Python Programming

Practice – 1

This practice reinforces the basics of Python Programming.

- *It helps to understand the different modes in which Python works.*
- *The basic data types of Python, the numbers and strings.*
- *Arithmetic and String operators.*
- *IO operation with Python programs.*

We shall put these elements together to create simple basic Python programs.

Hands On

1. Start **Python** in *Interactive Mode* and understand the following:.

   a) The different **keywords** of Python
   b) The basic **arithmetic operators** of Python
   c) The different **number types** supported by Python
   d) The use of **type( )** function for RTTI
   e) Different representations of **Python strings**.
   f) The different **string operators**
   g) Strings Features like : String slicing, Immutable property of string, Usage of negative subscripts with stings.

2. Your friend would like to have a simple application program which will enable him/her to find the area and circumference of a circle.

   You as a Python Developer write a program to accomplish this task. The formulae to compute the area and circumference of a circle are given for your reference.

   ```
   Area = PI * Radius^2
   Circumference = 2.0 * PI * Radius
   ```

   NOTE : Import the **math** module (import math) and use the **PI** constant as **math.pi** in this program.

Compiled By : *Mohammed Mukthar Ahmed*

3. The Fahrenheit scale was the primary temperature standard for climatic, industrial and medical purposes until the 1960s. In the late 1960s and 1970s, the Fahrenheit scale was replaced by the Celsius. However, the Fahrenheit scale is still used in the United States. An American would like to know the temperature in Fahrenheit, given the temperature in Celsius.

You as a Python resource write a program to perform this task. The appropriate formulae are given for your reference.

```
*Celsius = ( 5.0 / 9.0 ) * ( Fahrenheit - 32.0 )
*Fahrenheit = (( 9.0 / 5.0 ) * Celsius ) + 32.0
```

Python Programming

Practice – 2

This practice session enables us to understand the different control structures of Python programming language like:

- *Selection Statement*
- *Iterative Statements*
- *Branch Statements*

We make use of control structures to write Python programs which make decisions and repetitions.

Hands On

1. Basic arithmetic operations on number and their result will depend on whether the given numbers are even or odd. The tables below illustrate this.

Addition / Subtraction		
number1	number2	Result
Even	Even	Even
Even	Odd	Odd
Odd	Odd	Even

Multiplication		
number1	number2	Result
Even	Even	Even
Even	Odd	Even
Odd	Odd	Odd

Your task is to write a simple Python program to help understand these basic arithmetic operations both numerically as well as textually. The following sample outputs help in the understanding.

Sample Input:

Enter FIRST number : **12**
Enter SECOND number : **13**

Sample Output:

Sum of 12 and 13 is 25
Sum of 'even' and 'odd' is 'odd'
Product of 12 and 13 is 156
Product of 'even' and 'odd' is 'even'

Compiled By : *Mohammed Mukthar Ahmed*

2. The Gregorian calendar, which now serves as the standard calendar for civil use throughout the world, has both common years and leap years. The leap year is omitted three times every four hundred years.

   In other words, a century year cannot be a leap year unless it is divisible by 400. Thus 1700, 1800, and 1900 were not leap years, but 1600, 2000, and 2400 are leap years.

   Your task is to write a Python program which accept a year from the user and find whether it is a leap year or not.

   HINT : A leap year is divisible by 4 and not by 100, or is divisible by 400

   Try the above program with nested selection statements and a selection statement with a compound condition.

3. In mathematics, the **Pythagorean Theorem** or Pythagoras' theorem is a relation in Euclidean geometry among the three sides of a right triangle (right-angled triangle). In terms of areas, it states:
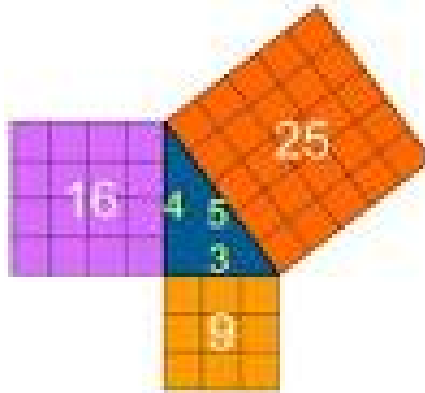
   In any right-angled triangle, the area of the square whose side is the hypotenuse (the side opposite the right angle) is equal to the sum of the areas of the squares whose sides are the two legs (the two sides that meet at a right angle).

   The task is to write a Python program which accept three positive integers from the user representing the three sides of a triangle and determine whether they form a valid right angle triangle as per the Pythagorean Theorem.

