Practice Exercise: Python Programming

Q1 Write a Python program that asks the user for a number and prints the sum of all numbers from 1 to the input number using a loop. Include error handling to ensure the input is a positive integer.

Q2 Create a Python class named `Rectangle` with two attributes, `length` and `width`. Write a method within the class that calculates the area of the rectangle. Then, write a function outside of the class that takes an instance of `Rectangle` and prints the area.

Q3 Using the Numpy package, generate a 10×10 array of random integers between 1 and 100. Write a function that replaces all elements in the array that are greater than 50 with the value -1. Demonstrate this functionality with an example.

Q4 Create a 1D Numpy array of 100 evenly spaced numbers between 0 and 2π. Calculate the sine and cosine of these numbers using Numpy's broadcasting feature. Use Matplotlib to plot both the sine and cosine functions on the same graph, with appropriate labels and a legend.

Q5 Load an image using OpenCV and convert it to grayscale. Then, using the scikit-learn library, divide the image into a grid of 4×4 pixel regions and compute the average colour of each region. Display the resulting grid of average colours as an image. Make sure to include comments explaining each step of your process.