Exercise 1a

a) Consider one of the provided files (`https://github.com/MeikeWeiss/GAP-Days2025-Intro/tree/master/Exercise%201/Exercise1a`), read the code and find the (syntax) errors by loading it in your GAP session.

- FirstSquares
- Faculty
- Signum
- SortList

b) Lists:

- Compute the sum of the first 100 numbers using a for (and while) loop.
- Define a list of integers and compute the list consisting of their squares. Try do to this just by using one command.
- Define a list of integers and compute the sublist consisting of those that are even. Try do to this just by using one command.

c) Groups:

- Let G be the group generated by $(1,2,3,4), (5,6,7,8), (1,5)(2,6)(3,7)(4,8)$. Compute the order of G and show that G is not abelian. Additionally, compute the center of G and show that it is a cyclic group of order four and that it has index 8.
- Given a set S of elements in a given group, compute a smaller subset consisting of S-conjugate representatives (within S). (Intermediate)
- More exercises can be found here https://www.ilariacolazzo.info/gap/tutorials/sheet2/.

d) Matrices:

- Create a square matrix M and a vector v and compute $M * v$ and $v * M$.
- Determine the determinant, the eigenvalues and the eigenvectors.

Exercise 1b

Write functions, that accomplish the following. Also test them for a sensible number of inputs, so that the correctness is somewhat ensured.

- Easy
  - The Wythoff function, i.e. a generalisation of the Fibonacci function where the starting integers can be freely chosen
  - -* Compute the greatest common divisor by using the Euclidean algorithm
  - A *FizzBuzz* function, i.e. takes an integer n as input and returns a list with n entries, where entry i is
    (i) `FizzBuzz` if i is divisible by 3 and 5
    (ii) `Fizz` if i is divisible by 3
    (iii) `Buzz` if i is divisible by 5
    (iv) i if none of the above are true
  - A palindrome checker, i.e. for an input string if the reverse of that string is the same.
- Intermediate
  - A function that solves the word problem in $\mathbb{Z}/n\mathbb{Z}$ for a given integer n and list of generators. E.g. find a word $(a_i)_{1\leq i\leq k} \in \{3, 5\}$ such that $\left(\left(\sum_{i=1}^{k} a_i\right) \bmod n\right) = t$ for a provided target t.
  - -* A function which computes the sign of a given permutation, which is of type permutation.

* These functions do have built in equivalents, which can be used to check whether your function works as expected.