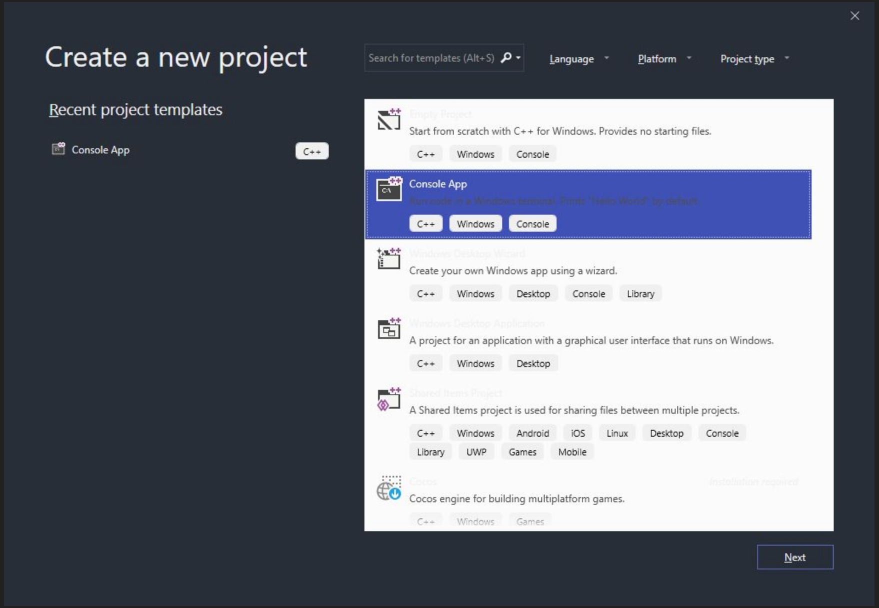
CPP Practice

420-J11-AS

New Project


Create a new project

Search for templates (Alt+S)

Language

Platform

Project type

Recent project templates

Console App C++

Empty Project
Start from scratch with C++ for Windows. Provides no starting files.
C++ Windows Console

Console App
Run code in a Windows terminal. Prints "Hello World" by default.
C++ Windows Console

Windows Desktop Wizard
Create your own Windows app using a wizard.
C++ Windows Desktop Console Library

Windows Desktop Application
A project for an application with a graphical user interface that runs on Windows.
C++ Windows Desktop

Shared Items Project
A Shared Items project is used for sharing files between multiple projects.
C++ Windows Android iOS Linux Desktop Console Library UWP Games Mobile

Cocos Installation required
Cocos engine for building multiplatform games.
C++ Windows Games

Next

```
#include <iostream>

int main()
{
	std::cout << "Hello World!\n";
}

// Hello World!
```

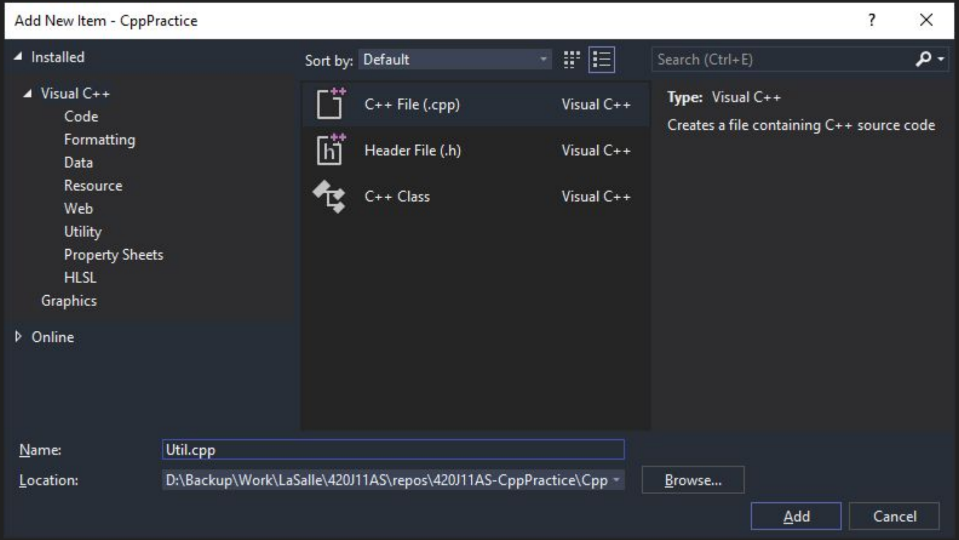
Free Function

```cpp
#include <iostream>

int main()
{
	hello();
}

void hello()
{
	std::cout << "Hello World!\n";
}

// error C3861:  'hello': identifier not found
```

Forward Declaration

```
#include <iostream>

void hello();

int main()
{
     hello();
}

void hello()
{
     std::cout << "Hello World!\n";
}

// Hello World!
```

