CMPSCI 182

Homework Assignment 1 (20 points)

Due 12/1/22

Please respond to the following exercises from the "Exercises" section of Chapter 9. **Write your answers to these questions in the provided text box. Clearly label which question you are answering**. For example, if you are writing an answer for part a) of question #1, label your answer 1a. or 1a). It may help to copy the text of each question or set of statements into the text box, and then write your answer next to or below the question or set of statements.

1. (10 points) Recall the classes *Sphere* and *Ball*, as described in this chapter in the section "Inheritance Revisited," (pages 457-460) and consider the following variation:

```
public class Sphere {

. . .

       public double area() { // surface area

         . . .

       } // end area
       public void displayStatistics() {

         . . .

       } // end displayStatistics()

       . . .


} // end Sphere

class Ball extends Sphere {

       . . .

      public double area() { // cross-sectional area
      // Cross-sectional area is used to compute drag
      // on the ball

         . . .

       } // end area
```

```
    public void displayStatistics() {

      . . .

     } // end displayStatistics()

     . . .

} // end Ball
```

Suppose that different implementations of *displayStatistics* appear in both *Sphere* and *Ball* and they each invoke the method *area*. Also assume that *b1* and *s1* are declared as follows:

```
Sphere s1 = new Sphere();

Ball b1 = new Ball();
```

For each of the scenarios shown next, indicate which version of the *area* method each call to *displayStatistics* invokes. Be sure to explain your answer. Also, if the statement involves an assignment, indicate if the assignment is legal or illegal. If the assignment is illegal, indicate why that assignment is illegal. Assume that each set of statements begins with the *Sphere* and *Ball* declarations shown above, and that each set of statements is independent of the others.

a)
```
s1.displayStatistics();
b1.displayStatistics();
```

b)
```
s1.displayStatistics();
s1 = b1;
s1.displayStatistics();
b1.displayStatistics();
```

c)
```
b1.displayStatistics();
b1 = s1;
s1.displayStatistics();
b1.displayStatistics();
```

3. (4 points) Consider the following classes:

   Clock represents a device that keeps track of the time. Its public methods include *setTime* and *chime*.

   AlarmClock represents a clock that also has an alarm that can be set. Its public methods include *setSoundLevel* and *getAlarmTime*.

   a) Which of the methods mentioned above can the implementation of *setTime* invoke?

b) Which of the methods mentioned above can the implementation of *getAlarmTime* invoke?

4. (2 points) Referring to the *Clock* and *AlarmClock* classes described in the previous question, consider a main method that contains the following statements:

```
Clock WallClock;
AlarmClock myAlarm;
```

a. Which of these objects can correctly invoke the method *chime*?

b. Which of these objects can correctly invoke the method *setSoundLevel*?

7. (4 points) Consider the following classes:

Expression represents an algebraic expression, including prefix, postfix and infix expressions. Its public methods include *characterAt*. Its protected methods include *isOperator* and *isIdentifier*. It also has several private methods.

InfixExpression is derived from *Expression* and represents infix expressions. Its public methods include *isLega*l and *evaluate*. It also has several protected and private methods.

a) What methods can the implementation of *isIdentifier* invoke?

b) What methods can the implementation of *isLegal* invoke?