Problem of the Week

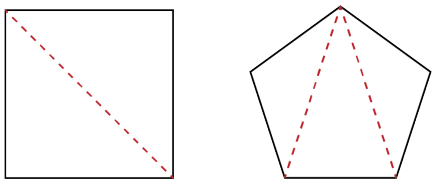
Problem A

Tracking Triangles

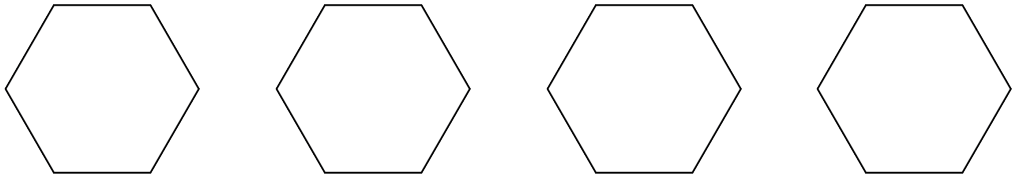
A regular polygon is a closed shape where all the side lengths are the same. Pauline draws lines inside regular polygons according to the following rules.

1. The lines must connect two vertices that are *not* beside each other.
2. The lines must be straight and cannot cross.

Pauline continues to draw lines until she cannot draw any more. At this point, the inside of her polygon will be made up entirely of triangles. For example, after drawing lines in a square she creates 2 triangles, and after drawing lines in a regular pentagon she creates 3 triangles, as shown.



(a) Notice that if Pauline had drawn lines between different pairs of vertices in the square and the regular pentagon, the resulting diagrams would have been rotations or reflections of the diagrams above, but would otherwise have been the same. Is it possible for Pauline to draw lines in a regular hexagon and create more than one diagram, which cannot be obtained from the others by a rotation or reflection? Use the hexagons below to test it out.



(b) Look at the number of triangles Pauline creates in a square, pentagon, and hexagon. Use this to predict the number of triangles Pauline creates in an octagon, and then check to see if you are correct.

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