Week #2: Problems for Junior Knights (Python)

Problem A: Step Counter

Step Counters are very popular!

Each day, the person wearing the step counter puts in their goal for the day.

For this program, you will prompt the user for their daily goal for number of steps.

Then, you'll ask them how many steps they have so far at noon.

Your program should tell the user how many more steps they need by the end of the day.

You are guaranteed that the user will enter a positive number for the goal and that the user will enter a non-negative integer less than the goal for the current number of steps.

Sample 1: Input and Output

```
What is your daily step goal?
10000
How many steps do you have right now?
4590
You need 5410 more steps to meet your goal.
```

Sample 2: Input and Output

```
What is your daily step goal?
19000
How many steps do you have right now?
8562
You need 10438 more steps to meet your goal.
```

Problem B: Gas Calculator

Write a program that asks the user for the price of gasoline per gallon, the number of gallons of gas currently in their car, the miles per gallon their car gets, and the length of their road trip in miles and calculates and prints out the amount the user will have to spend on extra gas to complete the road trip. (You may assume that the user will have to buy some gas to complete the trip.)

Sample 1: Input and Output

```
What is the price of gasoline per gallon?
4
How many gallons of gas are currently in your car?
1
How many miles per gallon does your car get?
20
What is the length of your road trip?
1000

You will have to spend 196.00 dollars on gas to complete
your road trip.
```

Problem C: Frozen Dinner Budget (dinner.py)

Arup's wife works out two days a week, thus, he must go home early on those days. Similarly, Friday usually involves family plans, so he must go home early on that day as well. This leaves two days a week where Arup can stay late and tape videos for COP 3223!!!

Unfortunately, this means that he has to buy some frozen dinners to eat at work. Write a program to help him calculate how much he will spend on these frozen dinners!

Use the following constant at the top of your program:

```
SALES_TAX = .065
DINNERS_PER_WEEK = 2
```

Prompt the user to enter how weeks of frozen dinners he/she would like to buy, as well as the cost of a single dinner (without tax). Calculate the total cost of the dinners, with tax. Don't worry about how many digits print after the decimal. Any answer within a penny of the correct answer will be counted as correct.

Sample Program Run (User Input in Bold and Italics)

```
What is the cost of one frozen dinner?
3.99
For how many weeks do you need frozen dinners?
16
You will spend 135.9792 dollars on frozen dinners.
```

Problem D: Changy Money

As a frequent world traveler, Arup Guha has to exchange money to get various different currencies. However, he needs some help to determine exactly how much money he will have left after one of his trips. You will write a program to help him with his estimate. In particular, you will prompt the user for the following information:

1) How much US currency he/she has.
2) The exchange rate from US currency to the foreign currency.
3) How much of the foreign currency he/she spent.

The user exchanges all of his/her money for their trip. Usually, however, the user will have some money leftover when his/her trip is done. At this point, the user exchanges the rest of this currency for US dollars. Your goal will be to determine how much money the user has left in US dollars after his/her trip.

The charge for an exchange of currency is $2 US. Thus, if you are exchanging 1002 US dollars for Canadian dollars and the Canadian exchange rate is 1.5, then you will receive exactly 1500 Canadian dollars. If you spend 597 Canadian dollars, then you have 903 Canadian dollars left to exchange back to US dollars. This evaluates to $602 US. However, since the exchange fee is $2 US, the user would actually have exactly $600 US.

You may assume that all the values the user enters are valid values. Specifically, you may assume that the user enters positive values for all three entries, and that the user will always have more than $2 US left after their trip is over. (This is necessary to pay for the transaction fee.)

Note: For actual exchange rates, go to http://www.xe.com/ucc/.

Sample Program Runs

Sample Run #1

```
How many US dollars are you exchanging?
1002
What is the exchange rate from US dollars to the foreign currency?
1.5
How much foreign currency did you spend?
597
You will be left with $600.00 US currency.
```

Sample Run #2

```
How many US dollars are you exchanging?
500
What is the exchange rate from US dollars to the foreign currency?
35
How much foreign currency did you spend?
10000
You will be left with $210.29 US currency.
```

Note: There is no need for you to correctly format the dollar value. You may simply print out the double variable that stores the correct value without specifically formatting it to print only 2 decimal places. (It will print many decimal places by default.)

Problem E: Picture Storage

Write a program that calculates the number of pictures that can be stored on a thumb drive. Ask the user to enter the number of gigabytes of data the thumb drive can store, as well as the length and width of each picture, in pixels. Assume that each pixel takes 3 bytes of storage. (This isn't really the case, since most pictures are stored in a compressed format.) Output your answer as a whole number. (Hint: Use integer division.)

*Note: There are **1073741824** bytes in a Gigabyte.

