width is: 6
Area is: 24
```

User Input

- *You have already learned that cout is used to output (print) values. Now we will use cin to get user input. cin is a predefined variable that reads data from the keyboard with the extraction operator (>>).*
- *In the following code, the user can input a number, which is stored in the variable x. Then we print the value of x:*

```
#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;   // Display the input value
  return 0;
}
```

- ***Note: cout is pronounced "see-out". Used for output, and uses the insertion operator (<<) while cin is pronounced "see-in". Used for input, and uses the extraction operator (>>).***

Example 3

- ***In this example, the user must input two numbers. Then we print the sum by calculating (adding) the two numbers:***

```
#include <iostream>
using namespace std;
int main() {
  int x, y;
   int sum;
   cout << "Type a number: ";
   cin >> x;
   cout << "Type another number: ";
```

```
    cin >> y; sum = x + y;
    cout << "Sum is: " << sum;
     return 0;
}
```