CSCI 1411: Fundamentals of Computing
Lab 5 – Arithmetic Operations 2
Due Date: September 29, 2023

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Goals:

- Use of variables of type int, float, and string
- Use of operators +, -, /, *, **, %, //
- Use of Python function from math library
- Analyzing the problem statement
- Reading and writing algorithms

Development Environment: IDLE

Deliverables:

1) This completed document with required screen shots and algorithms.
2) Python file created for the first and second parts of the lab. Name the file using the following format: `lastnameLab05Part1.py` and `lastnameLab05Part2.py`.

How to take a **screen shot**:

- For a Windows 10: Use Snipping Tool to copy and press CTRL + V to paste screen shot.
- For Mac: Press Shift + Command (⌘) + 4 to copy and press Command (⌘) + V to paste screen shot.

Part I – Write Python Program for Given Algorithm

Problem Statement: Write a program to determine the length of a ladder required to reach a given height when leaned against a house. The height and angle of the ladder are given as inputs. To compute the length use:

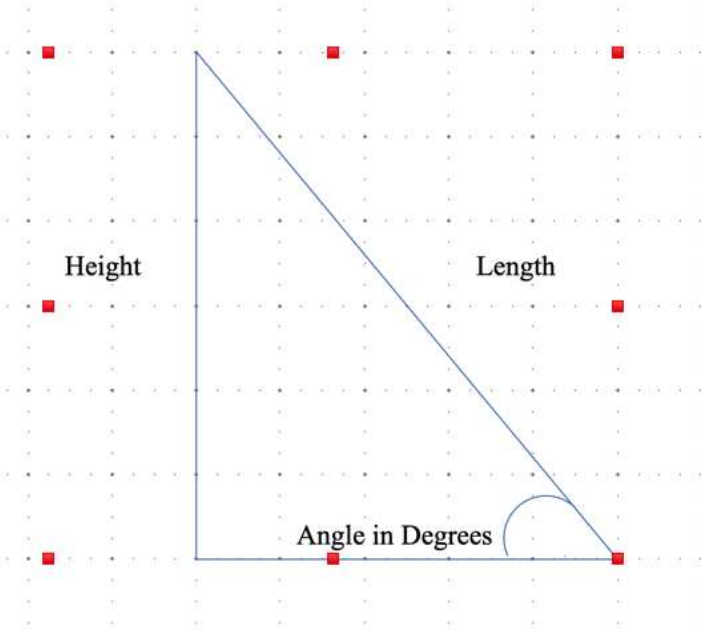
$$length = \frac{height}{\sin(radians)}$$

Note: The angle must be in radians. Prompt for an angle in degrees and use this formula to convert:

$$radians = \frac{\pi}{180}\ angle$$

Analyze the Problem:

- User wants to know the length of the ladder to reach a given height.
- User will provide the height of the house.
- User will provide the angle (in degrees) at which ladder will lean against the house.



Algorithm (Pseudocode):

1. Display 'What is the height of the house?'
2. Input height of the house (call it height).
3. Display 'What is the angle in degrees?'
4. Input angle in degrees (call it angle).
5. Calculate the angle in radians using the formula (call it radians):
   $radians = \frac{\pi}{180}\ angle$
6. Calculate the length of the ladder using the formula (call it length):
   $length = \frac{height}{\sin(radians)}$
7. Display the length of the ladder rounded to 2 decimal places.

Note: In Python step 1 and step 2 can be combined into a single statement. In the same way step 3 and 4 can be combined into a single statement.

