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Perimeters and Areas of Similar Figures

Unit 10 Lesson 4

Students will be able to:

- Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
- Solve real-world and mathematical problems involving area.

Perimeters and Areas of Similar Figures

Key Vocabulary:

- Similar figures
- Corresponding sides
- Scale factor
- Similarity ratio

- **SIMILAR FIGURES** are figures whose corresponding angles are congruent and corresponding side lengths are proportional.
- Corresponding sides of similar figures are in proportion.

- **SCALE FACTOR** or **SIMILARITY RATIO** is the ratio of the lengths of the corresponding sides of two similar figures.
- The perimeters and areas are related by the scale factor.

Perimeters and Areas of Similar Figures

SCALE FACTOR

$$\frac{a}{b}$$

RATIO OF PERIMETERS

$$\frac{P_1}{P_2} = \frac{a}{b}$$

Perimeters and Areas of Similar Figures

SCALE FACTOR

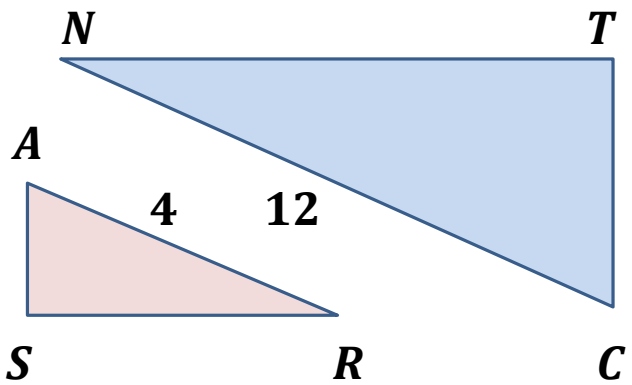
$$\frac{a}{b}$$

RATIO OF AREAS

$$\frac{A_1}{A_2} = \frac{a^2}{b^2}$$

Sample Problem 1: The figures in each pair are similar. Compare the first figure to the second. Find the scale factor and give the ratio of the perimeters and the ratio of the areas.

a. $\Delta ASR \sim \Delta CTN$



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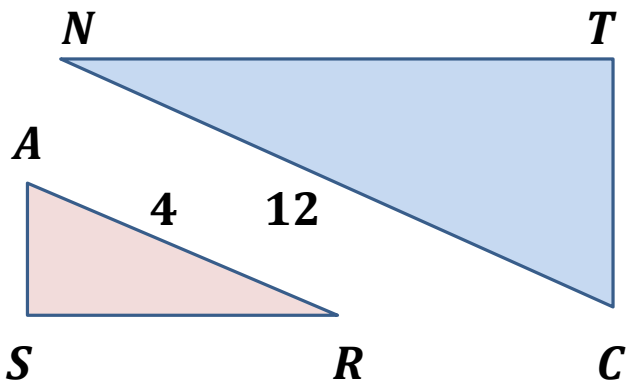


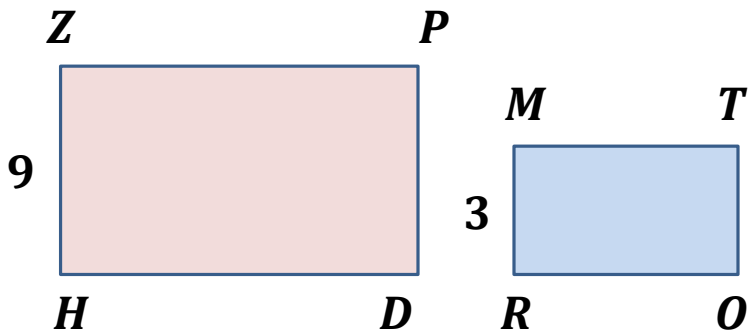
$\frac{\overline{AR}}{\overline{CN}} = \frac{4}{12} = \frac{1}{3}$ **SCALE FACTOR**