New Item - Util.cpp


Add New Item - CppPractice

Installed
- Visual C++
  - Code
  - Formatting
  - Data
  - Resource
  - Web
  - Utility
  - Property Sheets
  - HLSL
- Graphics

Online

Sort by: Default

Search (Ctrl+E)

C++ File (.cpp)	Visual C++
Header File (.h)	Visual C++
C++ Class	Visual C++

Type: Visual C++

Creates a file containing C++ source code

Name: Util.cpp

Location: D:\Backup\Work\LaSalle\420J11AS\repos\420J11AS-CppPractice\Cpp

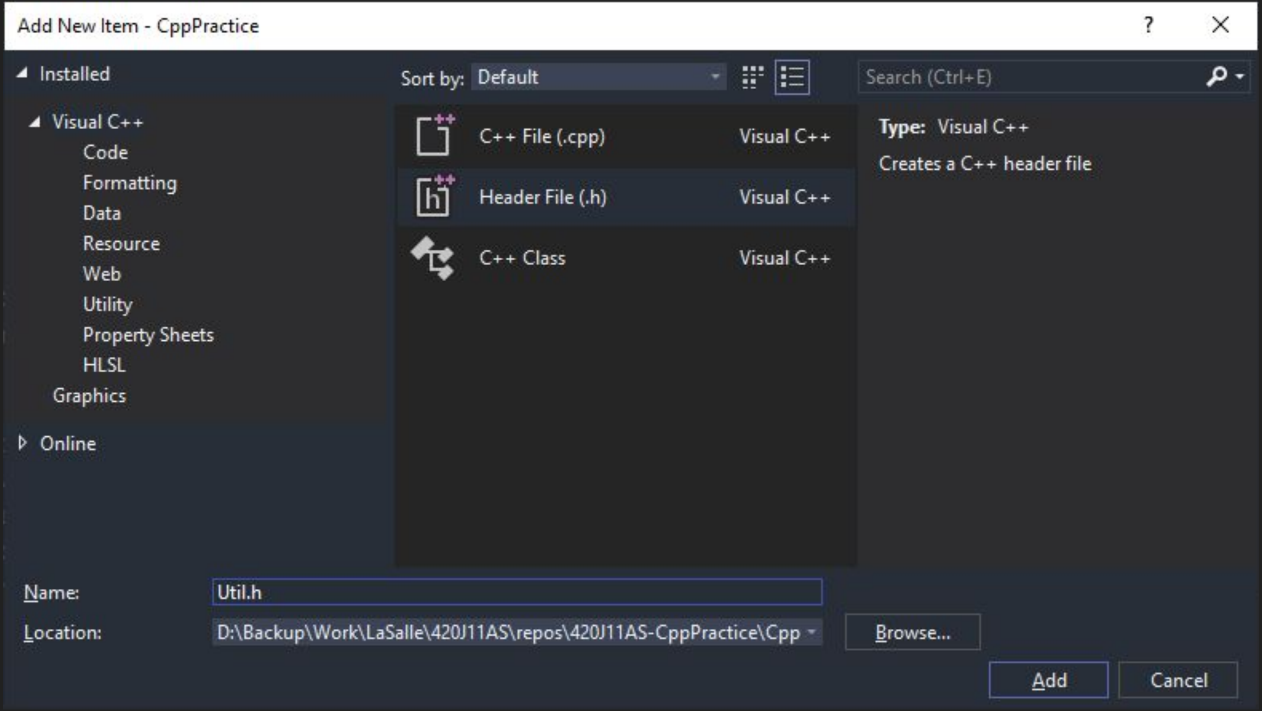
```cpp
// Util.cpp

#include <iostream>

void hello()
{
	std::cout << "Hello World!\n";
}

void bye()
{
	std::cout << "Bye World!\n";
}
```

Clean main

```
// CppPractice.cpp

void hello();
void bye();

int main()
{
	hello();
	bye();
}

// Hello World!
// Bye World!
```

```
// CppPractice.cpp

#include "Util.cpp"

int main()
{
	hello();
	bye();
}

// fatal error LNK1169: one or more
multiply defined symbols found
```

