

Scientific programming in mathematics

Exercise sheet 1

Variables & Simple conditional statements

Exercise 1.1. Write a program that reads the length $a \in \mathbb{R}$ and the width $b \in \mathbb{R}$ of a rectangle from the keyboard, computes the area of the rectangle, and prints the result to the screen. Save your source code as `rectangle.c` into the directory `series01`.

Exercise 1.2. In a game you win an amount of money in € equal to x , where $x \in \mathbb{R}$ satisfies $x > 0$. You want to share this money with your $n \in \mathbb{N}$ friends in a fair way. How much money $y \in \mathbb{R}$ do you and each of your friends get? Write a program that reads $x \in \mathbb{R}$ and $n \in \mathbb{N}$ from the keyboard and prints $y \in \mathbb{R}$ to the screen. Save your source code as `prize.c` into the directory `series01`.

Exercise 1.3. Write a program which reads the radius r of a circle from the keyboard and prints to the screen its area and its perimeter. Save your source code as `circle.c` into the directory `series01`.

Exercise 1.4. A Pythagorean triple consists of three natural numbers which can be interpreted as the side lengths of a right triangle. Write a program which reads three natural numbers $a, b, c \in \mathbb{N}$ from the keyboard and prints to the screen whether those three numbers are a Pythagorean triple or not. Save your source code as `pythagoras.c` into the directory `series01`.

Exercise 1.5. Consider the square with side length $L > 0$ and vertices $(0, 0)$, $(L, 0)$, (L, L) , and $(0, L)$. Moreover, consider a point $(x, y) \in \mathbb{R}^2$. Write a program which reads the parameters $L > 0$ and $x, y \in \mathbb{R}$ from the keyboard and prints to the screen the position of the point (x, y) with respect to the square. Note that a point can be (strictly) inside the square, on its boundary, or outside of it. Save your source code as `locate.c` into the directory `series01`.

Exercise 1.6. Write a program which reads three real numbers $x, y, z \in \mathbb{R}$ from the keyboard and prints to the screen the numbers in descending order. This means that the maximum $\max\{x, y, z\}$ is printed at first and the minimum $\min\{x, y, z\}$ at last. Save your source code as `sort3.c` into the directory `series01`.

Exercise 1.7. Write a program that, given 10 exercise sheets with 8 exercises each, reads from the keyboard the total number of marked (=solved) exercises by a student. The program then prints to the screen the percentage of marked exercises and whether this is enough for the student to achieve a positive final grade or not (assume that at least 50% of the assigned exercises must be solved in order to obtain a positive grade). Save your source code as `exercisegrade.c` into the directory `series01`.

Exercise 1.8. Write a program that reads three edge lengths $a, b, c > 0$ from the keyboard and prints to the screen the type of the resulting triangle: equilateral, isosceles, scalene, right-angled, one-dimensional degenerate, i.e., the sum of two edges equals the third one, or impossible, i.e., the sum of two edges is strictly smaller than the third one. Note that several properties may be satisfied simultaneously. Save your source code as `triangle.c` into the directory `series01`.