Junior Knights Week #4 Python Homework: Math Class, If Statement

Part A: Math Homework

Write a program that prompts the user to enter two points on the Cartesian plane with different x-coordinates and calculates the slope between the two points and the distance between the two points. The formulas for both of these quantities are as follows between points (x_1, y_1) and (x_2, y_2):

$$slope = \frac{y_2 - y_1}{x_2 - x_1}, \; distance = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Sample Run #1

```
What is the x-coordinate of your first point?
1.2
What is the y-coordinate of your first point?
-2.6
What is the x-coordinate of your second point?
2.7
What is the y-coordinate of your second point?
1.0
The slope of your line segment is 2.4.
The distance of your line segment is 3.9.
```

Part B: Lottery Chances

Write a program to calculate a person's chance of winning a lottery. Most lotteries allow users to choose some numbers out of the list 1, 2, 3, …, n, for some given value n. For example, the Florida lottery allows users to choose 6 values from the list 1, 2, 3, …, 53. Hint: The number of possible choices of tickets is $\frac{n!}{k!(n-k)!}$, when the user is choosing k tickets out of n.

Sample Run #1

```
How many total values can the user choose from?
53
How many values does the user choose for one ticket?
6
Your chance of winning is 4.355878781120576e-08
```

Sample Run #2

```
How many total values can the user choose from?
20
How many values does the user choose for one ticket?
4
Your chance of winning is 0.0002063983488132095
```

Part C: Lemonade – 1

Write a program that prompts the user for the following pieces of information concerning the raw materials the user has to make lemonade:

1) The number of lemons they have 2) The number of bags of sugar they have

Given this information, along with the three following constants below you should define in your program before your main function,

LEMONS_PER_PITCHER = 12
SPOONS_PER_BAG = 1000
SPOONS_PER_PITCHER = 50

you should determine the maximum number of pitchers of lemonade that the user can make. Your answer should be a non-negative integer. Thus, even if there are leftover ingredients to create .3 of a pitcher, you should not count this at all. You may assume that the water is free and the lemonade only consists of water, lemons and sugar.

You are guaranteed that the user will enter two non-negative integers for the values they are prompted to enter. Write a single statement of output with the following format, where X represents the number of pitchers you can make based on the input:

```
You can make a maximum of X pitchers.
```

Sample Run #1

```
Enter the number of lemons you have.
36
Enter the number of bags of sugar you have.
1
You can make a maximum of 3 pitchers.
```

Sample Run #2

```
Enter the number of lemons you have.
400
Enter the number of bags of sugar you have.
1
You can make a maximum of 20 pitchers.
```

Sample Run #3

```
Enter the number of lemons you have.
84
Enter the number of bags of sugar you have.
0
You can make a maximum of 0 pitchers.
```

Part D: Lemonade - 2

Once you have finished part C, edit it to ask the user the following pieces of information:

a) Cost of a single lemon (in cents, read this in as an integer)
b) Cost of a bag of sugar (in dollars, read this in as a double)
c) Cost of a cup of lemonade (in cents, read this in as an integer)
d) The number of cups in a pitcher (read this in as an integer also.)

You are guaranteed that the first third and fourth values will be positive integers and that the second value will be a positive real number with no more than 2 decimal places.

Then, calculate your profit or loss, assuming that you all the lemonade you can make from full pitchers. (Thus, if you have .3 of a pitcher of lemonade leftover, even if this can form a full cup, you don't sell it.)

Output one of the following three statements based on whether you make money, lose money or break even:

```
You earned $XX.XX money.
You lost $XX.XX money.
You broke even.
```

Sample Run #1

```
Enter the number of lemons you are going to buy.
36
Enter the number of bags of sugar you are going to buy.
1
Enter the cost of a single lemon, in cents.
10
Enter the cost of a bag of sugar, in dollars.
5.00
Enter the price to sell a cup of lemonade, in cents.
50
Enter the number of cups in a pitcher.
6
You earned $0.40 money.
```

Sample Run #2

```
Enter the number of lemons you are going to buy.
36
Enter the number of bags of sugar you are going to buy.
1
Enter the cost of a single lemon, in cents.
10
Enter the cost of a bag of sugar, in dollars.
5.00
Enter the price to sell a cup of lemonade, in cents.
40
Enter the number of cups in a pitcher.
6
You lost $1.40 money.
```

Sample Run #3

```
Enter the number of lemons you are going to buy.
36
Enter the number of bags of sugar you are going to buy.
1
Enter the cost of a single lemon, in cents.
15
Enter the cost of a bag of sugar, in dollars.
3.60
Enter the price to sell a cup of lemonade, in cents.
50
Enter the number of cups in a pitcher.
6
You broke even.
```