

Programming in C++

Header Guards

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Objectives

Objectives:

- ▶ Understand the need for header guards
- ▶ Recognize errors associated with header guards
- ▶ Implement header guards

Review Header Files

► Declarations

► `int square(int x);`

► `class Point { ... };`

► `#include "HeaderFile.h"`

main.cpp

```
#include "Point.h"
#include "point_functions.h"

int main() {
    Point p; // creates a Point object named p
    set_coordinates_from_user(p);
    display_coordinates(p);
    return 0;
}
```

Point.h

```
class Point {  
public:  
    Point(); // default sets x=0,y=0  
    int getX() const;  
    int getY() const;  
    void setX(const int x);  
    void setY(const int y);  
  
private:  
    int mX;  
    int mY;  
};
```

point_functions.h

```
#include "Point.h"

void set_coordinates_from_user(Point& point);
void display_coordinates(const Point& p);
```


point_functions.cpp

```
#include "point_functions.h"
#include "Point.h"
#include <iostream>

void set_coordinates_from_user(Point& point) {
    int x = 0;
    int y = 0;
    std::cout << "X? ";
    std::cin >> x;
    std::cout << "Y? ";
    std::cin >> y;
    point.setX(x);
    point.setY(y);
}

void display_coordinates(const Point& p) {
```

Point.cpp

```
#include "Point.h"

Point::Point()
    : mX(0), mY(0) {
}

int Point::getX() const {
    return mX;
}

int Point::getY() const {
    return this->mY;
}

void Point::setX(const int x) {
    if(x >= 0) {
```

Summary of Files

```
// Point.h
class Point {
    ...
};
```

```
// point_functions.h
#include "Point.h"

...
```

```
// main.cpp
#include "Point.h"
#include "point_functions.h"

int main() {
    Point p; // creates a Point object named p
    set_coordinates_from_user(p);
    display_coordinates(p);
    return 0;
}
```

Issues with Missing Header Guards

Effective main.cpp

```
class Point {  
    ...  
};  
class Point {  
    ...  
};  
void set_coordinates_from_user(Point& point);  
void display_coordinates(const Point& p);  
int main() {  
    Point p;  
    set_coordinates_from_user(p);  
    display_coordinates(p);  
    return 0;  
}
```

Compiler Error

```
g++ -c main.cpp
In file included from point_functions.h:1,
                  from main.cpp:2:
Point.h:1:7: error: redefinition of 'class Point'
    1 | class Point {
      |         ~~~~
In file included from main.cpp:1:
Point.h:1:7: note: previous definition of 'class Point'
    1 | class Point {
      |         ~~~~
```

Issues

- ▶ Redefinition of class
- ▶ Multiple definitions of types (typedef, etc.)

Implementing Header Guards

Preprocessor Symbols

```
#ifndef _POINT_H_
#define _POINT_H_

class Point {
    ...
};

#endif /* _POINT_H_ */
```

Pragma

```
#pragma once  
  
class Point {  
    ...  
};
```