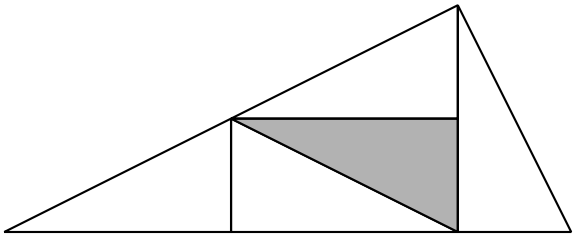
A.18 The Pinwheel Tiling

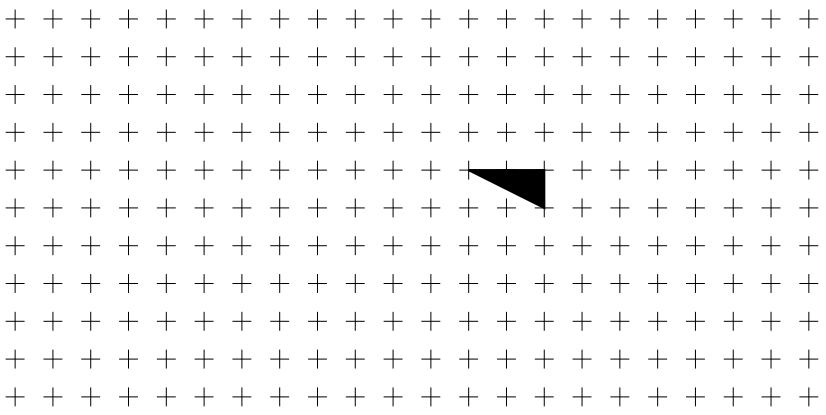
In this activity we are going to investigate a very special rep-tile, the *pinwheel tiling*.

1) The pinwheel tiling is based on the following triangle:



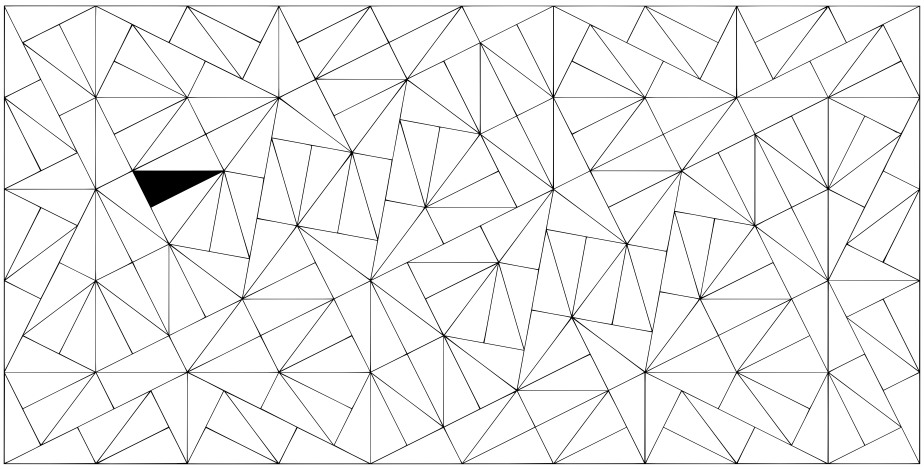
If the shortest side has a length of 1 unit, what are the lengths of the other sides? What type of triangle is this?

2) Each time we "inflate" the pinwheel rep-tile, we view the new larger triangle as being the shaded triangle in our base rep-tile. Inflate the triangle below two times.

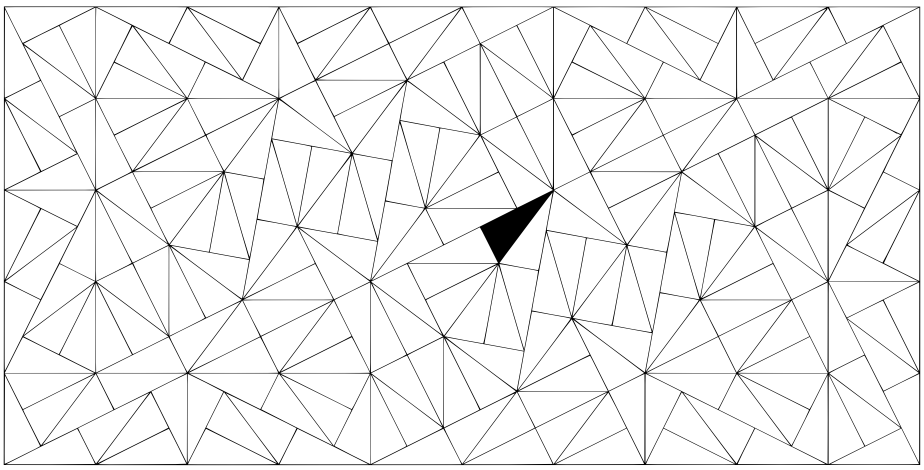


Check with your friend to see that you get the same result.

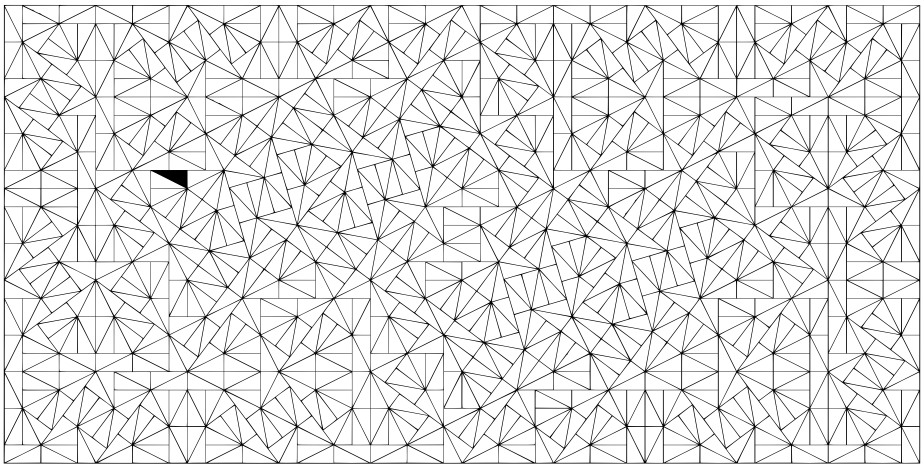
3) In the picture below, shade-in (using colored pencils) the various inflations of the shaded pinwheel rep-tile.



4) In the picture below, shade-in (using colored pencils) the various inflations of the shaded pinwheel rep-tile.



5) In the picture below, shade-in (using colored pencils) the various inflations of the shaded pinwheel rep-tile.



We claim that the pinwheel tiling has no symmetry through any isometry—yet it still has symmetry of scale.

6) Explain why any triangle in a pinwheel tiling is necessarily a part of one, and only one, inflation.

7) Suppose there was an isometry that moved one triangle to another. What would that say about an inflation that contained them both? Why would that contradict the problem above?

8) The pinwheel tiling has been used in the design of several famous buildings—which ones?