FACULTY OF COMPUTING
& INFORMATION TECHNOLOGY

KING ABDULAZIZ UNIVERSITY

كلية الحاسبات
وتقنية المعلومات

جامعة الملك عبدالعزيز

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Lab 3 - Elementary Programming I

Chapter:	2. Elementary Programming
Time:	80 Minutes
Week:	**4**
Date:	22/09/2019 – 26/09/2019

Lab
3

Objectives

- To familiarize students how to solve practical problems programmatically.
- To practice on elementary programming by using Python built-in data types, variables, constants, operators, expressions, and input and output.

Current Lab Learning Outcomes (LLO)

By completion of the lab the students should be able to

- Use the *input* function.
- Use variables.
- Use constants.
- Use arithmetic operators.
- Distinguish between float division operator and integer division operator.
- Write simple calculations.

Lab Requirements

- PyCharm (IDE).

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Practice Activities with Lab Instructor (20 minutes)

Problem 1	Programming Exercises (2.2)

Write a program that reads in the radius and length of a cylinder and computes the area and volume using the following formulas:

$$area = radius \times radius \times \pi$$

$$volume = area \times length$$

Here is a sample run:

```
Enter the radius and length of a cylinder: 5.5, 12 <enter>
The area is 95.0330975
The volume is 1140.39717
```

Solution

Phase 1: Problem-Solving Phase:

1- Ask the user to enter the radius and length of a cylinder (radius, length).
   - Use the *input* function to read inputs from the user.
   - Use the *eval* function to evaluate the string input to numbers.
   - Use the simultaneous assignment to assign values into many variables.
   - `radius, length = eval(input("message…"))`
2- Calculate the length of a cylinder (area).
   - `area = radius * radius * 3.14159`
3- Calculate the volume of a cylinder (volume).
   - `volume = area * length`
4- Display the results (area, volume).

Phase 2: Implementation Phase:

1. Create a new project and name it "Lab 3".
2. Create a new file and name it "activity_1.py".
3. Write the following code in the file:

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activity_1.py

```
1   # Enter radius of the cylinder
2   radius, length = eval(input("Enter the radius and length of a cylinder: "))
3
4   # Calculate the area of the cylinder
5   area = radius * radius * 3.14159
6   # Calculate the volume of the cylinder
7   volume = area * length
8
9   # Print the results
10  print("The area is", area)
11  print("The volume is", volume)
```

Problem 2   Programming Exercises (2.7)

Write a program that prompts the user to enter the minutes (e.g., 1 billion), and displays
the number of years and days for the minutes.

For simplicity, assume a year has 365 days. Here is a sample run:

```
Enter the number of minutes: 1000000000 <enter>
1000000000 minutes is approximately 1902 years and 214 days
```

Solution

Phase 1: Problem-Solving Phase:

1- Ask the user to enter the number of minutes (minutes).
   o minutes = eval(input("message…"))
2- Calculate the number of days (numberOfDays).
   o 1 Day = 24 Hours
   o 1 Hour = 60 Minutes
   o Use the integer division operator (//) to omit the floating-point from the result of the
      division.
   o numberOfDays = minutes // (24 * 60)
3- Calculate the number of years (numberOfYears).
   o 1 Year = 365 Days
   o numberOfYears = numberOfDays // 365
4- Display the result (numberOfDays, numberOfYears).

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Phase 2: Implementation Phase:

1. Open the project "Lab 3" if it was not opened or create it if it was not existing.
2. Create a new file and name it "activity_2.py".
3. Write the following code in the file:

activity_2.py

```python
1   # Obtain input
2   minutes = eval(input("Enter the number of minutes: "))
3
4   # Calculate the number of days
5   numberOfDays = minutes // (24 * 60)
6   # Calculate the number of years
7   numberOfYears = numberOfDays // 365
8
9   # Display results
10  print(minutes, "minutes is approximately",
11      numberOfYears, "years and", numberOfDays % 365, "days")
```

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Individual Activities (60 minutes)

Problem 3
Programming Exercises (2.1)

Write a program that reads a Celsius degree from the console and converts it to Fahrenheit and displays the result. The formula for the conversion is as follows:

$$fahrenheit = (9 / 5) \times celsius + 32$$

Here is a sample run of the program:

```
Enter a degree in Celsius: 43 <enter>
43 Celsius is 109.4 Fahrenheit
```

Problem 4
Programming Exercises (2.8)

Write a program that calculates the energy needed to heat water from an initial temperature to a final temperature. Your program should prompt the user to enter the amount of water in kilograms and the initial and final temperatures of the water. The formula to compute the energy is:

$$Q = M * (finalTemperature - initialTemperature) * 4184$$

where M is the weight of water in kilograms, temperatures are in degrees Celsius, and energy Q is measured in joules. Here is a sample run:

```
Enter the amount of water in kilograms: 55.5 <enter>
Enter the initial temperature: 3.5 <enter>
Enter the final temperature: 10.5 <enter>
The energy needed is 1625484.0
```

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Extra Exercises (Homework)

From the Textbook

- Programming Exercises:
  - 2.4
  - 2.6
  - 2.10

From MyProgrammingLab (https://pearson.turingscraft.com)

- 2.5
  - 51001
  - 51014
  - 51019
- 2.6
  - 51872
  - 51030
  - 51034

Upload Your Solutions

Upload your solutions of the lab activities to Blackboard.