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

4. In mathematics, a multiplication table is a table used to define a multiplication operation for an algebraic system. We have learnt and used it from our school days.

   Now, you as programmer need to write a program which generates a multiplication table for a given number.

   [a] Using **while** repetition construct
   [b] Using **for** repetition construct

5. In mathematics, the factorial of a non-negative integer n, denoted by **n!**, is the product of all positive integers less than or equal to n.

   You need to write a program to find the factorial of any positive integer. Program should handle negative integers with appropriate message.

6. A Canadian phone application requires the phone number to be reversed for lookup purpose.

   Write a program to reverse a given integer. It is assume the number is absolute.

7. In the 19th century, there was a need for secrecy, especially during times of war. Messages and files needed to encoded, so that the enemy couldn't read them. Encryption was used, and computers were used to make more complex, harder to crack codes. It was found that using two prime numbers multiplied together makes a much better key than any old number, because it has only four factors. One, itself, and the two primes that it is a product of. This makes the code much harder to crack.

   Prime numbers can also be used in pseudorandom number generators, and in computer hash tables.

   But, what are Prime numbers?

A natural number (i.e. 1, 2, 3, 4, 5, 6, etc.) is called a prime or a prime number if it has exactly two positive divisors, 1 and the number itself.

Your tasks are as follows:
a) Check if the given number is Prime or not.
b) List all Prime numbers between 1 and 2000

8. An application to measure the speed of reaction uses the reciprocal of the reaction time, 1 / time. Sorry! We are not asking you to develop an application to measure the speed of reaction.

Your task is to write a program to find the reciprocal between a range. The range will be given by the user. It could be something like -5 to +5 Care should be taken to handle the **Zero Division Error**.

9. Print every number from 1 to 20 in base 8 and base 16 along with its decimal equivalent in tabular format.

10. In mathematics, a quadratic equation is a univariate polynomial equation of the second degree. A general quadratic equation can be written in the form

$$ax^2 + bx + c = 0,$$

where x represents a variable or an unknown, and a, b, and c are constants with $a \neq 0$.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a},$$

However, if the discriminant is less than zero the roots are imaginary.

$$\Delta = b^2 - 4ac.$$

Your task is to finds the real roots of a quadratic equation and return them, or display a message 'Imaginary Roots' if the discriminant is less than zero.

11. Write a program to get a count of vowels, consonants and other characters in a given string.

Compiled By : *Mohammed Mukthar Ahmed*

12. The team members in your project would like to count the number of vowels and consonants in a given string. Help them in writing a simple Python program to do the same.

    NOTE: Consonants are only letters other than vowels. Care should be taken for special characters and numbers in the string.

13. Enhance the multiplication table generation (Question 4) program such that it helps us in repeatedly generating the table until the user wants.

14. An **Armstrong number** of three digits is an integer such that the sum of the cubes of its digits is equal to the number itself.

    Write a program to generate all Armstrong numbers between 100 and 999

    NOTE : Amstrong numbers are those numbers where the sum of the cubes of the individual digits equals the number itself.

15. In the Snake and Ladder game, the player rolls the dice several numbers of times. Imagining that the player rolls the dice 'N' times, your task is to find the frequency of face value of the dice.

    NOTE : Import the **random** module (import random) and use the **randint** method to generate a random number.

16. Yet another task for our SME in Python Programming. Implementation of the **Number Guessing Game**.

    Make sure that the following criteria's are taken care:
    - The guess number is generated by the program randomly. However, you have the option of setting the range.
    - If the guessed number and the given number are same the user wins. The program displays "**You've WON the game…**"
    - If the number given by the user is greater or lesser appropriate message is displayed. Like "**Number is too big…**" or "**Number is too low…**"

- A maximum of FIVE chances are given. Even after FIVE chances the number is not guessed rightly the following message is displayed "**You've have LOST the game…**"

NOTE : Import the **random** module (import random) and use the **randint** method to generate a random number.

17. In the previous practice session, we had writing a program to find temperature in Fahrenheit, given the temperature in Celsius for our American friend. He would like to classify the temperature in Fahrenheit as follows:

"**Too hot**" if the temperature is above 75, "**Too cold**" if the temperature is below 68, and "**Just right!**" if it is between 68 and 75.

Make necessary changes to the previous program to meet this requirement and display appropriate text.

18. A **Pythagorean triple** consists of three positive integers a, b, and c, such that a^2 + b^2 = c^2. Such a triple is commonly written (a, b, c)

Write a program which will help the user in generating all the Pythagorean triples between the numbers 1 to n, where "n" will be given by the user.

Moreover, also have a count of the number of Pythagorean triples generated.