Problem solving session No. 1

Problem set 1

1. Write a Python program that takes a positive integer as an input and checks if the number is prime or composite.
2. Write a Python program that takes a number as an input and outputs the sum of all the digits in the number.
3. Write a Python program that takes a positive integer as an input and checks if the number is palindrome or not.
4. Write a Python program that takes two positive integers as an input and outputs their greatest common divisor.
5. Write a Python program that takes a positive integer as an input and outputs its binary representation.

Problem set 2

1. Write a Python guessing game program where the user has to guess a randomly generated number between 1 and 100. The program will give hints after each guess whether the guess is higher or lower than the actual number.
2. The Maclaurin series of the exponential function e^x is as follows:

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots + \frac{x^n}{n!}$$

Write a Python program that takes a positive integer n and a real value number x as an input, and approximates the value of e^x.

3. The value of π can be approximated by the following formula:

$$\pi = \sqrt{6 \times (1 + \frac{1}{4} + \frac{1}{9} + \frac{1}{16} + \cdots + \frac{1}{n^2})}$$

Write a Python program that takes a positive integer n as an input and approximates the value of π.

4. Write a Python program that takes a positive integer n as an input and allows the user to enter n integers. The program should display the maximum number in the sequence and the count of its occurrence.

5. Assume that X is a random variable that follows the binomial distribution with parameters n and p, i.e. $X \sim B(n, p)$. Write a Python program that takes non-negative integers n and k as well as a real number p as an input and outputs the probability of the random variable X taking the value of k, i.e. $P(X = k)$.