

## Programming Assignment #5

Put all of your code into the same PYTHON file according to file name conventions given in <http://www.akyokus.com/fall2019/ip/assignments.html>. Programming assignment solutions should be submitted in the following format:

File Name: COE-64160099-KAYA-A1.py

```
#####
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# Student ID: 6321211
# Department: Computer Engineering
#
# Assignment ID: A1
#####

#####
# QUESTION I
# Description:
# Body mass index (BMI) is a measure of health # based on weight. It can be calculated by
# taking your weight in kilograms and # dividing it by the square of your height in meters.
# Write a program that prompts # the user to enter a weight in pounds and height in inches
# and displays the BMI. Note that one pound is 0.45359237 kilograms and one inch is
# 0.0254 meters.
#
# Sources:
# Give references for the sources that you used in your program if there are any
#
#####

print("\n")
print("SOLUTION OF QUESTION I:")
print("*****")
# Prompt the user to enter weight in pounds
weight = eval(input("Enter weight in pounds: "))

# Prompt the user to enter height in inches
height = eval(input("Enter height in inches: "))

KILOGRAMS_PER_POUND = 0.45359237 # Constant
METERS_PER_INCH = 0.0254 # Constant

# Compute BMI
weightInKilograms = weight * KILOGRAMS_PER_POUND
heightInMeters = height * METERS_PER_INCH
bmi = weightInKilograms / (heightInMeters * heightInMeters)

# Display result
print("BMI is", format(bmi, ".2f"))
if bmi < 18.5:
    print("Underweight")
elif bmi < 25:
    print("Normal")
elif bmi < 30:
    print("Overweight")
else:
    print("Obese")
```

```
#####
# QUESTION II
# Description:
# You can use the math functions to solve many computational problems. Given the three
# vertices of a triangle, for example, you can compute the angles by using
# math formulas. The following program asks user to enter the coordinates of a triangle,
# then it computes its angles.
#
# Sources:
# Give references for the sources that you used in your program if there are any
#
#####

print("\n")
print("SOLUTION OF QUESTION II:")
print("*****")
import math

x1, y1, x2, y2, x3, y3 = eval(input("Enter six coordinates of three points \
separated by commas like x1, y1, x2, y2, x3, y3: "))

a = math.sqrt((x2 - x3) * (x2 - x3) + (y2 - y3) * (y2 - y3))
b = math.sqrt((x1 - x3) * (x1 - x3) + (y1 - y3) * (y1 - y3))
c = math.sqrt((x1 - x2) * (x1 - x2) + (y1 - y2) * (y1 - y2))

A = math.degrees(math.acos((a * a - b * b - c * c) / (-2 * b * c)))
B = math.degrees(math.acos((b * b - a * a - c * c) / (-2 * a * c)))
C = math.degrees(math.acos((c * c - b * b - a * a) / (-2 * a * b)))

print("The three angles are ", round(A * 100) / 100.0,
      round(B * 100) / 100.0, round(C * 100) / 100.0)

#####
# QUESTION III
# Description:
# Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt
# ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation
# ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in
# reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur.
# Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit
# anim id est laborum
#
# Sources:
# Give references for the sources that you used in your program if there are any
#
#####

print("\n")
print("SOLUTION OF QUESTION III:")
print("*****")
```

Submit your programming assignment through the Google classroom IntProg-Fall2019  
<https://classroom.google.com/c/NDMyNjgzODE5MjNa>).

**NOTE: YOU ARE ONLY ALLOWED TO SEND YOUR HOMEWORK IN '.py' OR '.zip' FILE. DO NOT FORGET TO FOLLOW THE NAMING FORMAT. DO NOT COPY CODES FROM YOUR FRIENDS. IF IT OCCURS, THEN YOU AND YOUR FRIEND WILL GET 0 (ZERO) BECAUSE OF THE PLAGIARISM, TRY YOUR BEST.**

## QUESTION I:

*(Convert milliseconds to hours, minutes, and seconds)* Write a function that converts milliseconds to hours, minutes, and seconds using the following header:

**def convertMillis(millis):**

The function returns a string as hours:minutes:seconds.

For example,

convertMillis(5500) returns the string 0:0:5,

convertMillis(100000) returns the string 0:1:40,

convertMillis(555550000) returns the string 154:19:10.

Write a test program that prompts the user to enter a value for milliseconds and displays a string in the format of **hours:minutes:seconds**.

## QUESTION II:

*(The Fan class)* Design a class named Fan to represent a fan. The class contains:

- Three constants named **SLOW**, **MEDIUM**, and **FAST** with the values **1**, **2**, and **3** to denote the fan speed.
- A private **int** data field named **speed** that specifies the speed of the fan.
- A private **bool** data field named **on** that specifies whether the fan is on (the default is **False**).
- A private **float** data field named **radius** that specifies the radius of the fan.
- A private string data field named **color** that specifies the color of the fan.
- The accessor and mutator methods for all four data fields.
- A constructor that creates a fan with the specified speed (default **SLOW**), radius (default **5**), color (default **blue**), and on (default **False**).

Write a test program that creates two Fan objects. For the first object, assign the maximum speed, radius 10, color yellow, and turn it on. Assign medium speed, radius 5, color blue, and turn it off for the second object. Display each object's speed, radius, color, and on properties.

### QUESTION III:

(Algebra: linear equations) Design a class named LinearEquation for a  $2 \times 2$  system of linear equations:

$$\begin{array}{l} ax + by = e \\ cx + dy = f \end{array} \quad x = \frac{ed - bf}{ad - bc} \quad y = \frac{af - ec}{ad - bc}$$

The class contains:

- The private data fields **a**, **b**, **c**, **d**, **e**, and **f** with get methods.
- A constructor with the arguments for **a**, **b**, **c**, **d**, **e**, and **f**.
- Six **get** methods for **a**, **b**, **c**, **d**, **e**, and **f**.
- A method named **isSolvable()** that returns true if  $ad - bc$  is not 0.
- The methods **getX()** and **getY()** that return the solution for the equation.

Write a test program that prompts the user to enter a, b, c, d, e, and f and displays the result. If is 0, report that “The equation has no solution.” See Exercise 4.3 for sample runs.

### QUESTION IV:

(Algebra: quadratic equations) Design a class named QuadraticEquation for a quadratic equation

The class contains:

- The private data fields **a**, **b**, and **c** that represent three coefficients.
- A constructor for the arguments for **a**, **b**, and **c**.
- Three **get** methods for **a**, **b**, and **c**.
- A method named **getDiscriminant()** that returns the discriminant, which is  $b^2 - 4ac$ .
- The methods named **getRoot1()** and **getRoot2()** for returning the two roots of the equation using these formulas:

$$r_1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a} \quad \text{and} \quad r_2 = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

These methods are useful only if the discriminant is nonnegative. Let these methods return 0 if the discriminant is negative.

Write a test program that prompts the user to enter values for a, b, and c and displays the result based on the discriminant. If the discriminant is positive, display the two roots. If the discriminant is 0, display the one root. Otherwise, display “The equation has no roots.” See Exercise 4.1 for sample runs.