$\frac{P_{ARS}}{P_{CNT}} = \frac{1}{3}$ **RATIO OF PERIMETERS**

$\frac{A_{ARS}}{A_{CNT}} = \frac{1^2}{3^2} = \frac{1}{9}$ **RATIO OF AREAS**

Sample Problem 1: The figures in each pair are similar. Compare the first figure to the second. Find the scale factor and give the ratio of the perimeters and the ratio of the areas.

b. $ZPDH \sim MTOR$



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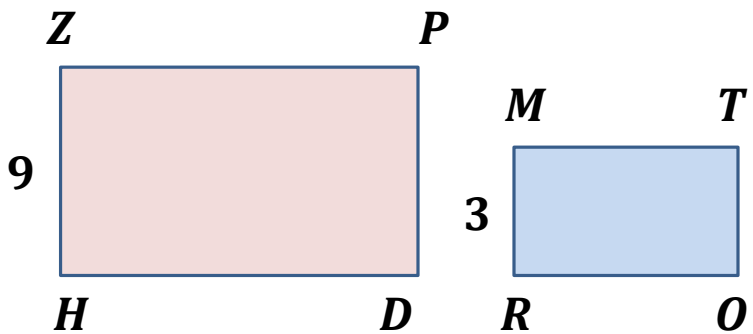


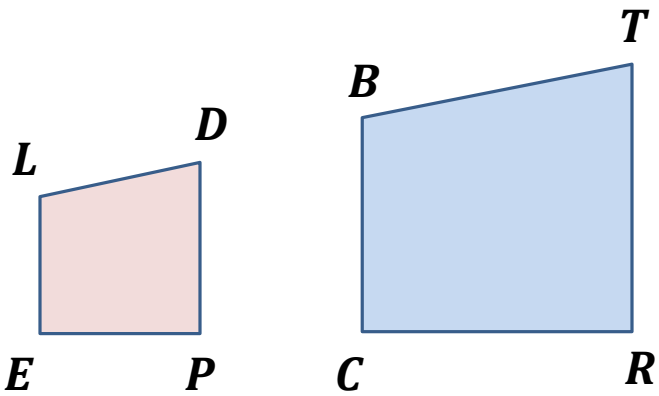
$$\frac{\overline{ZH}}{\overline{MR}} = \frac{9}{3} = \frac{3}{1} \quad \textbf{SCALE FACTOR}$$

$$\frac{P_{ZPHD}}{P_{MTOR}} = \frac{3}{1} \quad \textbf{RATIO OF PERIMETERS}$$

$$\frac{A_{ZPHD}}{A_{MTOR}} = \frac{3^2}{1^2} = \frac{9}{1} \quad \textbf{RATIO OF AREAS}$$

Sample Problem 2: The figures in each pair are similar. Find the area of the other figure.

$A_{LDPE} = 12\ m^2$ $\overline{LE} = 4\ m$ $\overline{BC} = 8\ m$ $A_{BTRC} = ?$



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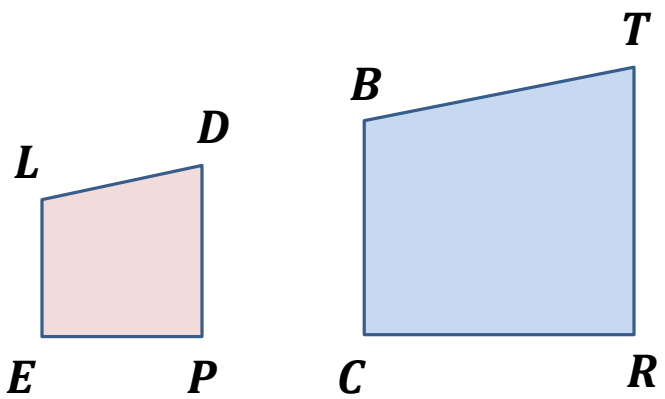


