CS213 Quiz # 2

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Name: _____ ID: _____

Question # 1 [50 Points]

```
void A_ping() { printf( "A_ping\n"); }

void B_ping() { printf( "B_ping\n" ); }
void B_pong() { printf( "B_pong\n" ); }

void C_ping() { printf( "C_ping\n" ); }
void C_pong() { printf( "C_pong\n" ); }
void C_wiff() { printf( "C_wiff\n" ); }

struct A{
   void (*ping)();
};

struct B {
   void (*ping)();
   void (*pong)();
};

struct C {
   void (*wiff)();
   void (*ping)();
   void (*pong)();
};

struct B* new_B() {
   struct B* b = (struct B*)malloc( sizeof(struct B) );
   struct A* a = (struct A*)b;
   a->ping = B_ping;
   b->pong = B_pong;
   return b;
}

struct C* new_C() {
   struct C* c = (struct C*)malloc( sizeof(struct C) );
   struct A* a = (struct A*)c;
   a->ping = A_ping;
   c->pong = C_pong;
   c->wiff = C_wiff;
   return c;
}

void foo( struct A* a ) {
   a->ping();
}

void main( void )
{
   foo( (struct A*)new_B() );
   foo( (struct A*)new_C() );
}
```

When `main()` executes, what would the program output be, and why?

Answer:

B_ping **Is assigning first function ptr offset of B to B_ping then second to B_pong**

C_wiff **Is assigning first function ptr offset of C to A_ping then third to C_pong then overriding first function ptr offset of C to C_wiff**

Question # 2 [50 Points]

```
class Polygon {
   float width;
   float height;

   public void setDimensions( float w, float h ) {
      width = w;
      height = h;
   }

   public float area() {
      return ( width * height );
   }
}

class Triangle extends Polygon {
   public float area() {
      return ( width * height /2 );
   }
}

class PolymorphismApp {

   public static void printArea( Polygon p ) {
      System.out.println( "Area is " + p.area() );
   }

   public static void main( String[] args ) {
      Polygon obj1 = new Triangle();
      Triangle obj2 = new Triangle();
      Polygon obj3 = new Polygon();

      obj1.setDimensions( 3, 4 );  12
      obj2.setDimensions( 5, 6 );  15
      obj3.setDimensions( 4, 3 ); 12

      printArea( obj1 );
      printArea( obj2 );
      printArea( obj3 );
   }
}
```

What is the program output, and why?

Answer:
Area is 6.0
Area is 15.0
Area is 12.0

Program output because of polymorphic dispatch, the dynamic type of the object determines what method to call.