Scientific Programming (Wissenschaftliches Programmieren)

Exercise 2

1. Fibonacci numbers (#3)

- Create a function `fibonacci()` which generates Fibonacci numbers.

- The function should take the number of desired Fibonacci numbers as argument and return those Fibonacci numbers as a list.

- Make sure it also works correctly, when the requested number of Fibonacci terms is only one or two.

Hint: The first two elements of a Fibonacci series are 1, all other elements are the sum of the previous two elements: 1, 1, 2, 3, 5, 8, 13, ...

2. Aligned printing of ordered numbers

- Create a function `print_ordered_ints()`, which takes a list of ordered integers (e.g. as generated by the `fibonacci()` function) and prints them aligned, indicating their position in the list.

- Example: `print_ordered_ints(fibonacci(15))` should result in:

```
 1:   1
 2:   1
 3:   2
 4:   3
 5:   5
 6:   8
 7:  13
 8:  21
 9:  34
10:  55
11:  89
12: 144
13: 233
14: 377
15: 610
```

Hint: The expression evaluation in f-strings can be nested, e.g. f"{value:{width}d}" would print the result of the expression `value` as integer with a field width obtained by evaluating the expression/variable `width`.

Hint: To find out the maximal printed length of a number, you can convert it to a string and determine the length of the string.

3. Path plotting

- Create a function `plot_paths()`, which takes a list of paths as argument and plots lines between the points of each path (e.g. via turtle graphics).

- Each path is a list of xy-coordinate tuples. The plotting should start at the first point of the path, and connect all subsequent points in the path. Points between different path should not be connected.

```
paths = [[(-50, -50), (50, -50), (50, 50), (-50, 50), (-50, -50)],
 [(-100, -100), (100, -100), (100, 100), (-100, 100), (-100, -100)]]
plot_paths(paths)
```
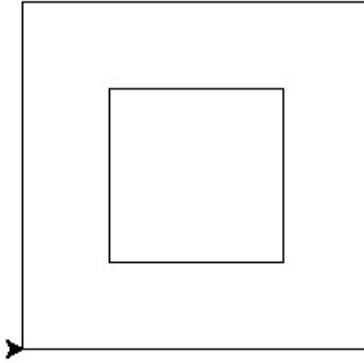

- Create a function `vasarelly_star_paths()`, which takes the nr. of grid points and a grid distance as two arguments and returns a list of paths, which can then be used to draw the corresponding Vasarelly-star.

- Test, the returned path list with the `plot_paths()` function.

Example:

```
plot_paths(vasarelly_star_paths(10, 20))
```