02393 C++ Programming Exercises

Assignment 8

To be handed in via Autolab — `https://autolab.compute.dtu.dk/courses/02393-E23/assessments`

1 Fun with shapes

The goal of the assignment is to implement a family of classes of two-dimensional shapes. You should implement a file `shapes.h` and a file `shapes.cpp`, and upload on Autolab a zip archive containing **both of them**. The test cases will need both files (see also the live-coding example discussed during the lectures).

You must implement the following C++ classes:

- `Shape`
- `Rectangle`
- `Square`
- `Circle`

Such classes must all have the following methods:

- Constructors:
  - `Rectangle` objects are constructed from two `double`s that specify height and width;
  - `Square` objects are constructed from one `double`, that specifies the length of the sides;
  - `Circle` objects are constructed from one `double`, that specifies the radius.
- `area` should return the area of the shape;
- `perimeter` should return the perimeter of the shape;
- `height` should return the height of the shape;
- `width` should return the width of the shape;
- `rotate` should rotate a shape by 90 degrees. (This may have no effect on some shapes.)

Hints. There are several possibilities for the design of the classes. Try to think what are the possibilities for inheritance relations among the classes and how to reduce the amount of code. Further hints are provided in the test programs and in the live coding example shown during the lecture.

Challenge. Putting two rectangles of the same height side-by-side yields a new rectangle (possibly a square one). How would you implement such a functionality?