



Problem of the Week

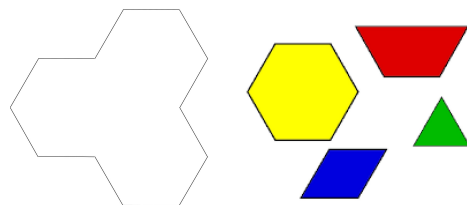
Problem B

A Fitting Solution

Problem

The figure below can be 'tiled' (that is, it will be completely covered with no spaces) by a variety of arrangements of pattern blocks of different shapes.

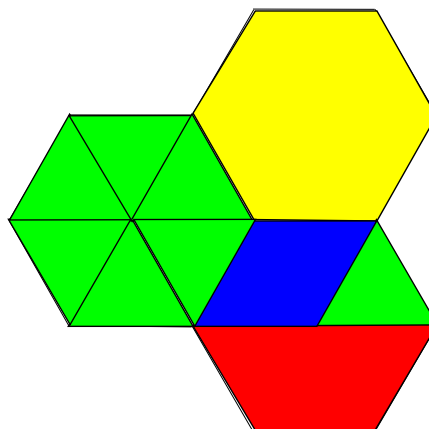
- a) Using exactly 10 pattern blocks, how many of each shape are required to completely cover this figure?
- b) What fraction of the total area of the figure is covered by hexagons? by trapezoids? by rhombuses? by triangles? Express each of your answers reduced to lowest terms.
- c) In what other ways can you cover this figure with the four shapes from the pattern blocks (but not necessarily 10 blocks)?



Solution

- a) There is just one combination of shapes that can be used to cover this figure using exactly 10 pattern blocks. A possible solution is shown at the right. There is one hexagon, one trapezoid, one rhombus and seven triangles.
- b) Since each green triangle covers $\frac{1}{18}$ of the figure, the fractions of the total area of the figure covered by each colour are as follows:

$$\begin{aligned}
 1 \text{ yellow hexagon} &= \text{six triangles} = \frac{6}{18} = \frac{1}{3} \\
 1 \text{ red trapezoid} &= \text{three triangles} = \frac{3}{18} = \frac{1}{6} \\
 1 \text{ blue rhombus} &= \text{two triangles} = \frac{2}{18} = \frac{1}{9} \\
 7 \text{ green triangles} &= \frac{7}{18}
 \end{aligned}$$



- c) There are seven other ways to cover this figure with four pattern blocks, as follows:
 - 2 yellow hexagons, 1 red trapezoid, 1 blue rhombus, 1 green triangle (5 blocks);
 - 1 yellow hexagon, 3 red trapezoids, 1 blue rhombus, 1 green triangle (6 blocks);
 - 1 yellow hexagon, 2 red trapezoids, 2 blue rhombi, 2 green triangles (7 blocks);
 - 1 yellow hexagon, 2 red trapezoids, 1 blue rhombus, 4 green triangles (8 blocks);
 - 1 yellow hexagon, 1 red trapezoid, 4 blue rhombi, 1 green triangle (7 blocks);
 - 1 yellow hexagon, 1 red trapezoid, 3 blue rhombi, 3 green triangles (8 blocks);
 - 1 yellow hexagon, 1 red trapezoid, 2 blue rhombi, 5 green triangles (9 blocks).

Convince yourself that these are correct by drawing diagrams for each. Think about why these are the only covers that use only four colours of pattern blocks.

