Name: _____

Computer Science I — Fall 2023

Exam #1

This exam should have four pages. Closed book and notes.
You are welcome to use the back of a page if you need more room.
Comments are not required for full credit.

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 `statusReport` that could be added to the `Turtle` class on the previous page. When called, it should print information about the direction in which the turtle is moving: If it's moving north or south (up or down the screen) the method should print "The turtle is moving vertically". If it's moving east or west (left or right across the screen) the method should print "The turtle is moving horizontally". For full credit, it should be possible to get *both* messages if a turtle was moving diagonally. (That isn't possible in the `Turtle` class you implemented on your assignments, but we could add new methods that set both `xDirection` and `yDirection` to 1, for example.)

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:

```
> 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
```