Tutorial 03: Introduction to Problem Solving, Selection Control Statements & Logical Operators

Exercise 1 (textbook)

Write a Java program that inputs five real numbers and determines and prints the number of negative numbers input, the number of positive numbers input and the number of zeros input.

```java
import java.util.Scanner;

public class Exercise01
{
    public static void main(String[] argv)
    {
        // declare a scanner to input numbers
        Scanner input = new Scanner(System.in);

        // declare 5 real variables
        double number1, number2, number3, number4, number5;

        // declare 3 counter variablesto count (1) negative numbers,
        // (2) positive numbers, and (3) zeros
        int countNegatives, countPositives, countZeros;

        //initialize the counters to zero
        countNegatives = countPositives = countZeros = 0;

        // prompt the user to enter 5 real numbers
        System.out.println("Enter five real numbers: ");
        number1 = input.nextDouble();
        number2 = input.nextDouble();
        number3 = input.nextDouble();
```

```java
number4 = input.nextDouble();
number5 = input.nextDouble();
// test the number1 value and increment the correponding counter
if ( number1 > 0 )
    countPositives++;
else if ( number1 < 0 )
    countNegatives++;
else
    countZeros++;
        if ( number2 > 0 )
    countPositives++;
else if ( number2 < 0 )
    countNegatives++;
else
    countZeros++;
if ( number3 > 0 )
    countPositives++;
else if ( number3 < 0 )
    countNegatives++;
else
    countZeros++;
if ( number4 > 0 )
    countPositives++;
else if ( number4 < 0 )
    countNegatives++;
else
    countZeros++;


// test the number5 value and increment the correponding counter
if ( number5 > 0 )
```

```
        countPositives++;
      else if ( number5 < 0 )
        countNegatives++;
      else
        countZeros++;


      System.out.printf("No of negative numbers: %d\nNo of positive numbers: %d\nNo of
zeros: %d\n", countNegatives, countPositives, countZeros);

   }

}
```

Exercise 2

**Write a Java program that determines whether a number n given by the user is inside the
range [a, b] or not, where a and b are also given by the user in any order (your program
should ensure that a always smaller than b). Hint: Swap their values when needed.**

```
import java.util.Scanner;

public class Exercise02

{

   public static void main(String[] argv)

   {

      Scanner input = new Scanner(System.in);

      int n;

      int a, b;

      System.out.println("Enter a number: ");

      n = input.nextInt();

      System.out.println("Enter the range values ([a,b]): ");

      a = input.nextInt();

      b = input.nextInt();

      if (a > b)

      {

         int t = a;

         a = b;
```

```java
            b = t;
        }


    if (n >= a)
        if (n <= b)
            System.out.printf("%d is inside the range [%d,%d]\n", n, a, b);
        else
            System.out.printf("%d is outside the range [%d,%d]\n", n, a, b);
    else
        System.out.printf("%d is outside the range [%d,%d]\n", n, a, b);

    }

}
```

Exercise 3

Write a Java program that determines if a number **n** given by the user is multiple of 11 and smaller than 100. Handle all (4) possible cases.

```java
import java.util.Scanner;

public class Exercise03
{
    public static void main(String[] argv)
    {
        Scanner input = new Scanner(System.in);
        int n;
        System.out.println("Enter a number: ");
        n = input.nextInt();
        if (n % 11 == 0)
            if (n < 100)
                System.out.printf("%d is multiple of 11 and smaller than 100\n", n);
            else
                System.out.printf("%d is multiple of 11 and not smaller than 100\n", n);
        else
```

```java
        if (n < 100)

            System.out.printf("%d is not multiple of 11 and smaller than 100\n", n);

        else

            System.out.printf("%d is not multiple of 11 and not smaller than 100\n", n);

    }

}
```

Exercise 4

Write a Java program to simulate a simple calculator. It should ask the user to enter a first number, the operation, and the second number. Addition ("+"), Subtraction ("-"), Division ("/"), Multiplication ("*"), and Modulus ("%") are the basic operations that should be implemented. Use the switch statement for the selection and the type `char` to represent the desired operation sign.

When the operation sign is not recognized, your program should print an error message.

