CSCI 1133
Exercise Set 0

You should attempt as many of these problems as you can. Practice is *essential* to learning and reinforcing computational problem solving skills.   We encourage you to do these without any outside assistance.

Solve the following computational problems using pencil and paper only. In all but the first problem, use the pseudo-code formalisms presented in class.

A. **The Farmer, Wolf, Goat and Cabbage**

A certain farmer is travelling with a wolf, a goat and a head of cabbage. She reaches the banks of a river that must be crossed using a small rowboat that will only accommodate the farmer and one of her possessions at a time. The farmer has a dilemma: if, at any point, she leaves the goat alone with the cabbage, the goat will eat the cabbage; whereas if she leaves the goat alone with the wolf, the wolf will eat the goat.

Describe (in words; you do not need to write formal pseudo-code) the individual steps required for the farmer to safely transport all of her possessions to the far side of the river without any being eaten.

B. **Maximum value**

Using pencil and paper, describe an algorithm that will accept two arguments, x and y, and return the maximum of the two values. Note that the 'maximum' of two equal values is the value of either.

Use the Pseudo-code formalism discussed in class, and construct your algorithm as a procedural abstraction named `max`.

C. **Maximum of 3 values**

Using pencil and paper, describe an algorithm that will accept three arguments, x, y and z, and return the maximum of the values.

Use the Pseudo-code formalism discussed in class, and construct your algorithm as a procedural abstraction named `max3`.

D. **Basal Metabolic Rate** (from Walter Savitch, *Problem Solving with C++*)

The Harris-Benedict equation estimates the number of calories your body needs to maintain your weight if you do no exercise. This is called your *basal metabolic rate*, or BMR. The formula for the calories needed for a woman to maintain her weight is:

$$BMR = 655 + (4.3 * \text{weight in pounds}) + (4.7 * \text{height in inches}) - (4.7 * \text{age in years})$$

The formula for the calories needed for a man to maintain his weight is:

$$BMR = 66 + (6.3 * \text{weight in pounds}) + (12.9 * \text{height in inches}) - (6.8 * \text{age in years})$$

A typical chocolate bar will contain around 230 calories. Using pencil and paper, describe an algorithm that will take a persons weight, height, age, and gender (1 for male, 2 for female) and return the number of 230 calorie chocolate bars that need to be consumed to maintain one's weight. Use the Pseudo-code formalism discussed in class, and construct your algorithm as a procedural abstraction named `bmr`.

E. **Loopy fun**

Using pencil and paper, describe an algorithm that will compute the sum of the following series:

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1/30 + 2/29 + 3/28 + . . . + 30/1
```

Use the Pseudo-code formalism discussed in class, and construct your algorithm as a procedural abstraction named `series`.