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Wintersemester 22/23

Exercises for the Class

Elements of Computer Science: Programming

Assignment 01

Submission of solutions until 3:30 p.m. at 07.11.2022
at `moodle.uni-trier.de`

- Every task needs to be edited in a meaningful way in order to get a point!
- Please comment your solutions, so that we can easy understand your ideas!
- If you have questions about programming or the homeworks, just ask you teachers!
- **Submission that can't be compiled are rated with 0 points!**

Exercise 1 (Evaluation: Numbers)

You receive an executable Java program as a template for the task. In its original state, this predefined program reads two numbers from the console and calculates the sum and difference of the numbers entered from them.

Modify the lines 19 and 22 in this section of the program so that the program will instead of calculating the sum and difference of the numbers,

- at line 20 return three times the first number and
- at line 23 return the sum of the second number and twice the first number.

For some test cases, you can automatically test the correctness of the way your program works.

```
1  import java.util.Scanner;
2
3  public class Exercise {
4    public static void main(String[] args) {
5    /* this program reads two numbers from the console and calculates the sum and
6    difference of the numbers entered from them*/
7
8      Scanner sc = new Scanner(System.in);
9      int    firstNumber;
10     int    secondNumber;
11     int    result;
12
13     System.out.println("First␣Input:␣");
14     firstNumber = sc.nextInt();
```

```
15
16      System.out.println("Second␣Input:␣");
17      secondNumber = sc.nextInt();
18
19      result =  firstNumber + secondNumber;
20      System.out.println("First␣Result:␣" + result);
21
22      result    =  firstNumber - secondNumber;
23      System.out.println("Second␣Result:␣" + result);
24    }
25  }
```

Exercise 2 (Evaluation: Numbers)

The task is based on the first program example `K2B01_first_Example` of the lecture.

Modify the program so that the squares of all natural numbers between 0 and 10 are replaced by a list of even numbers between 0 and 10. You can have the system automatically test the correctness of the operation of your program again.

As in the template the calculation must use a (while) loop.

```
1  public class K2B01E_first_Example {
2    public static void main(String[] args) {
3      int index;
4      int count;
5
6      index  =  0;
7      count = 10;
8
9      /* Just the following lines should be changed */
10     while ( index <= count )
11     {
12       System.out.println( index * index );
13       index = index + 1;
14     }
15   }
16 }
```

Exercise 3 (Evaluation: Numbers)

This exercise builds on the previous exercises. The predefined program can be compiled, but has no function. Complete the program as follows:
As in the first exercise, two numbers (naming "a" and "b") are to be read in. Similar to exercise 2, all *even* numbers between 0 and a (inclusive) have to be *multiplied* by b. The result needs to be printed afterwards to the console.

Even if it is not algorithmically necessary, this task must be solved by using the modulo operator (`%`). Modulo can be used to determine if a number is even or odd by calculating the remainder of an integer division. For example:

$$\text{By integer division we have } 27/2 = 13, \text{ remainder } 1$$
$$\text{because } 13 * 2 + 1 = 27$$
$$\text{By using modulo we get } 27 \,\%\, 2 = 1$$
$$\text{For an even number we get } 26 \,\%\, 2 = 0$$

For more information regarding the modulo operator check the following link: `https://en.wikipedia.org/wiki/Modulo_operation`
There are again test cases to check the correctness.

```
1  import java.util.Scanner;
2  public class Exercise {
3    public static void main(String[] args) {
4
5      Scanner sc = new Scanner(System.in);
6      int a;
7      int b;
8      int index;
9
10     index = 0;
11
12 /* From here you should complete the program code */
13
14
15 /* The two brackets must remain! */
16   }
17 }
```

Exercise 4 (Evaluation: Numbers)

The exercise is based on the previous tasks and the example program `K2B06_Arrays.java`. The predefined program initially has the same functionality as this example program, but has already been extended in the first lines to include the scanner for entering numbers.

Modify the middle part of the program as follows:

- The program should scan a number.
- This number is used to determine the size of the field/array.

- The individual field elements are not set to the square of the index, but with the double of the index.

```
1  public class K2B06E_Arrays {
2    public static void main(String[] args) {
3      int index;
4      int count;
5
6      int[] array;
7  /* Changes are only allowed in the following 10 lines! */
8      count=5;
9      array = new int[count];
10
11     index=0;
12     while (index<count)
13     {
14       array[index] = index*index;
15       index=index+1;
16     }
17 /* From here on no changes are allowed any more! */
18     index=0;
19     while (index<count)
20     {
21       System.out.println(array[index]);
22       if (index<count) System.out.println("-");
23       index=index+1;
24     }
25   }
26 }
```