Sample 1: Input and Output

```
How many gigabytes can your thumb drive store?
4
What is the width of each picture in pixels?
3168
and height?
4752

You can store 95 pictures on your thumb drive.
```

Problem F: Trains

Imagine a two-way straight railway and two trains approaching each other from opposite directions. You need to compute how long (in minutes) would it take for these trains to come side by side. You will also compute how many miles each train travels till then. Write a program to read in the distance (in miles), speeds of the trains (in miles per hour), and output the time to meet (in minutes) and the distance traveled by each train (in miles).

Sample 1: Input and Output

```
What is the distance between the two trains (in miles)?
4
What is the speed of the first train (in miles per hour)?
120
What is the speed of the second train (in miles per hour)?
80

The trains will meet in 1.2 minutes.
The first train will travel 2.4 miles and the second train
will travel 1.6 miles
```

Problem G: Rectangular Wedding Table Arrangements (table.c)

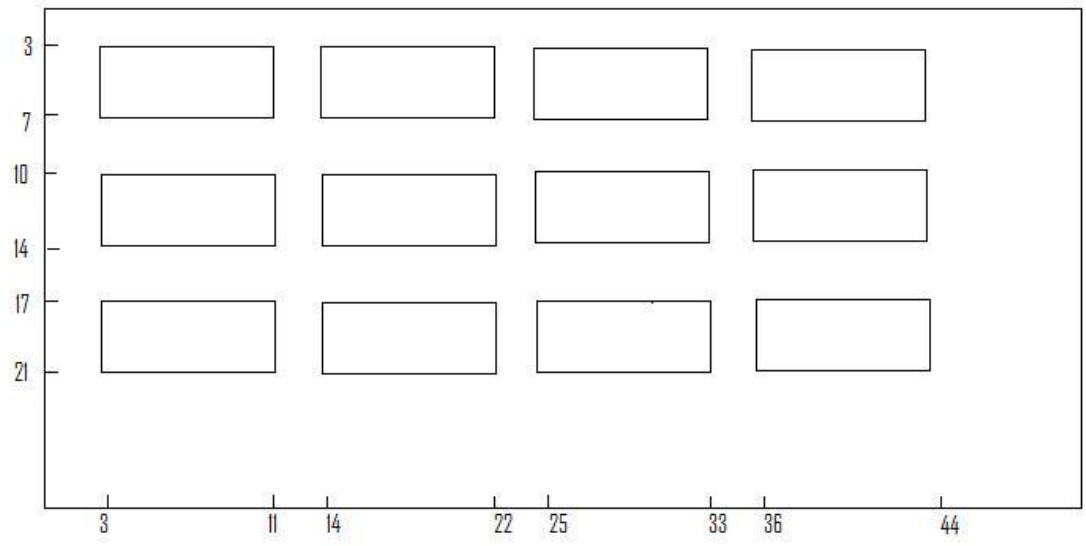
One of the first jobs everyone has when planning a wedding is picking a venue for the reception. In doing so, many venues show their seating arrangements for dinner to their clients. Depending on the dimensions of the tables and the distance between tables affects the number of people that can be seated. In this problem, you'll analyze placing rectangular tables in a rectangular room. Given the relevant dimensions, your job will be to determine the maximum number of people that can be seated in the room.

First, we assume that the room dimensions, length by width, are given, in feet. Next, we assume that each table is identical in size, and those dimensions are also provided in feet. We are also given the number of feet of space required between each table and between each table and wall. The last piece of information we need is the number of people that can be seated at each table.

Consider the following situation:

Room dimensions: 50' x 30'
Table dimensions: 8' x 4'
Space required: 3'
People per table: 10

The picture is given on the following page.



The labels on the left side of the diagram represent how far from the "top" of the room the beginning and end of each table is. Note that after the label 21, if we were to place another table, we'd have to skip three feet to 24 and place the table, which would end at 28 feet. But the problem with this is that we'd only have two feet remaining from the end of this fourth table to the bottom wall.

The labels on the bottom of the diagram represent how far from the left wall the beginning and ending of each table is. It should be fairly clear that a fifth table will not fit at the right end of the room.

Thus, for this given situation, 120 people (10 people at each of the 12 tables) can be seated for dinner.

Input Specification

1. The room dimensions (in feet) will be positive integers less than 1000.
2. The table dimensions (in feet) will be positive integers less than 1000.
3. The space required between tables and walls (in feet) will be a positive integer less than 10.
4. The people per table will be a positive integer in between 3 and 20, inclusive.

Output Specification

Output the total number of people the given seating arrangement can support with a statement in the following format.

```
This arrangement seats X people.
```

where X is the number of people is question.

Output Sample

Below is one sample output of running the program. **Note that this sample is NOT a comprehensive test.** You should test your program with different data than is shown here based on the specifications given above. In the sample run below, for clarity and ease of reading, the user input is given in *italics* while the program output is in **bold**. (Note: When you actually run your program no bold or italics should appear at all. These are simply used in this description for clarity's sake.)

Sample Run #1

What are the length and width of the room (in feet)?
50 30
What are the length and width of each table (in feet)?
8 4
How much space is required between tables (in feet)?
3
How many people does each table seat?
10
This arrangement seats 120 people.