$$\frac{\overline{LE}}{\overline{BC}} = \frac{4}{8} = \frac{1}{2}$$

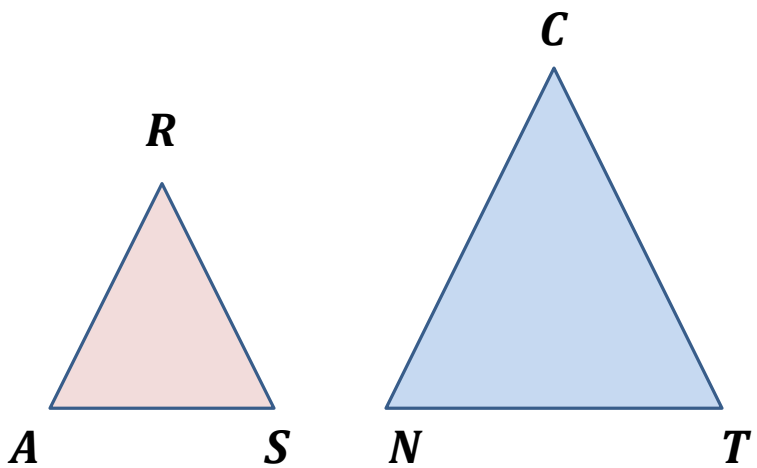
$$\frac{A_{LDPE}}{A_{BTRC}} = \frac{1^2}{2^2} = \frac{1}{4}$$

$$\frac{12m^2}{A_{BTRC}} = \frac{1}{4}$$

$$A_{BTRC} = 4 * 12m^2 = 48\ m^2$$

Sample Problem 3: Find the scale factor and the ratio of perimeters for each pair of similar figures.

$\Delta ASR \sim \Delta NTC$ $A_{ASR} = 8\sqrt{3}\ m^2$ $A_{NTC} = 128\sqrt{3}\ m^2$



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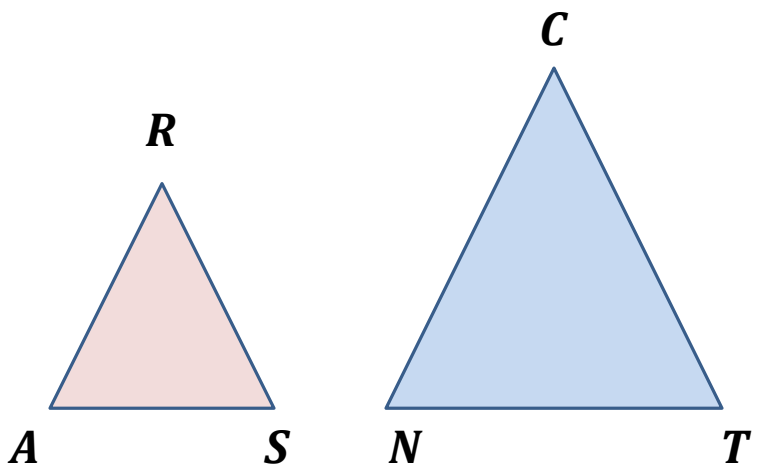


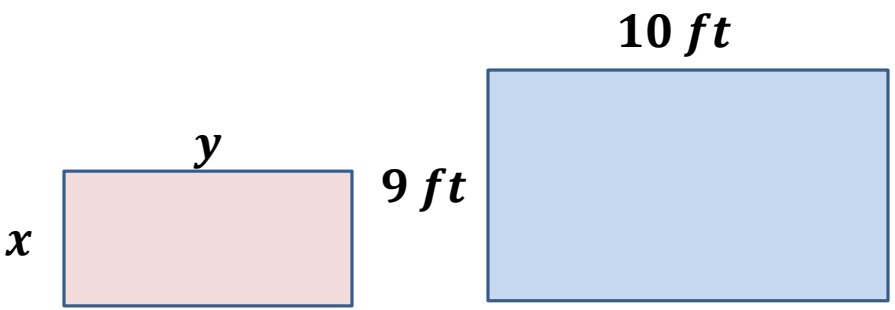
$$\frac{A_{ASR}}{A_{NTC}} = \frac{8\sqrt{3}}{128\sqrt{3}} = \frac{8}{128} = \frac{1}{16}$$

$$\frac{P_{ASR}}{P_{NTC}} = \frac{\sqrt{A_{ASR}}}{\sqrt{A_{NTC}}} = \frac{\sqrt{1}}{\sqrt{16}} = \frac{1}{4}$$

$$\frac{\overline{AR}}{\overline{NC}} = \frac{P_{ASR}}{P_{NTC}} = \frac{1}{4}$$

Sample Problem 4: Find the values of x and y when the smaller similar rectangle shown here has the area given.

