

In this lab we will create 3 miniature programs. In the first, create the following class.

```
class A1
{
public:
    int a;
    int b;
    int c;
    int fa(void) {return a;}
    int fb(void) {return b;}
    int fc(void) {return c;}
};
```

Create two additional classes A2 and A3, which are identical to A1, except, the last function declaration of A2 is modified to:

```
virtual int fc(void) {return c;}
```

and the last two function declarations of A3 is modified to:

```
virtual int fb(void) {return b;}
virtual int fc(void) {return c;}
```

In the main routine we will declare three variables OA1, OA2, and OA3, of types A1, A2, and A3 respectively. The program will print the sizes of these three objects using a statement like the following:

```
cout<<"Size of OA1: "<<sizeof(OA1)<<endl;
```

Print out the results, and answer the questions on the answer sheet. Then go on to mini-program 2.

For Mini-program 2 we will create the following class:

```
class Mama
{
public:
    int a;
    void f1(void) {cout<<"I am the Mama\n";}
};
```

We will create two more classes named “Baby” and “Kid”. These classes will be identical to the “Mama” class, except they will print “I am the Baby\n” and “I am the Kid\n” respectively, AND they will be derived from the Mama class, so the Baby and Kid classes will be declared as follows:

```
class Baby : public Mama ...  
class Kid : public Mama ...
```

In the main program, declare three variables, M1, B1, and K1, of types Mama, Baby, and Kid, respectively. Declare three pointer variables ALL THREE OF TYPE Mama. Name these variables M2, B2, and K2. M2 must be assigned a pointer to M1, B2 must be assigned a pointer to B1 *without a cast*, and K2 must be assigned a pointer to K1, *without a cast*! Now execute the following six statements:

```
M1.f1();  
B1.f1();  
K1.f1();  
M2.f1();  
B2.f1();  
K2.f1();
```

Print out the results and answer the questions on the question sheet.

Then go on to mini-program 3.

Mini-program 3 is identical to Mini-program 2, except you must modify ONE LINE in the definition of the Mama class. Change the declaration of the function f1 so it reads as follows:

```
virtual void f1(void) {cout<<"I am the Mama\n";}
```

Run the program, print the output, and answer the questions on the question sheet.

Print out all three programs and turn them in, along with a printout of the output of all three programs, and the filled out question sheet.

NAME _____

Mini-Program 1

1. Why is OA2 larger than OA1?

2. Why is OA3 the same size as OA2?

Mini Program 2

3. Why is it NOT ILLEGAL to assign a pointer to B1 to the variable B2?

4. Why are the last three lines of the output identical?

Mini Program 3

5. Why are the last three lines of the output NOT identical?

6. Why was it NOT necessary to change Kid or Baby?