Laboratory Work 2

Exercise 1:

1. **a)** Declare two variables, **`a`** and **`b`**, containing natural integers of your choice.
   b) Calculate the sum, difference, product, and quotient of **`a`** and **`b`**.
2. **a)** Declare two variables, **`a`** and **`b`**, containing real numbers of your choice.
   b) Calculate the sum, difference, product, and quotient of **`a`** and **`b`**.

Exercise 2:

1. **a)** Declare a variable containing a natural integer, for example, **`integer=5`**.
   b) Use the **`typeof`** function to determine the data type of the integer variable.
2. **a)** Declare a variable containing a real number, for example, **`real = 3.14`**.
   b) Use the **`typeof`** function to determine the data type of the real variable.
3. How does Scilab treat integers compared to real numbers in terms of data type?

Exercise 3:

1. Declare a variable containing a real number, for example, **`real_number = 3.14159265359`**.
2. Use the **`format()`** function to limit the display of **`real_number`** to **`2`**, **`15`**, and **`26`** decimal places.
3. Use the **`floor()`** function to round **`real_number`** down to the nearest integer (the nearest lower integer).
4. Use the **`ceil()`** function to round **`real_number`** up to the nearest integer (the nearest upper integer).
5. Use the **`round()`** function to round **`real_number`** to the nearest integer.

Exercise 4:

1. Give the Scilab command to calculate the following expression:

$$\frac{1}{\sqrt{8^3+1}} - \frac{2\sin\left(\frac{\pi}{4}\right)}{e^2} + \log(4)$$

2. Same question with decomposition:

$$\underbrace{\frac{1}{\sqrt{8^3+1}}}_{A} - \underbrace{\frac{2\sin\left(\frac{\pi}{4}\right)}{e^2}}_{B} + \underbrace{\log(4)}_{C}$$

Exercise 5:

1. Write a very small real number, for example, **`0.000000123`**, using scientific notation **`D`** and store it in a variable named **`small_number`**.

2. Write a very large real number, for example, **`1234567890`**, using scientific notation **`D`** and store it in a variable named **`large_number`**.

Exercise 6:

1. Identify the range of double-precision real numbers (approximately from 2.2×10^{-308} to 1.8×10^{308}).

2. Choose a positive real number within this range and store it in a variable named **`positive_number`**.

3) Choose a negative real number within this range and store it in a variable named **`negative_number`**.

Exercise 7:

1. Declare a variable **`epsilon`** and assign it the value of **`%eps`**.

2. Add **`epsilon`** to **`1`** and store the result in a variable **`result_eps`**.

3. What does **`%eps`** signify in Scilab?

4. Declare a variable **`infinity`** and assign it the value of **`%inf`**.

5. Add infinity to a positive number and store the result in a variable **`result_inf_positive`**.

6. Add infinity to a negative number and store the result in a variable **`result_inf_negative`**.

7. How do operations with **`%inf`** behave in calculations?

Exercise 8:

1. Declare two complex numbers **`z1`** and **`z2`** of your choice.
2. Perform the following operations and store the results in corresponding variables:
   - Addition of **`z1`** and **`z2`**.
   - Subtraction of **`z1`** by **`z2`**.
   - Multiplication of **`z1`** and **`z2`**.
   - Division of **`z1`** by **`z2`**.
3. Determine the conjugate of **`z1`**.
4. Calculate the real and imaginary parts of **`z2`** and store them in variables **`real_z2`** and **`imaginary_z2`**.
5. Calculate the modulus of **z1** and store it in a variable **`modulus_z1`**.
6. Calculate the argument of **`z1`** in radians and store it in a variable **`argument_z1`**.
7. Use the **`plot`** function to graph the complex numbers **`z1`** and **`z2`** on a complex plane.