$A_1 = 10\ ft^2$ $\quad x = ?$ $\quad y = ?$



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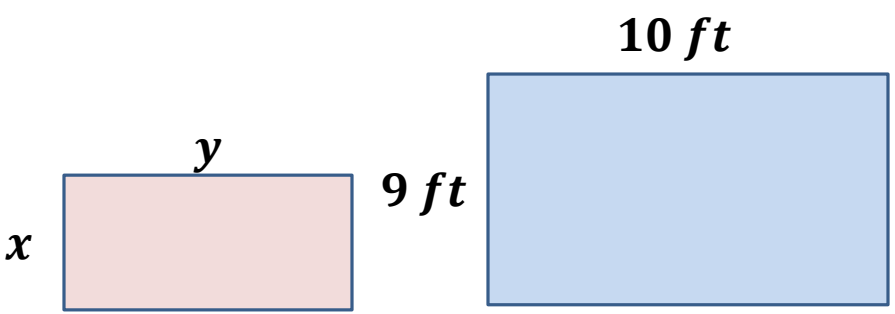

$$A_2 = 9\ ft * 10\ ft$$
$$A_2 = 90\ ft^2$$
$$\frac{A_1}{A_2} = \frac{10\ ft^2}{90\ ft^2} = \frac{1}{9}$$

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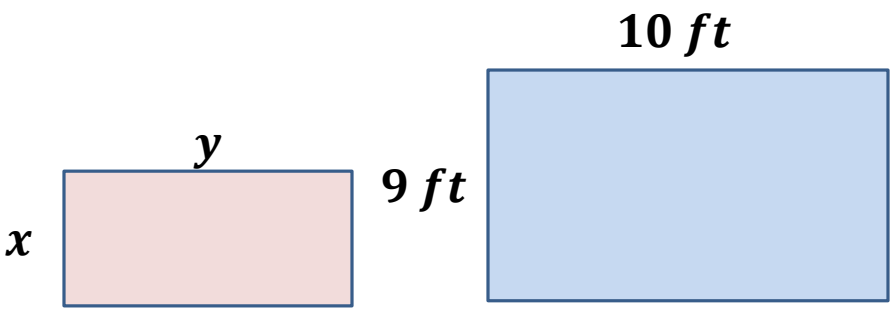

$$\frac{x}{9} = \frac{\sqrt{A_1}}{\sqrt{A_2}} = \frac{\sqrt{1}}{\sqrt{9}} = \frac{1}{3}$$

$$\frac{x}{9} = \frac{1}{3}$$

$$x = 3\ ft$$

Sample Problem 4: Find the values of x and y when the smaller similar rectangle shown here has the area given.

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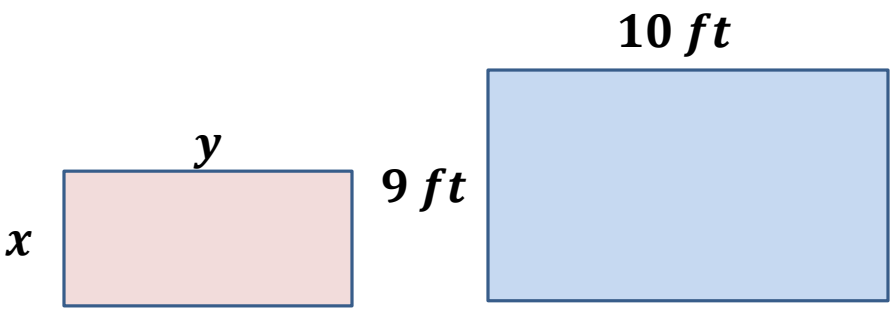


$$\frac{y}{10} = \frac{\sqrt{A_1}}{\sqrt{A_2}} = \frac{\sqrt{1}}{\sqrt{9}} = \frac{1}{3}$$

