

Homework 01

CSC/DSCI 1301 – Principles of CS/DS I

Due Date: February 7th at midnight

Please read all instructions, especially for the Program! Your program should be typed up. We will not accept handwritten or photocopied submissions.

True/False

Given the following variables and conditional expressions. Write the resulting Boolean value for each expression.

age = 20

name = 'Caleb'

status = 'Employed'

1. age >= 18 and name == 'Marie'

False

2. 18 < age <= 65 or status != 'Employed'

True

Short Answer

1. Convert the following decimal numbers into binary numbers. Show all your work!

- a. 99 = **1100011**

99/2 = 49 Remainder: 1

49/2 = 24 Remainder: 1

24/2 = 12 Remainder: 0

12/2 = 6 Remainder: 0

6/2 = 3 Remainder: 0

3/2 = 1 Remainder: 1

1/2 = 0 Remainder: 1

- b. 212 = **11010100**

212/2 = 106 Remainder: 0

106/2 = 53 Remainder: 0

53/2 = 26 Remainder: 1

26/2 = 13 Remainder: 0

$13/2 = 6$ Remainder: 1

$6/2 = 3$ Remainder: 0

$3/2 = 1$ Remainder: 1

$1/2 = 0$ Remainder: 1

2. Convert the following binary numbers into decimal numbers. Show all your work!

a. $1001100 = \underline{76}$

$$(0 \times 2^0) + (0 \times 2^1) + (1 \times 2^2) + (1 \times 2^3) + (0 \times 2^4) + (0 \times 2^5) + (1 \times 2^6)$$

$$0 + 0 + 4 + 8 + 0 + 0 + 64 = 76$$

b. $10000111 = \underline{135}$

$$(1 \times 2^0) + (1 \times 2^1) + (1 \times 2^2) + (0 \times 2^3) + (0 \times 2^4) + (0 \times 2^5) + (0 \times 2^6) + (1 \times 2^7)$$

$$1 + 2 + 4 + 0 + 0 + 0 + 0 + 128 = 135$$

3. Given the following Python code. Please describe the programming errors in the code and provide the corrections required to fix the program. Please include the line numbers for each correction. Hint: There are 3 errors in the code.

```
bad program.py
1
2 Program Description:
3 This program generates a random license plate for a user specified car and store
4 the year, make, model, and license plate in a dictionary
5
6 Author: Faris Hawamdeh
7
8
9 # Prompt the user to enter the year, make, and model of their vehicle
10 year = int(input('Please enter the model year of your vehicle: '))
11 make = int(input('Please enter the maker of your vehicle: '))
12 model = input('Please enter the model of your vehicle: ')
13
14 # Generate the 3-letter prefix: Can be A-Z
15 letter_a = chr(random.randint(65, 90))
16 letter_b = chr(random.randint(65, 90))
17 letter_c = chr(random.randint(65, 90))
18
19 # Generate the 4-digit number for the license plate
20 digits = random.randint(1000, 9999)
21
22 license_plate = letter_a + letter_b + letter_c + digits
23
24 car = (
25     'Year': year,
26     'Make': make,
27     'Model': model,
28     'Plate': license_plate
29 )
30
31 print(f'The license plate for your {car["Year"]} {car["Make"]} {car["Model"]} is {car["Plate"]}')
32
```

Error: line 11

Explanation: There is no need for "int()" in this line as the input would be a string and not a number

Fixed code: `make = input('Please enter the maker of your vehicle: ')`

Error: line 3

Explanation: The comment says “generates a random license place” which doesn’t accurately describe the program

Fixed code: This program generates a random license plate for a user specified...

Error: lines 24 and 29

Explanation: The code in between these lines use the dictionary container and require the use of {}, ()

Fixed code: model = car = { ... }

Program: triangles.py

Given the side lengths of a triangle, you will need to write a program that calculates several properties of the triangle. Using the user-entered side lengths, your program will need to output the answers to the following questions:

1. What is the perimeter of the triangle?
2. What is the area of the triangle?
3. Is the triangle an acute, obtuse, or right triangle?

The most common formula taught for calculating the area of a triangle is $Area = \frac{1}{2} * Base * Height$.

However, the perpendicular height of the triangle is not known by the user. In geometry, Heron's formula (or Hero's formula) gives the area of a triangle in terms of the three side lengths: a , b , and c . The two-stage formula is as follows: compute the semi-perimeter s and the **area** using the perimeter.

$$s = \frac{1}{2}(a + b + c)$$

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

The converse of the Pythagorean Theorem can be used to determine what kind of triangle it is based on the provided side lengths.

$$a^2 + b^2 = c^2$$

Assuming that c is always the length of the longest side, the following statements are always true.

1. If $a^2 + b^2 = c^2$, then it is a Right Triangle.
2. If $a^2 + b^2 > c^2$, then it is an Acute Triangle.
3. If $a^2 + b^2 < c^2$, then it is an Obtuse Triangle.

Example Output

```
Please enter the length of side A of the triangle (in meters): 3
Please enter the length of side B of the triangle (in meters): 4
Please enter the length of side C of the triangle (in meters): 5
The perimeter of the triangle is 12m
The area of the triangle is 6.00m^2
It is a Right Triangle.
```

Deliverables

For this program, you will need to provide the Python file containing your code as well as a screenshot of the output of your program. Please name your files as follows:

- Python Files
 - lastname_firstname_filename.py
 - For example: **hawamdeh_faris_triangles.py**
- Screenshots
 - lastname_firstname_filename.png
 - For example: **hawamdeh_faris_triangles.png**

Important

Your coding style is just as important as the correctness of your program. Unlike your programs in the lab, you will be evaluated on your variable names and use of comments in addition to the program output. Your code must include a block comment at the top of your Python file with your name and a description of your program. Your variable names should be meaningful and conform to snake case.