Problem 1: [24 points]

a) What is the difference between an object and a class?

b) What do we mean by the “state” of an object?

c) What’s the difference between declaring and initializing a variable?
public class Turtle
{
    private int xDirection;  // Are we heading left or right?
    private int yDirection;  // Are we heading up or down?
    private int distance;    // How far do we move each time?
    private Circle shell;    // The Circle representing our turtle

    public void mystery(Turtle t) {
        if (xDirection == -1 || t.xDirection == -1) {
            xDirection = -1;
            t.xDirection = -1;
            yDirection = 0;
            t.yDirection = 0;
        } else {
            xDirection = 1;
            t.xDirection = 1;
            yDirection = 0;
            t.yDirection = 0;
        }  // Other methods omitted...
    }
}

Problem 2: [25 points]

a) Assume the mystery method above has been added to the Turtle class from your second assignment. If mystery is called on a Turtle that’s facing West, and is passed a reference to a Turtle facing North, what does the mystery method do?

b) In English, describe what the method does in general. (Try to focus on what it does rather than a step-by-step description of how it works.) To get in the right frame of mind, think about what you would write as a comment for the method.
Problem 3: [25 points]

Below, define a method called `reportSpeed` that could be added to the `Turtle` class on the previous page. When called, it should print a single line of output that includes the turtle’s current “speed” (the value in its `distance` field), and a short message: If the speed is less than or equal to 25 print “is not very speedy” after the speed, if it’s greater than 25 but less than or equal to 50 print “is pretty speedy”, and if the speed is greater than 50 print “is super speedy”. The sample interactions below show the creation of a turtle with speed of 30, and the output from `reportSpeed`. The turtle has its speed changed to 18, then 52, showing output each time.

```java
> Turtle t = new Turtle(30);
> t.reportSpeed();
30 is pretty speedy
> t.setDistance(18);
> t.reportSpeed();
18 is not very speedy
> t.setDistance(52);
> t.reportSpeed();
52 is super speedy
```
Problem 4: [26 points]

According to the grading policy on our syllabus, there’s a 5% penalty if an assignment is turned in one day late and a 10% penalty for two days late. I typically don’t accept assignments more than two days late, so they’re worth 0 points after that. Below, write a method called adjustedScore that helps me adjust an assignment score based on its lateness. (You do not need to define an entire class — just this one method.) It should take two inputs: number of days late (which will always be expressed in a whole number of days), and the score received on the assignment (which might be something like 62.5). It should return an adjusted score that applies the appropriate late penalty. For example:

```python
> exam.adjustedScore(0, 100)    // 0 days late
100.0
> exam.adjustedScore(1, 100)   // 5% penalty, so 95 now
95.0
> exam.adjustedScore(3, 100)   // >2 days late, worth 0
0.0
> exam.adjustedScore(2, 50.5)  // 10% penalty, so -5.05
45.45
```