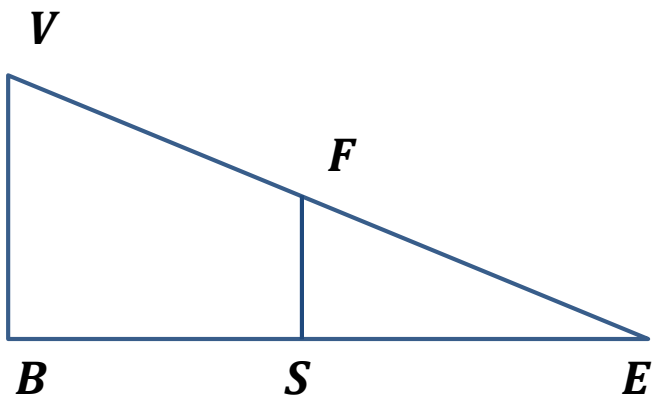
$$\frac{y}{10} = \frac{1}{3}$$

$$y = \frac{10}{3}\ ft$$

Sample Problem 5: The figures in each pair are similar. Find the value of missing side.

$\Delta BEV \sim \Delta SEF$

$A_{BEV} = 36\ m^2 \quad A_{SEF} = 12\ m^2 \quad \overline{BV} = 6\ m \quad \overline{SF} = ?$



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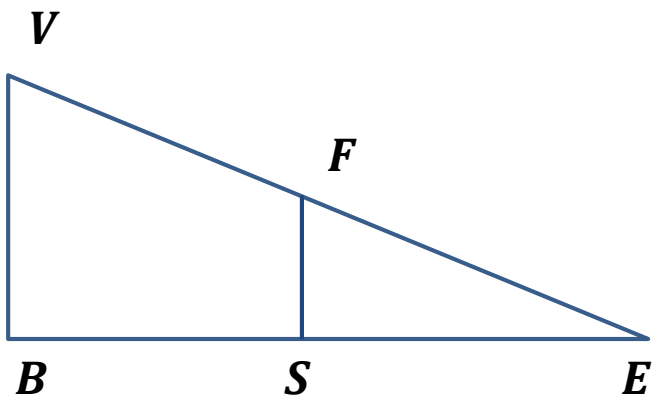

$$\frac{A_{BEV}}{A_{SEF}} = \frac{(\overline{BV})^2}{(\overline{SF})^2}$$

$$\frac{36\ m^2}{12\ m^2} = \frac{(6\ m)^2}{(\overline{SF})^2}$$

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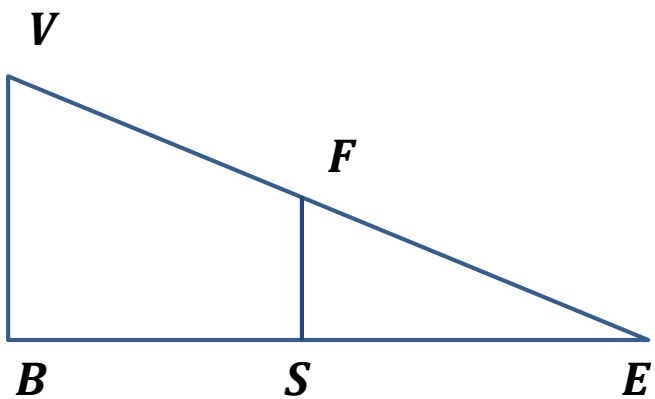

$$\frac{36\ m^2}{12\ m^2} = \frac{36\ m^2}{(\overline{SF})^2}$$

$$(\overline{SF})^2 = 12\ m^2$$

$$\overline{SF} = \sqrt{12\ m^2}$$

$$\overline{SF} = 2\sqrt{3}\ m$$