Hints: (1) Declare a variable of type `char` for the operator, (2) Read the operation sign using `input.next().charAt(0)` where input is a variable of type `Scanner`, and (3) use operation signs (as char) in the switch's cases (`case '+' :`).

```java
import java.util.Scanner;

public class Exercise04

{

    public static void main(String[] argv)

    {

        Scanner input = new Scanner(System.in);

        double number1, number2, result = 0;

        char operator;

        System.out.println("Enter n1 op n2: ");

        number1 = input.nextDouble();

        operator = input.next().charAt(0);

        number2 = input.nextDouble();

        switch(operator){

            case '+':

                result = number1 + number2;
```

```java
                break;
            case '-':
                result = number1 - number2;
                break;
            case '*':
                result = number1 * number2;
                break;
            case '/':
                result = number1 / number2;
                break;
            case '%':
                result = number1 % number2;
                break;
            default:
                System.out.printf("Unknown operation %s\n", operator);
        }
        System.out.printf("%.2f %s %.2f = %.2f\n", number1, operator, number2, result);
    }
}
```

Problem 1 (past exam)

(class CheckOrder) Write a Java program that performs the following tasks:

- Ask the user to input 4 real numbers.
- Determine if the numbers are in ascending order, descending order, or not ordered at all.
- In all cases, compute and display the average of the four numbers.

Example 1:

```
Enter four numbers: 1.0 2.0 3.0 4.0

The numbers are in ascending order.
Their average is: 2.500000.
```

Example 2:

```
Enter four numbers: 9.9 7.7 5.5 3.3

The numbers are in descending order.
Their average is: 6.600000.
```

Example 3:

```
Enter four numbers: 20.0 10.0 40.0 30.0

The numbers are not ordered.
Their average is: 25.000000.
```

```java
import java.util.Scanner;

public class CheckOrder
{
    public static void main(String[] argv)
    {
        Scanner input = new Scanner(System.in);
        double number1, number2, number3, number4;

        System.out.print("Enter four numbers: ");
        number1 = input.nextDouble();
        number2 = input.nextDouble();
        number3 = input.nextDouble();
        number4 = input.nextDouble();

        if ( ( number1 <= number2 ) && ( number2 <= number3 ) && ( number3 <=
number4 ) )
            System.out.println("\nThe numbers are in ascending order.");
        else
            if ( ( number1 >= number2 ) && ( number2 >= number3 ) && ( number3
>= number4 ) )
                System.out.println("\nThe numbers are in descending order.");
            else
                System.out.println("\nThe numbers are not ordered.");

        System.out.printf("Their average is: %f.\n", ( number1 + number2 +
number3 + number4 ) / 4);
    }
}
```

Problem 2 (past exam)

(class BankAccount) Write a Java program that simulates primitive bank operations. The program will perform the following tasks:

- Declare the amount variable and initialize it with the value 5000.

- Print a menu of possible operations: 1) Amount, 2) Deposit, and 3) Withdraw.
- Ask the depositor to choose an operation:
  - If the operation is 1, print the amount.

  - If the operation is 2, ask the user to enter the amount to deposit and add it to the old amount and print the result.

  - If the operation is 3, ask the user to enter the amount to withdraw and add subtract it from the old amount (only if it is possible) and print the result.

Example 1:
```
Choose an operation:
       1) Amount
       2) Deposit
       3) Withdraw
Please choose 1, 2 or 3:  1

The amount is 5000.000000.
```

Example 2:
```
Choose an operation:
       1) Amount
       2) Deposit
       3) Withdraw
Please choose 1, 2 or 3:  2
Enter the amount to deposit: 300

The new amount is 5300.000000.
```

Example 3:
```
Choose an operation:
       1) Amount
       2) Deposit
       3) Withdraw
Please choose 1, 2 or 3:  3
Enter the amount to withdraw: 3202

The new amount is 1798.000000.
```

```java
import java.util.Scanner;

public class BankAccount
{
   public static void main(String[] argv)
   {
      Scanner input = new Scanner(System.in);
      double amount = 5000.00;
      int operation;

      System.out.println("Choose an operation: ");
      System.out.println("\t1) Amount ");
```

```java
        System.out.println("\t2) Deposit");
        System.out.println("\t3) Withdraw");

        System.out.print("Please choose 1, 2 or 3:  ");
        operation = input.nextInt();

        switch (operation)
        {
            case 1 :
                System.out.printf("\nThe amount is %f.\n", amount);
                break;
            case 2:
                System.out.print("Enter the amount to deposit: ");
                double d = input.nextDouble();
                amount += d;
                System.out.printf("\nThe new amount is %f.\n", amount);
                break;
            case 3:
                System.out.print("Enter the amount to withdraw: ");
                double w = input.nextDouble();
                amount -= w;
                System.out.printf("\nThe new amount is %f.\n", amount);
                break;
            default:
                System.out.println("Unknown operation.");
        }
    }
}
```