New Item - Util.h



Type: Visual C++

Creates a C++ header file

Name: Util.h

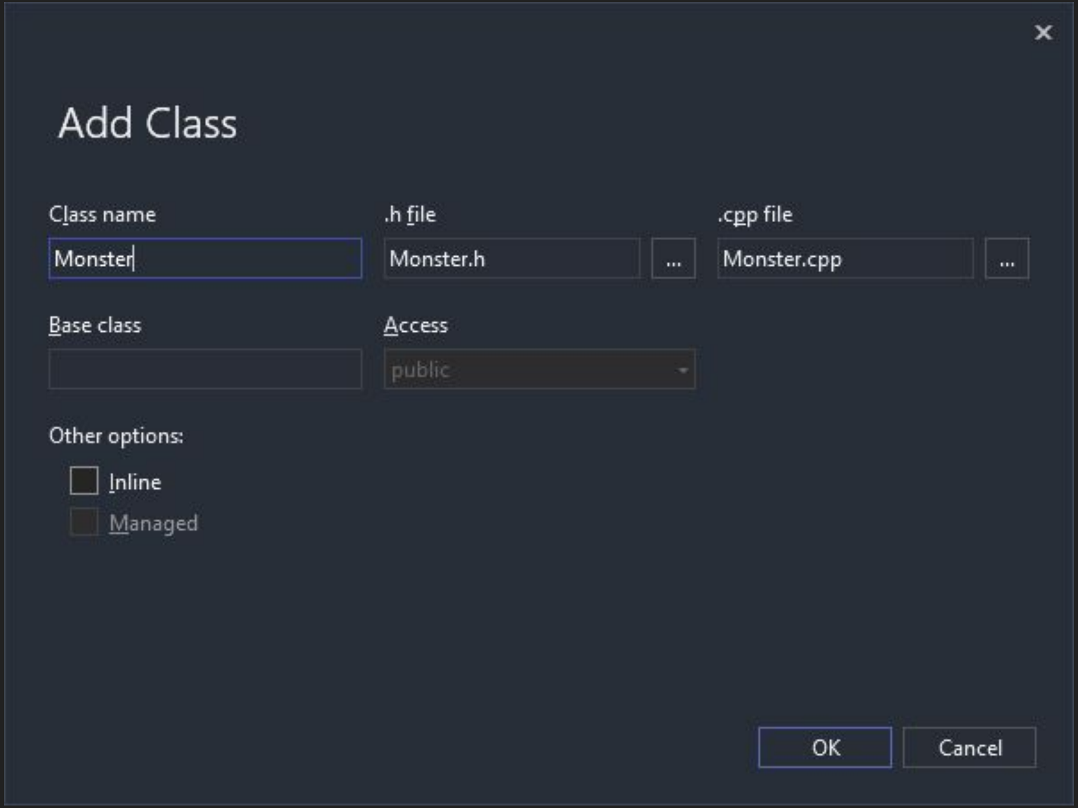
Location: D:\Backup\Work\LaSalle\420J11AS\repos\420J11AS-CppPractice\Cpp

Fixed main

```
// Util.h

void hello();
void bye();
```

```
// CppPractice.cpp

#include "Util.h"

int main()
{
	hello();
	bye();
}

// Hello World!
// Bye World!
```

New Class - Monster



Add Class

Class name: Monster

.h file: Monster.h

.cpp file: Monster.cpp

Base class:

Access: public

Other options:

[ ] Inline

[ ] Managed

Monster Header and Implementation

```cpp
// Monster.h

#include <string>

class Monster
{
public:
     Monster(std::string);

     std::string name;
};
```

```cpp
// Monster.cpp

#include "Monster.h"
#include <iostream>

Monster::Monster(std::string givenName)
{
     name = givenName;
     std::cout << "My name is " << name << ".\n";
}
```

Hero Class - Header and Implementation

```cpp
// Hero.h

#include "Monster.h"

class Hero
{
public:
    void attack(Monster);
};
```

```cpp
// Hero.cpp

#include "Hero.h"
#include <iostream>
using namespace std;

void Hero::attack(Monster monster)
{
    cout << "Hero attacks " << monster.name << "\n";
}
```

Update main

```
// CppPractice.cpp
#include "Util.h"
#include "Monster.h"
#include "Hero.h"

Monster monster("Le Goblin");
Hero hero;

int main()
{
     hello();

     hero.attack(monster);

     bye();
}
```

```
// error C2011:  'Monster': 'class'
type redefinition
```

Header Guard

```cpp
// Monster.h
#pragma once

#ifndef MONSTER_H
#define MONSTER_H

#include <string>

class Monster
{
public:
	Monster(std::string);

	std::string name;
};
#endif
```

```
// My name is Le Goblin.
// Hello World!
// Hero attacks Le Goblin.
// Bye World!
```

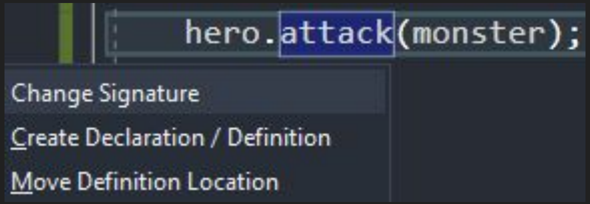
Pointers - Indirection / Dereference

```
// CppPractice.cpp
#include "Util.h"
#include "Monster.h"
#include "Hero.h"

Monster* monster;
Hero hero;

int main()
{
     hello();
     monster = new Monster("Le Goblin");
     hero.attack(*monster);
     delete monster;
     bye();
}
```

