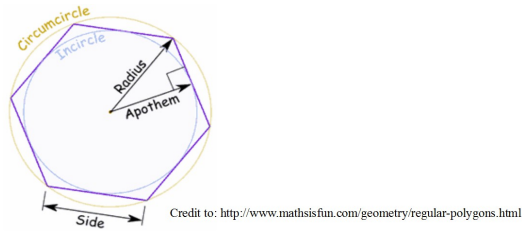


CS118 Programming

Regular Polygons

A regular polygon is a polygon with all sides of equal length and all angles of equal measure.



The area of any regular polygon is

$$A = \frac{n a s}{2}$$

where

n is the number of sides

a is the length of the apothem

s is the length of one of the sides

In a regular polygon the length of the apothem is related to the length of a side:

$$a = \frac{s}{2 \tan\left(\frac{180^\circ}{n}\right)}$$

Please note that the this formula's tangent function assumes an angle in degrees.

Write a Python program with CLI (command line interface – the normal type program we've been writing) that will collect from the user a single value: the length of a side of a regular polygon. After collecting the value from the user, use the `round()` function to round the input to 3 decimal places.

Have your program create a table following the format shown in the sample run below (**don't use any spaces in your format strings**). Include in the table the length of the side (to 4 decimal places) and the area of a pentagon (5 sides), octagon (8 sides), and 20-gon (20 sides), each to 2 decimal places. Finally, show also the apothem for the 20-gon to 4 decimal places.

```
Area of regular polygons: length of the side? (>0) 12.345678
-----
Side          Pentagon      Octagon      20-gon      Apothem
-----
12.3460      262.24      735.97      4811.83      38.9748
```

Extra Credit (30%)

Make a second Python program that will permit the user to display any three regular polygons and the largest apothem. Collect a description of each polygon and its number of sides and display those instead of the three in the original assignment.

Display the table only if none of the number of sides is invalid (non-integer, or fewer than 3 sides). If any are invalid, exit the program gracefully with an error message from your program (NOT a Python error message).

Submit both .PY files in a ZIP file.