

# C++ Programming Basics

---

## 1. How to

- To compile: `g++ -o name FirstProgram.cpp`
- To run: `./name`

### FirstProgram.cpp

```
#include <iostream> //allows for printing

int main() {
    int max = 0;

    //declare an array below:
    int arr[] = {6, 1, 3, 7, 5};

    //find highest value in array:
    for (int i = 0; i < 5; i++){
        if (arr[i] > max) {
            max = arr[i];
        }
    }

    std::cout << "max number in the array is: " << max << "\n";
    return 0;
}
```

## 2. Variables and Classes in C++

Every variable is defined by four properties:

1. type
2. name
3. value
4. memory location

And every variable is one of two types:

Primitive	Complex(Object)
<code>int myFavoriteInt;</code>	<code>Sphere myFavoriteSphere;</code>
<code>char grade = 'A';</code>	<code>Cube rubix;</code>
<code>double gamma = 0.653;</code>	<code>Grade courseGrade;</code>

### Creating New Types

In data structures, we will be learning and creating new types of structures to store data.

### Big Idea: Encapsulation

When we create a class in c++ we want to separate 2 things:

- the API: **WHAT** is the class supposed to do?
- the Implementation: **HOW** does it do it?

## Encapsulation principles: C++ Convention

- sphere.h

Define what other programmers will be able to use

- sphere.cpp

The implementation of the code

## 3. Our first class

### sphere.h

```
#ifndef SPHERE_H_
#define SPHERE_H_

class Sphere {
public:
    // this is accessible from other classes.
    double getRadius();
    void setRadius(double r);
    double getVolume();

private:
    // this is not accessible from other classes.
    double radius;
};

#endif
```

Note:  
ifndef = if not defined  
(this acts like an if for the compiler)

Has this already been defined(aka. included in a cpp file)? If not, include it

### sphere.cpp

```
#include "sphere.h"

double Sphere::getRadius() {
    return radius;
}

void Sphere::setRadius(double r) {
    radius = r;
}

double Sphere::getVolume() {
    return (4/3) * 3.14 * radius^3;
}
```

## 4. Key Concepts in C++ Classes:

Every class will be made up of common key pieces:

1. Inclusion guards sphere.h :1 :2 and :17

2. class definition (ends with ;) sphere.h :4 ... :15

3. including header file sphere.cpp :1

4. double colon is scope resolution operator sphere.cpp :3

⇒ This signifies that the method belongs to the class specified before the double colon