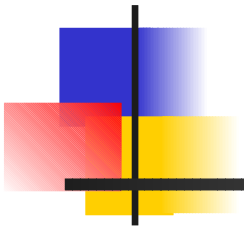
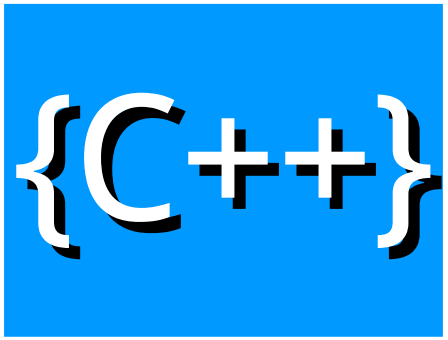


# Classes

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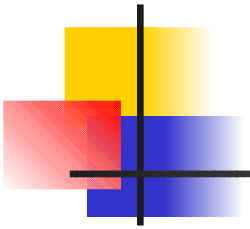
# Example: Rewrite the code to C++ Class

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

struct person
{
    string name;
    int age;
};

int main()
{
  person a, b;
  a.name = "Calvin";
  b.name = "Hobbes";
  a.age = 30;
  b.age = 20;
  cout << a.name << ": " << a.age << endl;
  cout << b.name << ": " << b.age << endl;
  return 0;
}
```



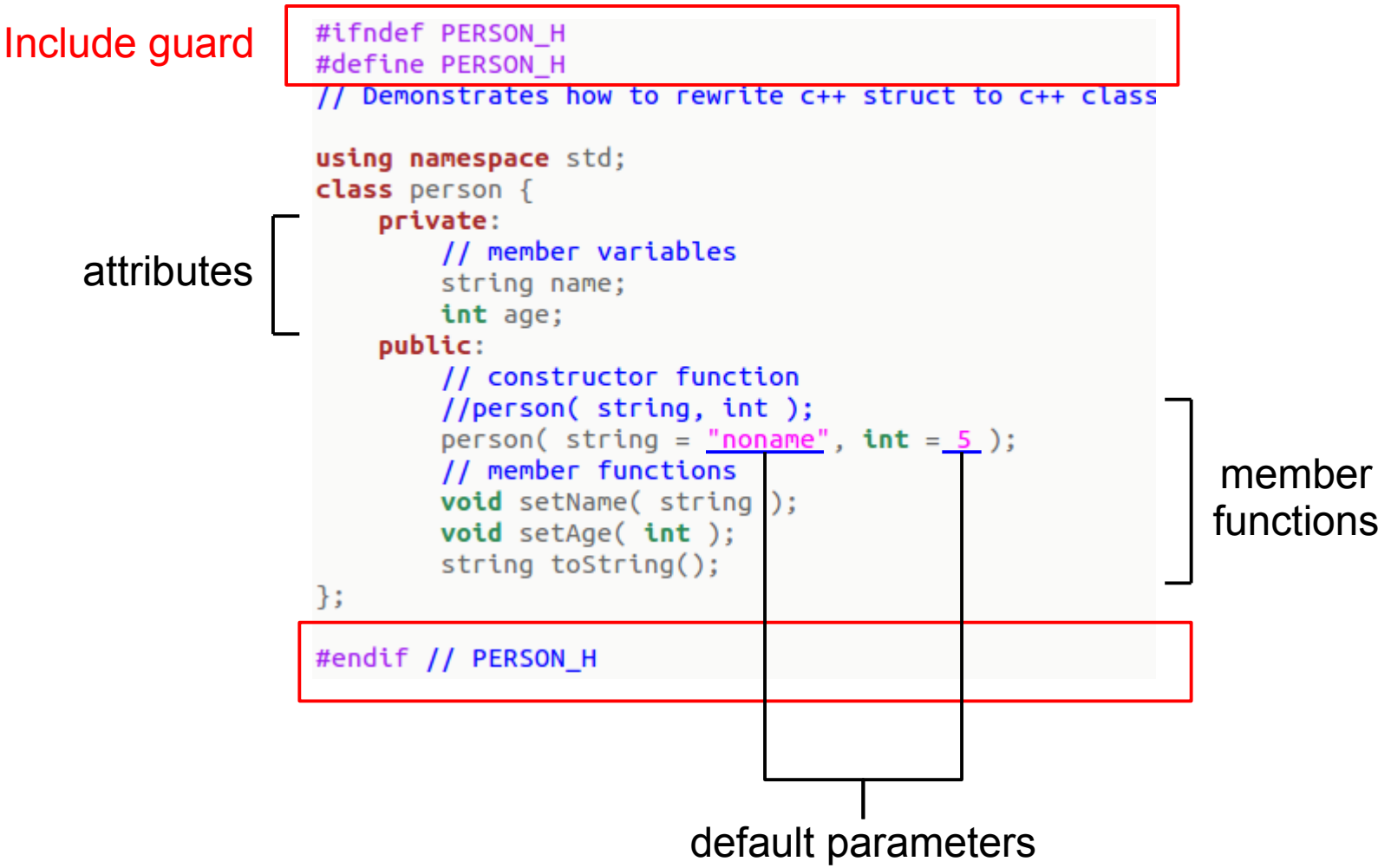
# Rule of Three

- The code can be copied once, but that when the same code is used three times, it should be extracted into a new procedure.

# toString function

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

struct person
{
    string name;
    int age;
};

string toString(person &pn)
{
    ostringstream stringStream;
    stringStream << "Name: " << pn.name << ", " << "Age: " << pn.age;
    return stringStream.str();
}

int main()
{
  person a, b;
  a.name = "Calvin";
  b.name = "Hobbes";
  a.age = 30;
  b.age = 20;
  cout << toString(a) << endl;
  cout << toString(b) << endl;
  return 0;
}
```

