CS-UY 1114: Lab 2

math, random, number systems, simple conditionals

You must get checked out by your lab CA **prior to leaving early.** If you leave without being checked out, you will receive 0 credit for the lab.

Restrictions

The Python structures that you use in this lab should be restricted to those you have learned in lecture so far. Please check with your teaching assistants in case you are unsure whether something is or is not allowed!

If you do not have Python running on your computer please go back to Lab 0 and set it up before moving on

Create a new python file for each of the following problems.

Problem 1: Binary and Other Number Systems Conversions

Convert the following numbers by hand:

Binary to Decimal: $01011010_{2} = ?$

Decimal to Binary: $153_{10} = ?$

Binary to Hexadecimal: $10100111_{2} = ?$

Hexadecimal to Decimal: $0xFDA_{16} = ?$

Decimal to Octal (base 8): $229_{10} = ?$

Here is a nice website for visualizing binary and decimal conversions

Make sure you know how to convert between number systems by hand!

Problem 2: *Evaluating Advanced Expressions*

```
A = True
B = False
C = True
```

Evalutate the following expressions by hand assuming the above variable values.

```
(A and C or B) or (C or A)
```

```
not(C and A) and (4 * 5 == 20)
```

```
(3 + 3 == 5) or (C or B and A) or (3 * 3 == 9)
```

```
(not("")) or (A and B) or (C or B and A)
```

Problem 3: *Random Number Analysis*

This is a quick problem to work on making your own advanced expressions.

1. Generate a random number between 0 and 100
2. Determine whether it is even or odd and print the result
3. Determine whether the number is above or below 50 and print the result

Here are some expected outputs for this problem

```
71 is even: False
71 is greater than 50: True
```

```
18 is even: True
18 is greater than 50: False
```

Do not use conditional statments for this problem

Hints:

Take a look through the random module documentation to find the functions you need for the problem.

- Try to think about how you can use advanced boolean expressions to determine the results.
- Consider using modulus operator to solve some of the problem

Problem 4 : *Random Profit*

You are a store owner and decide to markup the price of **one** item in your store. You have a rough idea of what range you'd like the markup percentage to be in but have no particular number in mind. You decide the best way to choose the markup percentage is through randomness! You are tasked to calculate this item's new price after choosing a randomly generated percentage within the range specified.

The program will ask the user for **four** inputs: the name of the item to markup, the original price of the item, the lower-bound of the desired range, and the upper-bound of the desired range. Then, the program will

output **one** output with the following information: the name of the item, its new price, and its markup percentage.

You may assume the given range will be within (0.0, 100.0]. Here's some documentation on the random.uniform() method to help you.

Although money doesn't usually go past 2 decimal places, your love for money leads you to be okay with outputting the nitty, gritty long decimals you may calculate.

The following are examples of possible outputs:

```
What item would you like to markup? Textbooks
What is this item's original price? 140
What is the lower bound of your desired range? 0
What is the upper bound of your desired range? 5
Textbooks's new price will be $146.32179515308064 after the
4.515567966486168% markup.
```

```
What item would you like to markup? Paper bag
What is this item's original price? 5.99
What is the lower bound of your desired range? 80
What is the upper bound of your desired range? 100
Paper bag's new price will be $11.608921580843857 after the
93.80503473862863% markup.
```

```
What item would you like to markup? Cheese
What is this item's original price? 4.99
What is the lower bound of your desired range? 3.5
What is the upper bound of your desired range? 6
Cheese's new price will be $5.289067670091224 after the 5.993340081988434%
markup.
```

Problem 5: *Area of a Triangle*

This program will solve for the area of a triangle. Take in user input for the lengths of the triangle base and side and an angle measure. Calculate and print out the area of the triangle using the following formula.

