CS 225

Data Structures

Sept. 15 - Templates

	`Sphere obj;`	`RedBall obj;`	`RedBall r;`
			`Sphere &obj = r;`

`obj.print_1();`	**“Sphere”**	*No print_1() is defined in RedBall, so we use the base class (Sphere)’s print_1():* **“Sphere”**	**“Sphere”**
`obj.print_2();`	**“Sphere”**	*The type of **obj** is RedBall, so we’ll use RedBall’s implementation:* **“Ball”**	The type of ***obj*** is Sphere, so we’ll use Sphere’s impl since Sphere::print_2() is **not** virtual: **“Sphere”**
`obj.print_3();`	**“Sphere”**	*No print_3() is defined in RedBall, so we use the base class (Sphere)’s print_3():* **“Sphere”**	**“Sphere”**
`obj.print_4();`	**“Sphere”**	*The type of **obj** is RedBall, so we’ll use RedBall’s implementation:* **“Ball”**	The type of ***obj*** is Sphere, but Sphere::print_4() **is** virtual. Therefore, we will used the derived class’ impl: **“Ball”**
`obj.print_5();`	**Will not compile** since Sphere is an abstract class when print_5() is defined as a pure virtual function.	*The type of **obj** is RedBall, so we’ll use RedBall’s implementation:* **“Ball”**	The type of ***obj*** is Sphere, but Sphere::print_4() **is** virtual. Therefore, we will used the derived class’ impl: **“Ball”**

derived-defaultCtor.cpp

```
class Sphere {
  public:
    Sphere(double d) {  /* ... */  }
}

class Ball : public Sphere {


}

int main() {
  Ball b;
  return 0;
}
```

Abstract Class:

[Requirement]:

[Syntax]:

[As a result]:

virtual-ctor.cpp

```
class Sphere {
  public:
    virtual Sphere();
}

class Ball : public Sphere {
  public:
    __________________________________;
}

```

virtual-dtor.cpp

```
class Sphere {
  public:
    virtual ~Sphere();
}

class Ball : public Sphere {
  public:
    __________________________________;
}

```

Call Order – How are derived classes created?

Call Order – How are derived classes destroyed?

MP: Extra Credit

The most successful MP is an MP done early!

Unless otherwise specified in the MP, we will award +1 extra credit point per day **for completing Part 1** before the due date *(up to +7 points)*: Example for MP2:

+7 points: Complete by Monday, Sept. 18 (11:59pm)
+6 points: Complete by Tuesday, Sept. 19 (11:59pm)
+5 points: Complete by Wednesday, Sept. 20 (11:59pm)
+4 points: Complete by Thursday, Sept. 21 (11:59pm)
+3 points: Complete by Friday, Sept. 22 (11:59pm)
+2 points: Complete by Saturday, Sept. 23 (11:59pm)
+1 points: Complete by Sunday, Sept. 24 (11:59pm)
MP2 Due Date: Monday, Sept 25

MP: Extra Credit

The most successful MP is an MP done early!
We will give partial credit and maximize the value of your extra credit:

You made a submission and missed a few edge cases in Part 1:
Monday: +7 * 80% = **+5.6** earned

You fixed your code and got a perfect score on Part 1:
Tuesday: +6 * 100% = **+6** earned *(maximum benefit)*

You began working on Part 2, but added a seg fault to Part 1:
Wednesday: +5 * 0% = +0 earned

…

Overloaded Operator LHS/RHS

```
bool Sphere::operator<( ________________ ) {
   // ...

}



Sphere& Sphere::operator=( _____________ ) {
   // ...

}
```

sphere.cpp

```cpp
void Sphere::_destroy() {  delete[] props_;  }

void Sphere::_copy(const Sphere &other) {
  r_ = other.r;
  props_max_ = other.props_max_;
  props_ct_ = other.props_ct_;
  props_ = new std::string[10];
  for (unsigned i = 0; i < props_ct_; i++) {
    props_[i] = other.props_[i];
  }
}

Sphere& Sphere::operator=(const Sphere &other) {



  _destroy();
  _copy(other);
  return *this;
}
```

assignmentOpSelf.cpp

```cpp
#include "Sphere.h"

int main() {
  cs225::Sphere s(10);
  s = s;
  return 0;
}
```

Abstract Data Type

List ADT

What types of “stuff” do we want in our list?

Templates

template1.cpp

```


T maximum(T a, T b) {
  T result;
  result = (a > b) ? a : b;
  return result;
}
```

template2.cpp

```


T maximum(T a, U b) {
  T result;
  result = (a > b) ? a : b;
  return result;
}
```

List.h

```
#ifndef LIST_H
#define LIST_H



class List {
  public:








  private:



};

#endif
```

List.cpp

CS 225 – Things To Be Doing

Exam 2 starts on Monday!

More Info: https://courses.engr.illinois.edu/cs225/fa2017/exams/

lab_inheritance

Due: Sunday, Sept. 17 (11:59pm)

MP2 is out – Early Deadline Monday, Sept. 18

Up to +7 Extra Credit for Early Submission

POTD

Every Monday-Friday – *Worth +1 Extra Credit /problem (up to +40 total)*