Problem Set 1

Assigned: Sept. 6
Due: Sept. 18

In homework assignments that ask you to write Java code, such as exercises 1, 2, and 3 below, you only have to write the code on your submitted homework; you don’t have to get it working. Therefore, you will only lose a small part of the credit for minor errors that would actually prevent it from running, like trivial syntax errors (e.g. a missing semicolon). Of course, a very good way to be sure you’ve got the right answer is to get it working.

On problems that ask you what a given piece of code will do, such as exercise 4, it is 100% OK to download it, run it, and see what it does. However it is critical that you should understand why it does what it does; otherwise, you will not be able to answer the question on the exam, where you don’t have the option of running it.

Problem 1

A. For both Rectangle and LocatedRect, write two methods that rotate the rectangle by 90° clockwise around its lower right-hand corner (see picture).

- A destructive method R.DestRotate(). This modifies R itself to be the result of the rotation. It should return R itself.
- A non-destructive method R.NonDestRotate(). This creates and returns a new rectangle that is the result of rotating R, but it leaves R unchanged.

Thus you are writing four methods in total.

B. Write a small driver, comparable to TestRectangle, that illustrates the difference between DestRotate and NonDestRotate for LocatedRect.
Exercise 2

A. Write a class Square that extends Rectangle with the following features:
   i. The constructor Square(double side) initializes both the xSpan and the ySpan fields to be equal to side.
   ii. There are methods getSide() and setSide(double side) that do the obvious things.
   iii. If q is a Square then calling q.setSpans(x, y) will print out a warning message, "You may not use setSpans to set the sides of a square!" and have no effect.

B. Write a class LocatedSquare that extends Square in the same ways that LocatedRectangle extends Rectangle.

C. Can you do part (B) by having LocatedSquare extend both Square and LocatedRectangle?

Exercise 3

Modify the class Person to record their spouse. Assume that a person has only one spouse at a time. Specifically, write the following code:

A. A data field spouse, of class Person.

B. A getters getSpouse().

D. A method marry(Person q). If p and q are Persons then calling p.marry(q) should do the following.
   i. If q is null, print an error and exit. (That is, exit the method; do not terminate the entire program.)
   ii. If either p or q is married then print an error message and have no effect.
   iii. If p is a parent of q or vice versa, then print an error message and have no effect.
   iv. Otherwise, set p’s spouse to be q and vice versa.

E. A method divorce(). If you call p.divorce() and q is currently p’s spouse, then both p’s spouse and q’s spouse should be set to null. If p is unmarried, then nothing should happen; the program should not crash.

Also: D.i requires you to check that q is not null. Explain why there is no point in including a check that p, the owner of the method, is not null.

Exercise 4

Consider the code for Hwk1Ex4A.java and Hwk1Ex4B.java on the attached handout.

A. What do these output?

B. Explain the output.