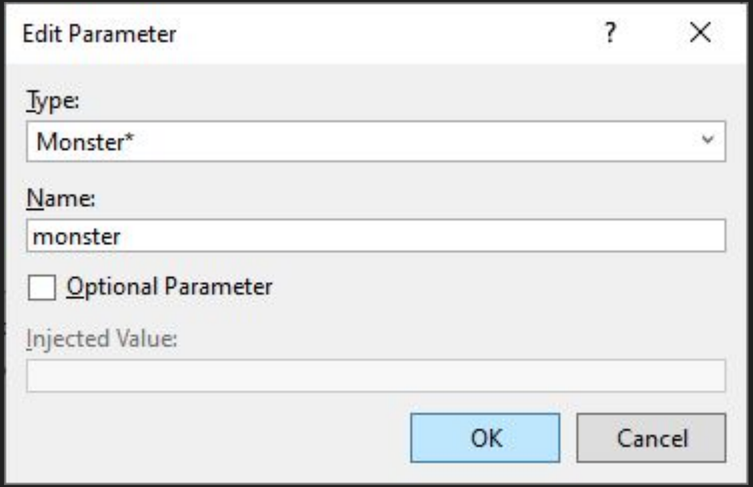
```
// Hello World!
// My name is Le Goblin.
// Hero attacks Le Goblin.
// Bye World!
```

Pointers - Change Signature

```
// CppPractice.cpp
#include "Util.h"
#include "Monster.h"
#include "Hero.h"

Monster* monster;
Hero hero;

int main()
{
	hello();

	monster = new Monster("Le Goblin");
	hero.attack(monster);

	bye();
}
```



```
hero.attack(monster);
```



Edit Parameter

Type: Monster*

Name: monster

☐ Optional Parameter

Injected Value:

Pointers - Member Selection

```cpp
// Hero.cpp
#include "Hero.h"
#include <iostream>
using namespace std;

void Hero::attack(Monster* monster)
{
     cout << "Hero attacks " << monster->name << ".\n";
}
```

Templates - Vector

```
// Monster.h
#include "Monster.h"
#include "Hero.h"
#include <vector>
using namespace std;

vector<Monster*> monsters;
Hero hero;

int main()
{
	monsters.push_back(new Monster("Alice"));
	monsters.push_back(new Monster("Bob"));
	monsters.push_back(new Monster("Charlie"));

	hero.attack(monsters[1]);
}
```

```
// My name is Alice.
// My name is Bob.
// My name is Charlie.
// Hero attacks Bob.
```

Range-Based For

```
// Monster.h
#include "Monster.h"
#include "Hero.h"
#include <vector>
using namespace std;

vector<Monster*> monsters;
Hero hero;

int main() {
	monsters.push_back(new Monster("Alice"));
	monsters.push_back(new Monster("Bob"));
	monsters.push_back(new Monster("Charlie"));

	for (auto monster : monsters) {
		hero.attack(monster);
		delete monster;
	}
}
```

```
// My name is Alice.
// My name is Bob.
// My name is Charlie.
// Hero attacks Alice.
// Hero attacks Bob.
// Hero attacks Charlie.
```

Const Correctness

```
// Hero.h
#include "Monster.h"

class Hero
{
public:
     void attack(const Monster * monster) const;

private:
     int level;
};
```

Const Parameter

```
// Hero.h
#include "Hero.h"
#include <iostream>
using namespace std;

void Hero::attack(const Monster * monster) const
{
    monster->name = "oof";
    cout << "Hero attacks " << monster->name << ".\n";
}

// error C2678:  binary '=': no operator found which takes a left-hand operand of
type 'const std::string' (or there is no acceptable conversion)
```

Const Member Function

```
// Hero.h
#include "Hero.h"
#include <iostream>
using namespace std;

void Hero::attack(const Monster * monster) const
{
     level++;
     cout << "Hero attacks " << monster->name << ".\n";
}

// error C3490:  'level' cannot be modified because it is being accessed through a
const object
```

Exercise - Use Smart Pointers

```
vector<T> monsters;

Where T is:
1.  Monster*
2.  shared_ptr<Monster>
3.  unique_ptr<Monster>
```

References

- https://www.learncpp.com/cpp-tutorial/forward-declarations/
- https://docs.microsoft.com/en-us/cpp/cpp/header-files-cpp?view=vs-2019
- https://www.learncpp.com/cpp-tutorial/header-guards/
- http://www.cplusplus.com/doc/tutorial/pointers/
- https://docs.microsoft.com/en-us/cpp/standard-library/vector-class?view=vs-2019
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- https://isocpp.org/wiki/faq/const-correctness
- https://docs.microsoft.com/en-us/cpp/cpp/smart-pointers-modern-cpp?view=vs-2019