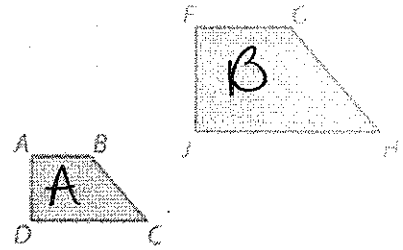
April 22, 2014

11.5 Areas of Similar Figures

Target: Use properties of similarity to solve problems

Theorem 11.1 Areas of Similar Polygons

Words If two polygons are similar, then their areas are proportional to the square of the scale factor between them.



Example

Scale factor or Perimeter $\frac{A}{B}$ Ratio of Area $\frac{A^2}{B^2}$

To find area of ~ figures

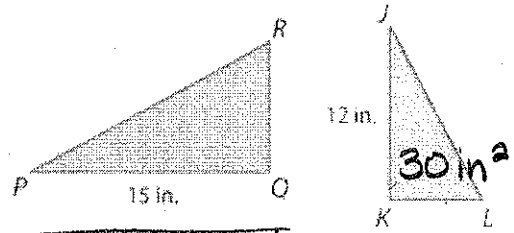
① scale factor

② Area factor

③ Set up Proportion

Example 1 Find Areas of Similar Polygons

If $\triangle JKL \sim \triangle PQR$ and the area of $\triangle JKL$ is 30 square inches, find the area of $\triangle PQR$.



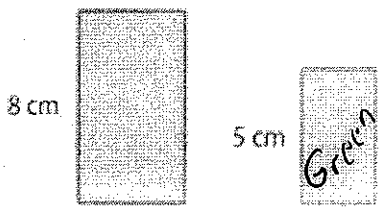
① $\frac{15}{12} \div \frac{3}{3} = \frac{5}{4}$ ② $\frac{5^2}{4^2} = \frac{25}{16}$ ③ $\frac{25}{16} = \frac{x}{30}$

$\frac{16x}{16} = \frac{750}{16}$

$x = 46.9 \text{ in}^2$

For each pair of similar figures, find the area of the green figure.

1A.



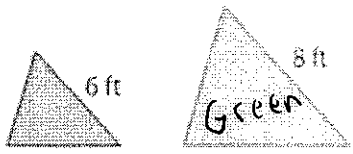
$A = 32 \text{ cm}^2$

$\frac{8^2}{5^2} \quad \frac{64}{25}$

$\frac{64}{25} = \frac{32}{x}$ $800 = 64x$

$x = 12.5 \text{ cm}^2$

1B.



$A = 13.5 \text{ ft}^2$

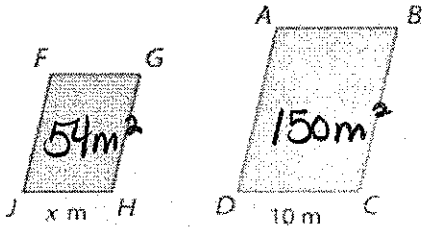
$\frac{6^2}{8^2} = \frac{36}{64}$

$\frac{36}{64} = \frac{13.5}{x}$ $36x = 864$

$x = 24 \text{ ft}^2$

Example 2 Use Areas of Similar Figures

The area of $\square ABCD$ is 150 square meters.
The area of $\square FGHJ$ is 54 square meters.
If $\square ABCD \sim \square FGHJ$, find the scale factor of $\square FGHJ$ to $\square ABCD$ and the value of x.



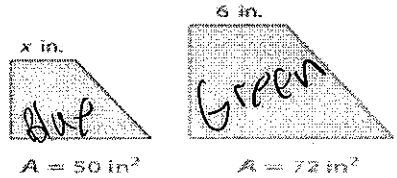
$\frac{54}{150} \div 2 \quad \frac{27}{75} \div 3 \quad \frac{9}{25} \quad \frac{\sqrt{9}}{\sqrt{25}} = \frac{3}{5}$

$\frac{3}{5} = \frac{x}{10} \quad 5x = 30$

$x = 6\text{ m}$

For each pair of similar figures, use the given areas to find the scale factor of the blue to the green figure. Then find x.

2A.

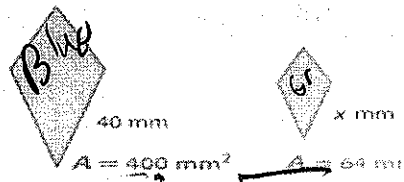


$\frac{50}{72} = \frac{\sqrt{25}}{\sqrt{36}} \quad \frac{5}{6} = \frac{x}{6}$

$30 = 6x$

$x = 5\text{ in}$

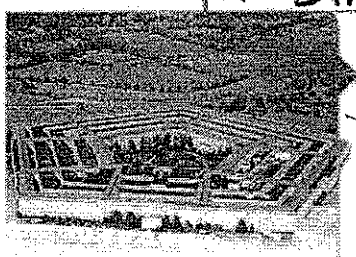
2B.



$\frac{400}{64} \div 8 \quad \frac{50}{8} \div 2 \quad \frac{\sqrt{25}}{\sqrt{4}} = \frac{5}{2} = \frac{40}{x}$

$5x = 80$

$x = 16\text{ mm}$



Real-World Link

The Pentagon building, including its center courtyard, occupies approximately 34 acres or 1,481,000 square feet of land. Each outer wall of the regular pentagonal building is 921 feet in length.

Source: U.S. Department of Defense

Real-World Example 3 Scale Models

CRAFTS Use the information at the left. Orlando and Mia are making a scale model of the Pentagon. If the area of the base of their model is approximately 50 square inches, about how many times the length of each outer wall of the Pentagon is the length of the outer wall of the model?