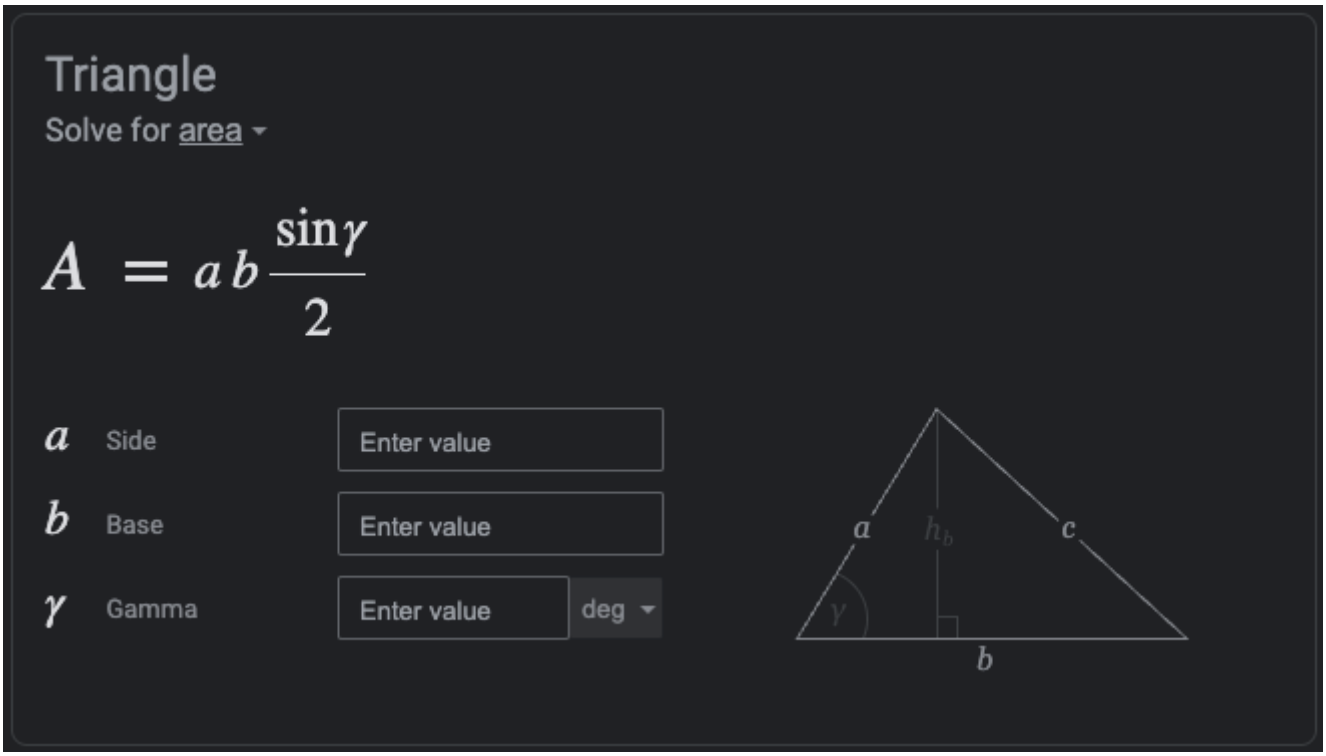

***Figure 1**: Area of Triangle Formula*

This is an example of the programs expected output.

```
Enter the length of the triangle base: 10
Enter the length of the triangles side A: 7
Enter the value of angle Gamma in degrees: 21
The area of the triangle is 12.54287823408551
```

Take a look through the math module documentation to find the functions you need for the problem.

Problem 6: *The Bell Curve*

In statistics, a normal distribution (sometimes called a "bell curve") is observed in many situations. For example, the scores of all students who take the SAT exam are expected to fall in a normal distribution where most of the students score the mean value or close to the mean value. Smaller numbers of students will score above and below the mean.

The standard normal distribution is a simple case of the normal distribution in which the mean = 0 and the standard deviation = 1.

It is described by the probability density function given below:

$$f(x) = \frac{1}{\sqrt{2\pi}} e^{\frac{-1}{2}x^2}$$

***Figure 2**: Probability Density Function*

Create a new file and write code to check the value of the probability density function at x = 0, x = 1, and x = -1. You do **not** need to read in user input for this problem. Print the value of the probability density function for each value of x. Your output should be formatted as follows:

```
The value of the pdf at x = 0.0 is 0.3989422804014327
The value of the pdf at x = 1.0 is 0.24197072451914337
The value of the pdf at x = -1.0 is 0.24197072451914337
```

Take a look through the math module documentation to find the functions you need for the problem.