Write a Python program to implement the above algorithm. Use PI as defined in the math library. **Do not define your own value of PI.** Test your program using the following data:

Input		Output
Height	**Angle (in degrees)**	**Length**
10.0 ft	30.0 degrees	20.0
10.0 ft	45.0 degrees	14.14
10.0 ft	60.0 degrees	11.55
Table 1		

Run your program and take a screen shot of your result and paste it in the box below:

Screen Shot 1

```
= RESTART: C:/Users/Brandon/workspace/bachelors/sem-1/fund-of-computing/BrandonP
erez/completed-assignments/perezBrandonLab5Part1.py
>>> main()
How high is the wall you're climbing: 10
What will be the angle of your ladder in degrees: 30
Your ladder will need to be 20.00ft tall
>>> main()
How high is the wall you're climbing: 10
What will be the angle of your ladder in degrees: 45
Your ladder will need to be 14.14ft tall
>>> main()
How high is the wall you're climbing: 10
What will be the angle of your ladder in degrees: 60
Your ladder will need to be 11.55ft tall
>>>
```

Part II – Write Python Program for the Given Problem Statement

Problem Statement: Write a program to calculate the area of a triangle given the length of its three sides (a, b, c) using the following formulas:

$$s = \frac{a + b + c}{2}$$

$$area = \sqrt{s\,(s-a)(s-b)(s-c)}$$

Analyze the Problem (write your answer in the box below):

Prompt for length of three sides
Get the average length of the three
plug in variables to the area formula
output result

Algorithm (Pseudocode) (write your answer in the box below):

Eval Input sides a,b,c
S equals average of a,b,c
print f string of output phrase + equation for area

Write a Python program to implement the above algorithm. Test your program using the following data:

Input			**Output**
a	**b**	**c**	**Area**
10.0	10.0	10.0	43.3
9.5	11.2	15.5	52.84
3	2	3	2.83

Table 2

Run your program and take a screen shot of your result and paste it in the box below:

Screen Shot 2

```
= RESTART: C:/Users/Brandon/workspace/bachelors/sem-1/fund-of-computing/BrandonP
erez/completed-assignments/perezBrandonLab5Part2.py
>>> main()
Length of side a: 10
Length of side b: 10
Length of side c: 10
The area of your triangle is 43.30
>>> main()
Length of side a: 9.5
Length of side b: 11.2
Length of side c: 15.5
The area of your triangle is 52.84
>>> main()
Length of side a: 3
Length of side b: 2
Length of side c: 3
The area of your triangle is 2.83
```

Every program should have the following comment block at the top. Make sure to fill in your name, class with section number, due date, brief description of your program, and status of your program:

```
#
# Name:
# Class: CSCI 1411-00X
# Due Date:
# Description:
# Status:
```

Rubric for Lab 5:

Criteria	Rating
Part I (Screen shot 1)	Screen shot included – 5 points No screen shot included – 0 points
Part I: Python Program	Prompts for and reads in the height – 5 points Reads in the height without prompt – 2 points Does not read in the height – 0 points
Part I: Python Program	Prompts for and reads in the angel in degrees – 5 points Reads in the angel in degrees without prompt – 2 points Does not read in angel in degrees – 0 points
Part I: Python program	Uses PI value from math library – 5 points Hardcode their own value of PI – 0 points
Part I: Python Program	Converts the angle given in degrees to radians – 5 points Does not convert the angle given in degrees to radians – 0 points
Part I: Python Program	Correctly calculates the length (see Table 1) – 5 points Incorrect calculation of length – 2 points Does not calculate the length – 0 points
Part I: Python Program	Displays the result with a text message (Example: Required length of the ladder is xxx feets) – 5 points Displays the result without appropriate text message – 2 points Does not display the result – 0 points
Part II (Screen shot 2)	Screen shot included – 5 points No screen shot included – 0 points
Part II: Analysis	Analysis statement is included – 5 points Analysis statement is not included – 0 points
Part II: Algorithm:	Algorithm is included – 5 points Algorithm is not included – 0 points
Part II: Python Program	Prompts for and reads in a, b, and c – 5 points Reads in a, b, and c without any prompts – 2 points Does not read in a, b, and c – 0 points
Part II: Python Program	Correctly calculate the area of the triangle (see Table 2) – 5 points Incorrect calculation of the area – 2 points Does not calculate the area – 0 points
Part II: Python Program	Displays the result with a text message – 5 points Displays the result without appropriate text message – 2 points Does not display result – 0 points
Total Points	65