Homework 1

Due Date: Sunday, September 18th, 2:00 pm
(Please note the mid-day handin deadline)

To install: cs015_install hw1
To submit: cs015_handin hw1

Note: All of the above commands should be run in a terminal.

New Concepts Covered:

- Calling and defining methods in Java
- The this keyword
- Mathematical expressions and parameters

Getting Started

Install this homework by typing `cs015_install hw1` into a terminal (look over Lab 0 for a reminder on how to open one). This will create an empty directory in `/home/<your login>/course/cs015/hw1/`. This is where you'll need to save a PDF with your answers. Please do not include any identifying information on your handout (name, login, BannerID) as we grade anonymously.

Collaboration Policy

As a reminder: You will not be graded or receive credit for any assignment, including this one, unless you have read the Collaboration Policy and digitally signed and submitted the collaboration policy form from Lab 0.

Assignment Specifications

Please answer the following questions:

Question 1

In a paragraph, summarize the CS15 collaboration policy as you understand it, making sure to cover the policies on homework, lab, projects, and course material.
Question 2

Oh the places Robots (and you) will go! For this question, assume that every Robot knows how to shuffle left, shuffle right, move up and move down by any number of steps.

Note: These are different capabilities than the SamBot from lecture.

a. Write out the list of “pseudocode” instructions that will guide cs15Bot, an instance of the Robot class, through the following maze:

b. Given this high level description, you can now fill in the RobotMover’s moveRobot method to guide cs15Bot through the maze. You may assume that the Robot class has the following methods:

- shuffleLeft(int n);
- shuffleRight(int n);
- moveUp(int n);
- moveDown(int n);

```java
public class RobotMover {

    /* additional code elided */

    public void moveRobot(Robot cs15Bot) {
        /* Your code goes here! */
    }
}
```
Question 3

Our friend cs15Bot, a CS15 student and a Robot, encounters Principal Cat in the Hat™ at Seussville High School. Principal Cat in the Hat™ wants cs15Bot to choreograph a “Seuss Dance” for all of their Robot friends to perform. cs15Bot knows how to do the following dance moves:

- oozeLikeOobleck()
- hearAPooh()
- friskAbout()
- humAndSplash(int numSeconds)
- bumpBumpAndJump(int numTimes)

a. The “Seuss Dance” routine requires the Robot to ooze like Oobleck, then hear a Who, then hum and splash for 5 seconds, followed by frisk about, and finally bump bump and jump three times (in that order!).

Note that all of these methods are defined in the Robot class, shown below. Write another method in the Robot class called choreographSeussDance() that forms the “Seuss Dance” routine, as described above. This method does not need to return anything. Be mindful of the proper syntax when declaring and calling a method!

```java
public class Robot {
    /* additional methods elided */

    public void oozeLikeOobleck() {
        /* implementation elided */
    }

    public void hearAPooh() {
        /* implementation elided */
    }

    public void humAndSplash(int numSeconds) {
        /* implementation elided */
    }

    public void friskAbout() {
        /* implementation elided */
    }
}
```
public void bumpBumpAndJump(int numTimes) {
   /* implementation elided */
}

/* Your choreographed Seuss Dance method goes here! */

b. In the code you wrote for problem 3a, name a method that you defined.

c. In the code you wrote for problem 3a, name a method that you called.

Question 4

a. What is the general form of a method that takes in parameters? Name each of the important components of a method declaration.

b. For the method declarations listed below, explain the properties of the method that each declaration is describing. Make sure that your answer mentions each component from your general method form in 4a, including any parameters, and describe each component in context of the declaration.
   i. public int countFish() { /* implementation elided */ }  
   
   ii. public void saveTheTrees(int numTrees) {
      /
      *
      */ implementation elided */
   }

Question 5

For the following problems, you will be translating the word or math problems listed below into Java methods. Remember to think about the return type and the parameter types, and that you’re encouraged to use descriptive names for the methods and the parameters.

a. Translate the following word problems into Java methods within the ThingsCalculator class.

   i. Thing 1 and Thing 2 each run for a certain number of hours each day. Given the hours that Thing 1 runs and the hours that Thing 2 runs, what is the total number of hours that Things 1 and 2 run?
   
   ● Input: 2 integers - the hours that Thing 1 runs and the hours that Thing 2 runs
   ● Output: 1 integer - the total hours that Things 1 and 2 run
ii. Things 1 and 2 also fly kites for a certain amount of time each day. One day, Thing 1 runs for 4 hours, Thing 2 runs for 5 hours and both fly kites for the same amount of time. Given the amount of time that Thing 1 and Thing 2 spend flying kites, what is the total amount of time that Thing 1 and Thing 2 spend running and flying kites on this day? (Hint: you should use your method from the previous part!)

- Input: 1 integer - the hours that Thing 1 and Thing 2 each spend flying kites. For instance, if x is inputted, this means that Thing 1 flies kites for x hours and Thing 2 flies kites for x hours.
- Output: 1 integer - the total number of hours that Things 1 and 2 spend flying kites and running on this day.

```java
public class ThingsCalculator {
    /* Your code goes here! */
}
```

b. Translate the following mathematical functions into Java methods in the FunctionCalculator class.

i. \[ a(x, y) = \frac{x}{y} + 5x - 7 \]

- Input: two ints (x and y)
- Output: a double

```java
public class FunctionCalculator {
    public static double a(int x, int y) {
        return (double) x / y + 5 * x - 7;
    }
}
```

ii. \[ b(x, y, z) = a(y, z) + x \mod 2 \]

- Input: three ints (x, y, z)
- Output: a double

```java
public class FunctionCalculator {
    public static double b(int x, int y, int z) {
        return a(y, z) + x % 2;
    }
}
```

**Handin Information**

This assignment must be submitted no later than 2:00 pm on Sunday, September 18th. There is no late handin for this assignment. Please remove any identifying information from your handin. Remember to create a single PDF with your answers and place it in the correct directory (/home/<your login>/course/cs015(hw1). Check out our [PDF guide](#) for instructions on how to make PDFs on a Sunlab computer. When your PDF is in the right directory, run `cs015_handin hw1` in a terminal to submit. When you have successfully handed in the assignment, a confirmation email will be sent to your CS department account (<yourlogin>@cs.brown.edu).
You must submit this electronically through the handin script! If you do not handin via cs015_handin and instead email your handin to the HTAs (before the handin deadline), you will lose 25% of the total available points. Emailed handins must be in a PDF file format to receive any credit.