EXERCISES

1. PART I

Exercise 1.1. Choose randomly $0 \leq a, b \leq 1000$ and compute the set

$$S = \{0 \leq m \leq 1000 \mid a \text{ divides } m \text{ and } b \text{ divides } m\}.$$

Exercise 1.2 (Bingo)**.** Choose randomly 6 different numbers between 1 and 90, then *extract* randomly other 6 **different** numbers between 1 and 90. Check Check how many elements these two sets have in common.

Exercise 1.3. Construct the set with the first fifty powers of 2.

Exercise 1.4. Calculate how many numbers of the form $x^2 + 3x + 1$ with $0 \leq x \leq 100$ are also multiples of 5.

Exercise 1.5. Compute the truth table for the boolean expression $(x \wedge y) \vee (\neg\, x \wedge \neg\, y)$.

Exercise 1.6. Check that the following expression is true for all $1 \leq n \leq 1000$.

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}.$$

$\boxed{\textbf{Exercise 1.7.} \text{ Compute the first twenty lines of Pascal's triangle.}}$

Exercise 1.8. Choose randomly $2 \leq a \leq 1000$. If a is prime then print "a is prime", print the factorization of a otherwise.

Exercise 1.9. Find $1 \leq x, y \leq 100$ such that $x^2 + p^2 = 10037$.

Exercise 1.10. Find the minimal prime number p such that p is not a *Mersenne prime*, i.e. $2^p - 1$ is not prime.

Exercise 1.11. Prove that the Fermat's conjecture is false, i.e. $2^{2^n} + 1$ is not prime for every positive integer n.

Exercise 1.12. Choose randomly $-100 \leq a \leq 100$. Write a `case`-statement that returns "a is zero" if $a = 0$, "a is positive" if $a > 0$ and "a is negative" if $a < 0$.