# RECITATION 3

**Q1.** Write a program that asks the user to enter an integer number and prints whether that number is positive or not (= negative or 0!).

**Q2.** Write a program that asks the user to enter an integer number and prints whether that number is even or odd.

**Q3.** Write a program that asks the user to enter a real number and prints whether that number lies in [5,10[ or not ([5,10[ means 5 ≤ x < 10).

**Q4.** Write a program that asks the user to enter a real number and prints whether for that number, each one of the following conditions is met or not:

- condition A: 3 ≤ x < 8.5
- condition B: x < 3 OR 5.4 < x ≤ 7.3 OR x > 13
- condition C: x ≠ 3 AND x < 9.75

Examples:

- 0 matches conditions: not A, B, C
- 3 matches conditions: A, not B, not C
- 8 matches conditions: A, not B, C
- 15 matches conditions: not A, B, not C

**Q5.** Write a program that asks the user to enter a real number and prints whether that number is positive, zero or negative.

**Q6.** Write a program that asks the user to enter 5 integer numbers one by one. While reading the numbers, the program calculates the minimum of those numbers. At the end, this minimum is printed. Try to limit the number of variables in your program to 2 (or max 3) but do not introduce loops yet.

**Q7.** Write a program that compares your speed with the speed limit. If you are speeding, the program will calculate your fine. If not, nothing happens. The fine consists of a fixed amount of € 100 and a variable amount of € 2.5 for every km over the speed limit. The screen should look like:

```
Be aware! Speeding is heavily fined!
Enter your speed: 131
Enter the speed limit: 120
Your speed is 11 km/h over the speed limit.
Your fine amounts 127.5 euro.
```

**Q8.** Write a BMI (Body Mass Index) calculator. BMI is a measure of body fat based on height and weight that applies to adult men and women. It can be calculated with the following formula:

$$BMI = \frac{weigth\ in\ kg}{(heigth\ in\ m) * (heigth\ in\ m)}$$

The BMI is divided into different categories:

- underweight < 18.5
- normal weight 18.5 – 24.9
- overweight 25 – 29.9
- obesity ≥ 30

Ask the height and weight of the user, calculate his/her BMI and print the category the user belongs to.

**Q9.** Write a program that first reads 3 integer numbers that represent the current date and then reads again 3 integer numbers to be interpreted as a birth date. Based upon this information the program prints the age of that person in years and months.

```
Enter the current date: 6 1 2015
Enter your birth date: 25 1 1985
Your age is: 29 years and 11 months
```

**Q10.** Write a program that reads a start and end time, calculates the time difference and prints it in the format hh hours mm minutes ss seconds. You can read hours, minutes and seconds separately. If the start time appears to be later than the end time, you can assume the start time to be from the previous day. Examples:

| start | 2 12 12 | 3 12 18 | 5 23 45 | 21 0 0 |
|---|---|---|---|---|
| end | 3 15 17 | 3 15 17 | 7 10 30 | 4 30 15 |
| time difference | 1 3 5 | 0 2 59 | 1 46 45 | 7 30 15 |

**Q11.** Write a program that reads 3 numbers and prints them ranked from small to large.

**Q12.** Write a program that asks the user to enter an instruction in the format:

*number1 operand number2*

For the operand, the user can choose +, -, * or /. The program calculates the mathematical result and prints it to the screen.

Tip: Read the instruction with scanf("%f%c%f%*c", &num1, &operand, &num2); and use switch(operand).

**Q13.** A gas company calculates its prices as follows:

- For a consumption ≤ 1m³ -- € 20,00
- For a consumption > 1m³ -- € 20 for the first m³ + € 3,5/m³ for the part over 1m³

The total amount needs to be increased with a tax of 21%. Write a program that asks the user to enter his/her consumption and prints an invoice to the screen showing consumption, cost prince, tax amount and total amount.

**Q14.** The equivalent resistance $R_{eq}$ for 2 parallel resistors $R_1$ and $R_2$ can be calculated with:

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$$

Write a program that reads the values of $R_1$ and $R_2$, calculates $R_{eq}$ and prints it to the screen. Make sure the program also works correctly for an $R_1$ and/or $R_2$ equal to 0!

**Q15.** Write a program that calculates the length of the third side of a right-angled triangle based upon the lengths of the 2 other sides and prints it to the screen. To this end, ask the user to enter the length of all 3 sides in the order: side1 side2 hypotenuse. A zero is to be entered for the side for which you wish to calculate the length.

**Q16.** Write a program that asks the user to enter the coefficients a, b and c of a quadratic equation with general form $ax^2 + bx + c = 0$ and prints all real roots of this equation. Make sure the program does not crash for certain values of the coefficients!

| a | b | c | roots |
|---|---|---|---|
| 1 | 1 | -6 | two real roots: -3 and 2 |
| 2 | 1 | -6 | two real roots: -2 and 1.5 |
| 1 | 1 | 1 | no real roots |
| 1 | -4 | -4 | double real root: 2 |
| 0 | 1 | 1 | one solution: -1 |
| 0 | 0 | 1 | no solutions (inconsistent equation) |
| 0 | 0 | 0 | identity |

(a=1, b=c=-4 case is incorrect in the above table.)