Polytechnic Tutoring Center

Midterm 2 REVIEW – CS1133, Fall 2020

Disclaimer: This mock exam is only for practice. It was made by tutors in the Polytechnic Tutoring Center and is not representative of the actual exam given by the Academic Department.

Question 1

An online store is doing a promotional giveaway. Customers must fulfill certain requirements in order to receive one of various prizes. Customers must have an account on the store's website to be eligible to receive any prize. Customers receive a pencil for being a member. Customers receive an additional gift based on the amount of time for which they have been a member. Customers who have been members for 1 to 3 years (not including 3 years) receive a pen. Those who have been members for 3 to 5 years (not including 5 years) receive a keychain. Customers who have been members for 5 years or more receive a teddy bear. Customers do not receive more than a single prize based on the amount of time for which they have been a member. In addition to the prize for regular membership and the prize for being a member for a particular length of time, customers with a premium membership get a water bottle.

Write a program which prompts the user to input a logical value representing whether the customer meets the given requirements (1 for true, 0 for false), as well as the number of years for which the customer has been a member, and outputs a display indicating which prizes, if any, the customer is eligible to receive. Example output displays are shown below.

Example 1:

```
The customer has an account on the store website: 1
The customer is a premium member: 1
Number of years for which the customer has been a member: 4
The customer receives the following prize(s):
  pencil
  keychain
  water bottle
```

Example 2:

```
The customer has an account on the store website: 1
The customer is a premium member: 0
Number of years for which the customer has been a member: 6
The customer receives the following prize(s):
  pencil
```

```
  teddy bear
```

Example 3:

```
The customer has an account on the store website: 1
The customer is a premium member: 1
Number of years for which the customer has been a member: 3.5
The customer receives the following prize(s):
  pencil
  keychain
  water bottle
```

Example 4:

```
The customer has an account on the store website: 0
The customer receives no prize.
```

Question 2

For any given matrix, replace any even numbers with the negative of the value (ex: if the value is 8, it should be replaced by -8), and replace any positive odd numbers with 3 times the square root of the value. Do not alter negative odd numbers.

An example is shown below, with the given matrix on top and the matrix after completing the desired operations on the bottom.

```
Initial Matrix:

                    -40    79    31    53     5    -9
                     64    36   -72    53    78    54
                    -74     2   -67    38    26   -65
                      0    -3     5   -54    50   -57
                    -51   -69   -63    28    -5   -51


Matrix After Completing Operations:

  40      26.6646      16.7033      21.8403       6.7082           -9
 -64          -36           72      21.8403          -78          -54
```

```
 74    -2   -67   -38   -26   -65
  0    -3  6.7082  54   -50   -57
-51   -69   -63   -28    -5   -51
```

You should also count how many even numbers are in the matrix, as well as how many odd numbers are in the matrix. The example above contains 14 even numbers and 16 odd numbers. You may assume that the matrix contains only whole numbers. Your code should work for a matrix of any size. You may NOT use vectorized operations. There is no need to produce an output display.

Question 3

Evan has 17 nieces and nephews. It is the day after Halloween and Evan is bored, so he decides to count how much candy each niece or nephew collected when they went trick or treating. If Evan counts more than 350 pieces of candy, he stops counting because he realizes that he is wasting his time and needs to find something more productive to do. If Evan's nieces and nephews have collected 300 candies or fewer, feels bad and buys them more candy. Each niece or nephew collected between 12 and 30 pieces of candy.

Create a Monte Carlo simulation to determine the ratio of times Evan stops counting the candy before he has counted every piece of candy from each of his nieces and nephews, as well as the ratio of times Evan buys his nieces and nephews more candy. You may only use scalar operations. Your program should display these fractions as percentages. The output display should resemble the following.

```
Evan will finish counting all of his nieces' and nephews' candy
62.675% of the time.

Evan will buy his nieces and nephews candy 0.588% of the time.
```