

Objective: Solve problems involving similar figures

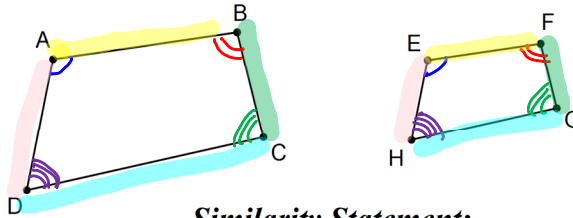
Congruent Figures: Exactly the same size & shape (\cong)

Similar Figures: Same shape, different sizes (\sim)

If two polygons are similar, then:

- Their corresponding angles are congruent.
- The lengths of their corresponding sides are proportional.

Examples:



Similarity Statement:
 $\underline{ABCD} \sim \underline{EFGH}$

1. List all pairs of congruent angles.

2. Write a **statement of proportionality** for the sides.

$$\begin{aligned} \angle A &\cong \angle E & \angle C &\cong \angle G \\ \angle B &\cong \angle F & \angle D &\cong \angle H \end{aligned}$$

$$\frac{AB}{EF} = \frac{BC}{FG} = \frac{CD}{GH} = \frac{DA}{HE}$$

Scale Factor: The ratio of corresponding sides
 (Divide a side in one figure by its matching side in the other figure)

Examples: Decide whether each set of figures are similar. If they are similar, write a similarity statement and find the scale factor. **Must have all sets of angles congruent & all sets of sides proportional.**

1. $\triangle RPQ \sim \triangle YZX$
 orders need to match!
 $\frac{9}{6} = \frac{3}{2}$
 $\frac{12}{8} = \frac{3}{2}$
 $\frac{18}{12} = \frac{3}{2}$
 scale factor = $\frac{3}{2}$

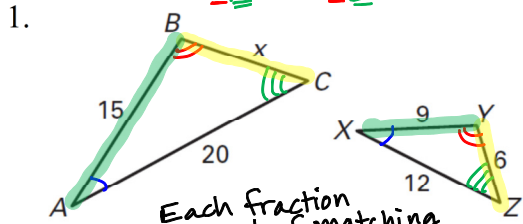
2. $\frac{9}{6} = \frac{3}{2}$
 $\frac{12}{10} = \frac{6}{5}$
 All angles are right angles, so all are congruent.
 not the same!!!

3. $\angle A \cong \angle F$
 $\angle B \cong \angle G$
 $\angle C \cong \angle H$
 $\angle D \cong \angle E$
 $\frac{AB}{FG} = \frac{7}{5}$
 $\frac{BC}{GH} = \frac{14}{10} = \frac{7}{5}$
 $\frac{CD}{HE} = \frac{21}{15} = \frac{7}{5}$
 $\frac{DA}{EF} = \frac{28}{21} = \frac{7}{5}$

NOT SIMILAR

orders must match!
 $ABCD \sim FGHE$
 scale factor = $\frac{7}{5}$

Examples: $\triangle ABC \sim \triangle XYZ$. Find the value of x .



Each fraction is set of matching sides.

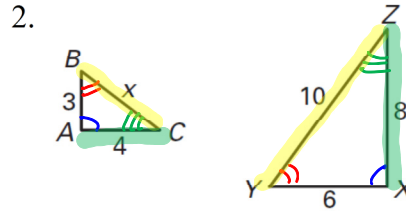
tops from same shape
bottoms from same shape

$$\frac{x}{6} = \frac{15}{9}$$

$$9x = 6(15)$$

$$\frac{9x}{9} = \frac{90}{9}$$

$$\boxed{x = 10}$$



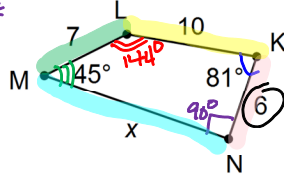
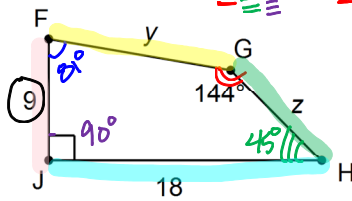
$$\frac{x}{10} = \frac{4}{8}$$

$$8x = 4(10)$$

$$\frac{8x}{8} = \frac{40}{8}$$

$$\boxed{x = 5}$$

Examples: In the diagram below, $FGHJ \sim KLMN$.



Scale factor:
 $\frac{9}{6} = \frac{3}{2}$ or $\frac{6}{9} = \frac{2}{3}$

1. List all pairs of congruent angles.

- $\angle F \cong \angle K$
- $\angle G \cong \angle L$
- $\angle H \cong \angle M$
- $\angle J \cong \angle N$

2. Write a statement of proportionality.

$$\frac{FG}{KL} = \frac{GH}{LM} = \frac{HJ}{MN} = \frac{JF}{NK}$$

3. Find $m\angle F$.

$$81^\circ$$

4. Find $m\angle H$.

$$45^\circ$$

5. Find $m\angle L$.

$$144^\circ$$

6. Find $m\angle N$.

$$90^\circ$$

7. Find the value of x .

$$\frac{x}{10} = \frac{6}{9}$$

← smaller shape on top

$$\frac{9x}{9} = \frac{10 \cdot 6}{9}$$

$$\boxed{x = 12}$$

8. Find the value of y .

$$\frac{y}{10} = \frac{9}{6}$$

← bigger shape on top

$$\frac{6y}{6} = \frac{90}{6}$$

$$\boxed{y = 15}$$

9. Find the value of z .

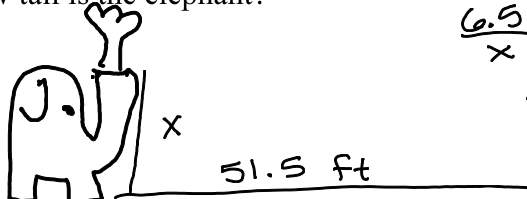
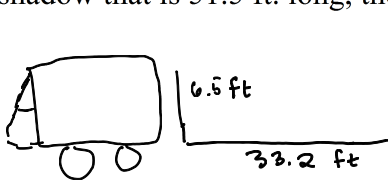
$$\frac{z}{7} = \frac{9}{6}$$

$$\frac{6z}{6} = \frac{63}{6}$$

$$\boxed{z = 10.5}$$

Examples:

1. A 6.5 ft. tall car standing next to an adult elephant casts a 33.2 ft. shadow. If the adult elephant casts a shadow that is 51.5 ft. long, then how tall is the elephant?

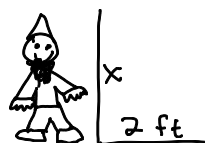
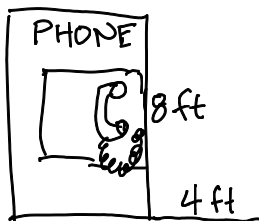


$$\frac{6.5}{x} = \frac{33.2}{51.5}$$

$$\frac{33.2x}{33.2} = \frac{334.75}{33.2}$$

$$\boxed{x \approx 10.1 \text{ ft}}$$

2. A telephone booth that is 8 ft. tall casts a shadow that is 4 ft. long. Find the height of a nearby lawn ornament that casts a 2 ft. shadow.



$$\frac{8}{x} = \frac{4}{2}$$

$$\frac{4x}{4} = \frac{16}{4}$$

$$\boxed{x = 4 \text{ ft}}$$