# The definition of class(.h)




```
#ifndef PERSON_H
#define PERSON_H
// Demonstrates how to rewrite c++ struct to c++ class

using namespace std;
class person {
    private:
        // member variables
        string name;
        int age;
    public:
        // constructor function
        //person( string, int );
        person( string = "noname", int = 5 );
        // member functions
        void setName( string );
        void setAge( int );
        string toString();
};

#endif // PERSON_H
```

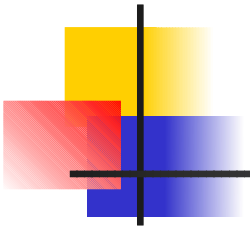
# The definition of member functions(.cpp)

Include the definition of person class

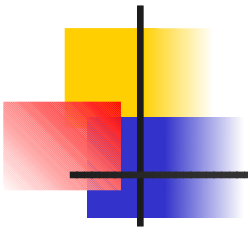
class name::function name

```cpp
#include <iostream>
#include <sstream>
#include "person.h"
using namespace std;

person::person(string nm, int ae)
{
    setName(nm);
    setAge(ae);
}

void person::setName( string nm )
{
    name = nm;
}

void person::setAge( int ae )
{
    age = ae;
}

string person::toString()
{
    ostringstream stringStream;
    stringStream << "Name: " << name << ", " << "Age: " << age;
    return stringStream.str();
}
```

# Class in a Separate Header File for Reusability



- .cpp files for source-code implemenations
  - Class implementations
  - Main programs
  - Test programs
  - …
- .h Header files
  - Separate files in which class definitions are placed.
  - Allow compiler to recognize the classes when used elsewhere.
  - Generally have .h filename extensions



# Creating an object of a Class

- Declaring a variable of a class type creates an object. You can have many variables of the same type (class).
  - Instantiation
- Once an object of a certain class is instantiated, a new memory location is created for it to store its data members and code
- You can instantiate many objects from a class type.
  - Ex) Circle c; Circle *c;

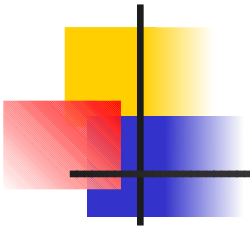
# Instance an object with default parameters

```
class person {
    private:
        // member variables
        string name;
        int age;
    public:
        // constructor function
        //person( string, int );
        person( string = "noname", int = 5 );
        // member functions
        void setName( string );
        void setAge( int );
        string toString();
};
```

Instance an object with default parameters

Main program

```
#include <iostream>
#include "person.h"

int main(int argc, const char *argv[])
{
    person noname;
    person tom("Tom", 20 );

    cout << noname.toString() << endl;
    cout << tom.toString() << endl;
    return 0;
}
```



# Assignment 1

- Create a class Rectangle with attributes
  - length and width are integer , and those default value are 1
  - FillCharactor, the specified character that will be used to draw the rectangle.
- Provide these member functions
  - set and get functions for access and mutant the length and width attributes
    - The set functions should verify that length and width are larger than 1 and less than or equal to 20
    - The names of four functions are

# Assignment 1

setWidth(), setLength(), getWidth(), getLength()

- Two functions that calculate the perimeter and the area of the rectangle and return the results.
  - The names of this two functions are calculatePerimeter(), calculateArea()
- draw function that displays the rectangle with FillCharactor
- setFillCharacter function to specify the character that will be used to draw the rectangle.

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