



Problem of the Week

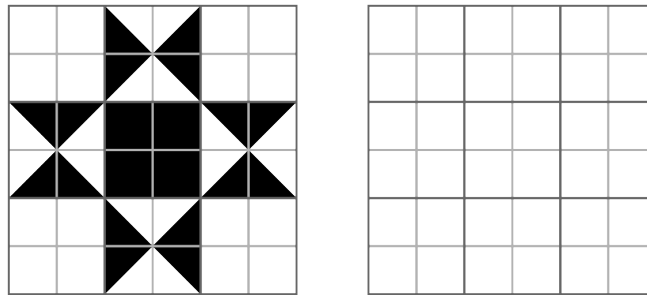
Problem B and Solution

Quilt Designs for Barns

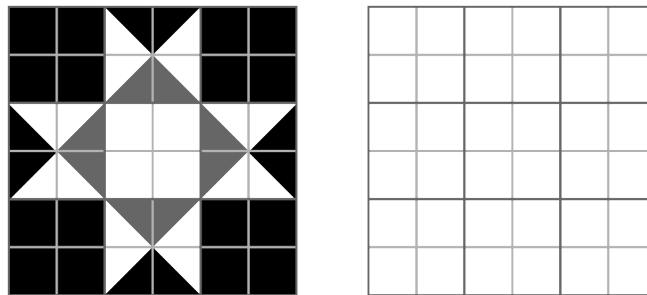
Problem

Sometimes people decorate their barns with quilts. These barn quilts are often designed in a square grid with a variety of colours and patterns, and they usually have symmetry in such a way that if they're rotated they will look the same. In the 6 by 6 grids below, you are going to explore and create some barn quilt designs. In each part, you can add straight lines as needed.

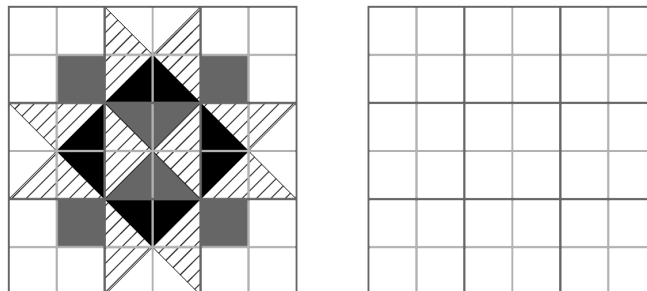
- (a) What fraction of the barn quilt design below is black, and what fraction is white? In the blank grid, design another barn quilt using two colours and the same fractions.



- (b) What fraction of the barn quilt design below is black? Grey? White? In the blank grid, design another barn quilt using three colours and the same fractions.



- (c) What fraction of the following barn quilt design below is black? Grey? Striped? White? In the blank grid, design another barn quilt using four colours and the same fractions.

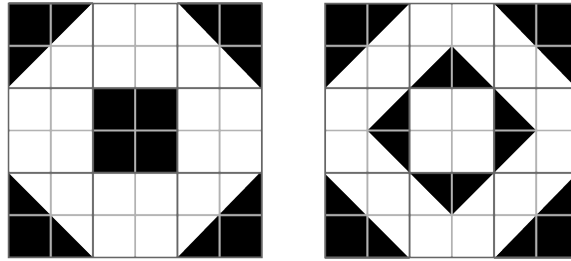




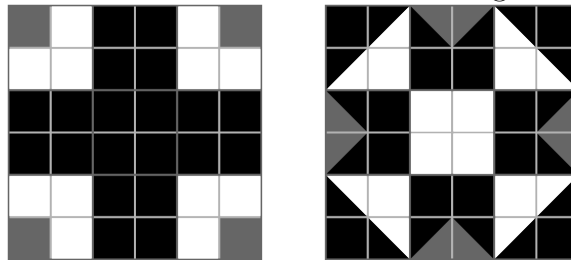
Solution

Note that a 6 by 6 grid consists of 36 smaller squares. There are also smaller triangles in the designs which each make up half of a smaller square. (These smaller triangles are formed when the two diagonals of a 2 by 2 square in the grid are drawn.)

- (a) The given barn quilt design has 16 white smaller squares plus 16 white smaller triangles, equivalent to $16 \div 2 = 8$ smaller squares. Therefore, the amount that is white is equivalent to $16 + 8 = 24$ smaller squares, and the fraction that is white is $\frac{24}{36} = \frac{2}{3}$. Thus, the fraction that is black must be $1 - \frac{2}{3} = \frac{1}{3}$. Two barn quilt designs using two colours and the same fractions are given below.



- (b) The given barn quilt design has 16 black smaller squares plus 8 black smaller triangles, equivalent to $8 \div 2 = 4$ smaller squares. Therefore, the amount that is black is equivalent to $16 + 4 = 20$ smaller squares, and the fraction that is black is $\frac{20}{36} = \frac{5}{9}$. There are 8 grey smaller triangles, equivalent to a total of $8 \div 2 = 4$ grey smaller squares. Therefore, the fraction that is grey is $\frac{4}{36} = \frac{1}{9}$ and the fraction of white is $1 - \frac{5}{9} - \frac{1}{9} = \frac{3}{9} = \frac{1}{3}$. Two barn quilt designs using three colours and the same fractions are given below.



- (c) The given barn quilt design has 12 white smaller squares plus 8 white smaller triangles, equivalent to $8 \div 2 = 4$ smaller squares. Therefore, the amount that is white is equivalent to $12 + 4 = 16$ white smaller squares, and the fraction that is white is $\frac{16}{36} = \frac{4}{9}$. There are 8 black smaller triangles, equivalent to a total of $8 \div 2 = 4$ black smaller squares. Therefore, the fraction that is black is $\frac{4}{36} = \frac{1}{9}$. There are 4 smaller grey squares plus 4 grey smaller triangles, equivalent to $4 \div 2 = 2$ smaller squares. Therefore, the amount that is grey is equivalent to $4 + 2 = 6$ grey smaller squares, and the fraction that is grey is $\frac{6}{36} = \frac{1}{6}$. There are 20 striped smaller triangles, equivalent to $20 \div 2 = 10$ striped smaller squares. Therefore, the fraction that is striped is $\frac{10}{36} = \frac{5}{18}$. Two barn quilt designs using four colours and the same fractions are given below.

