

Übungen zur Vorlesung  
Einführung in das Programmieren für TM

Serie 3

**Aufgabe 3.1.** Write a void-function `divisor` which checks if a given number  $x \in \mathbb{N} := \{1, 2, 3, \dots\}$  is divisible by 2, 3, or 6. Additionally, write a main program that reads in the number  $x$ , then calls the function `divisor`, and prints out the result.

**Aufgabe 3.2.** Write a function `evenorodd(n)` which returns the value 1 if  $n \in \mathbb{N}$  is even or 0 if  $n$  is odd. Write a main program which reads in the value  $n$  from the keyboard and prints on the monitor if  $n$  is even or odd.

**Aufgabe 3.3.** Let the three points  $(x, y)$ ,  $(u, v)$ , and  $(a, b)$  in  $\mathbb{R}^2$  be given. Write a function `points` which checks if the three points lie on the same line. Additionally, write a main program which reads in the six values and prints out the result on the monitor.

**Aufgabe 3.4.** Write a void-function `sort3` which gets three real numbers  $x, y, z \in \mathbb{R}$  as input. Furthermore, the numbers should be printed out in descending order. Additionally, write a main program that reads in the numbers  $x, y, z$  and calls the function.

**Aufgabe 3.5.** Implement the following game. Compute a random number between 0 and 15. You have three tries for guessing the right number. If your first or second guess is wrong, the program should tell you if the number you have entered is larger or smaller than the correct one. If also your third (and last) guess is wrong, then the right number should be printed on the monitor. Random numbers can be created as follows: First include the header files `stdlib.h` and `time.h` into your program. The following code lines

```
    srand( (unsigned) time(NULL) );  
    int randnumber = (int) (16.0*rand()/(RAND_MAX+1.0));
```

generate a random number between 0 and 15. The variable `randnumber` has the type `int`.

**Aufgabe 3.6.** Recall the meanings of the terms *Lifetime & Scope*. What is the output of the following code lines?

```
1  #include <stdio.h>  
2  
3  int max(int,int);  
4  
5  main() {  
6      int x = 1;  
7      int y = 2;  
8      int z = 3;  
9  
10     printf("(x,y,z) = (%d,%d,%d)\n",x,y,z);  
11  
12     {  
13         int x = 100;  
14         y = 2;  
15         z = max(x,y);  
16         printf("(x,y,z) = (%d,%d,%d)\n",x,y,z);  
17  
18         {  
19             int z = y;
```

```

20     y = 200;
21
22     printf("(x,y,z) = (%d,%d,%d)\n",x,y,z);
23 }
24 printf("(x,y,z) = (%d,%d,%d)\n",x,y,z);
25 }
26 printf("(x,y,z) = (%d,%d,%d)\n",x,y,z);
27 }
28
29 int max(int x, int y) {
30     if(x>=y) {
31         return x;
32     }
33     else {
34         return y;
35     }
36 }

```

Draw a timeline and visualize the lifetime and the scope of the variables  $x,y,z$ . Moreover, mark all blocks and functions.

**Aufgabe 3.7.** The Fibonacci series is recursively defined by  $x_0 := 0$ ,  $x_1 := 1$ , and  $x_{n+1} := x_n + x_{n-1}$ . Write the function `fibonacciRec` which returns  $x_n$  for given  $n$ .

**Aufgabe 3.8.** Write a recursive function `binomial` that computes the binomial coefficient  $\binom{n}{k}$  for  $k \leq n$ . Use the addition formula

$$\binom{n}{k} = \binom{n-1}{k} + \binom{n-1}{k-1} \quad \text{for } 1 \leq k < n$$

with  $\binom{n}{0} = 1 = \binom{n}{n}$  for  $n \in \mathbb{N}_0$ . Write a main program which reads in  $k, n \in \mathbb{N}_0$  with  $k \leq n$  and computes  $\binom{n}{k}$ .