University of Huddersfield
School of Computing and Engineering

CFM2103 Mathematical Programming

Practical **Week 1**

Work through the questions included below. If you get stuck, please revisit the information on the slides used today before you ask for help.

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1. Download the code `Week1Ex1.py` from Brightspace and run it. Study the structure of the code.

   This code takes four numbers as input from the user; these numbers represent the coordinates of two different points in the plane. If A_1 and A_2 are the points in question, then their coordinates are (x_1, y_1) and (x_2, y_2), respectively. The code computes the distance d (say) between the two points by using the *distance formula*

   $$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}\,.$$

   The result is then displayed on the screen by using an appropriate formatting statement.

   Modify this computer code so that it takes as input the coordinates of three points that represent the vertices of a triangle. Use the distance formula to find the lengths of the sides of this triangle. Your code should also compute the perimeter (P) and the area (A) of the triangle. For the latter you can use the formula

   $$A = \sqrt{p(p-a)(p-b)(p-c)}\,,$$

   where a, b, c are the lengths mentioned above and $p = (a + b + c)/2$ corresponds to the semi-perimeter of the triangle. The output of your code should be neatly displayed on the screen (as in Q.5 below)

2. Write a computer code that converts a given temperature from Celsius to Fahrenheit (if you don't know the formula for conversion use Google). What is 23° C on the Fahrenheit scale? What about 32° C? The output of your code should be displayed on the screen together with any additional (relevant) information.

3. Download the code `Week1Ex2.py` from Brightspace and run it several times. This piece of code prompts the user to enter an integer that represents an elapsed time in seconds, and then displays it in the form *"DD days HH hours MM minutes and SS seconds"*. For example, if the user enters the number 700005, the message *"8 days 2 hours 26 minutes and 45 seconds"* will be displayed on the screen.

4. Inside an ATM bank machine there are notes of \$20, \$10, \$5, and \$1. Write a Python program that prompts the user to enter the amount of money he or she wants to withdraw (using an integer value) and then displays *the least number* of notes the ATM should give. For example, if the user enters an amount of \$76, the program should display the message *3 notes of \$20, 1 note of \$10, 1 note of \$5, and 1 note of \$1.*

5. Write a program that prompts the user for two integers and then prints: the sum, the difference, the product, the average, the absolute value, the larger of the two, and the smaller of the two. The output should be properly aligned as indicated below:

```
Sum:            45
Difference:     -5
Product:       500
Average:        22.50
Distance:        5
Maximum:        25
Minimum:        20
```

[**Hint:** For the last two you may want to use the built-in Python functions `min(a,b)` and `max(a,b)` that are self-explanatory.]

Optional questions:

If you would like to receive additional feedback on your work, you should attempt the questions included below and submit your computer code in a zipped folder on Brightspace by no later than 5:00 PM next Tuesday.

1. (a) Write a computer program that prompts the user to enter a four-digit integer and then calculates the sum of its digits.

   (b) Modify your code so that the user can provide a six-digit number; the question is the same: the sum of the digits must be displayed on the computer screen.

   [**Note:** Your code should use only concepts/syntax that was discussed this week.]

2. (a) Write a Python program that prompts the user to enter a three-digit integer and then reverses it. For example, if the user enters the number 375, the number 573 should be displayed.

   (b) Modify your code so that the user can enter a six-digit number. The question is the same, the number provided must be displayed in reverse order.

   [**Note:** Your code should use only concepts/syntax that was discussed this week.]