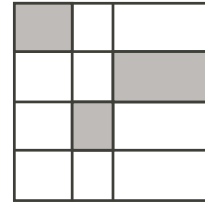


Problem

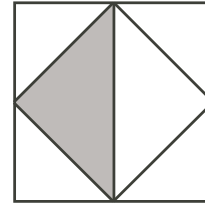
- a) The beautiful Princess Morag must solve this problem to escape the evil King Rothbart:

In the square shown, the horizontal lines are equidistant (equally spaced) from one another. What fraction of the square is shaded?



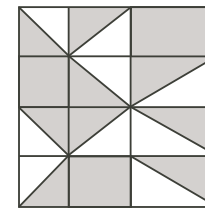
- b) King Rothbart goes back on his word and insists Morag solve a further problem to win her freedom:

The mid-points of the sides of the square are joined as shown. What fraction of the original (larger) square is shaded?



Extension:

The horizontal lines of the square at right are equidistant from one another. What fraction of the square is shaded?



Hints**Part a)**

Hint 1 - What fraction of the first column is shaded?

Part b)

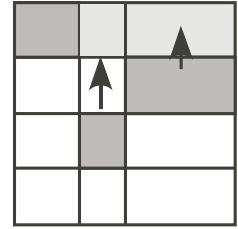
Hint 1 - If you draw a horizontal line across the middle of the square, what figures have equal area?

Extension:

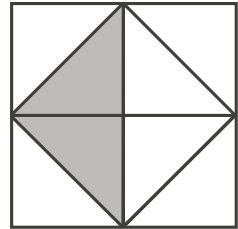
Hint 1 - What fraction of column one is shaded? of column 2?

Solution

a) Since the horizontal lines are evenly spaced, we see that exactly $\frac{1}{4}$ of each vertical column is shaded. Thus, by shifting all the shaded regions to one row, we see that $\frac{1}{4}$ of the whole square is shaded.



b) By sketching a horizontal line across the middle of the square, we form eight identical triangles, of which two are shaded. Thus $\frac{2}{8}$ or $\frac{1}{4}$ of the square is shaded.



Extension:

Thinking of each column as consisting of eight identical triangles, we see that in each column, five of these triangles are shaded. Thus $\frac{5}{8}$ of each column is shaded, and hence $\frac{5}{8}$ of the whole square is shaded, since the horizontal lines are equidistant from one another.

