

Summary:

Two figures are similar (\sim) if they have the same shape but not necessarily the same size.

The scale factor is the ratio of the lengths of the corresponding sides.

(a.k.a. the similarity ratio)

Two figures are congruent (\cong) if they are similar and the same size.

Two polygons are similar if:

1) Corresponding angles are congruent AND 2) Corresponding sides are proportional

Two TRIANGLES are similar if \sim

1st way: AA \sim (2 \angle pairs \cong)

2nd way: SAS \sim (2 sides proportional and \angle 's \cong between those 2 sides)

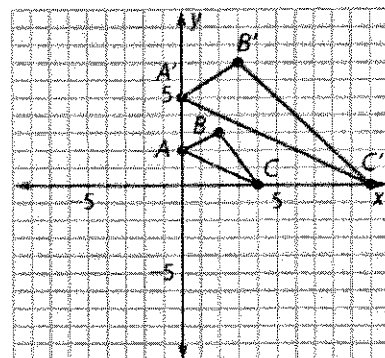
3rd way: SSS \sim (3 sides proportional)

Day 7: Similarity

Warm-Up: Given triangle CDE with C(2, 2), D(-6, 4), and E(-2, -6), write the points of the image under the following transformations.

- 1) $(x, y) \rightarrow (3x, 3y)$ C'(6, 6), D'(-18, 12), E'(-6, -18)
- 2) $(x, y) \rightarrow (\frac{1}{4}x, \frac{1}{4}y)$ C'($\frac{1}{2}$, $\frac{1}{2}$), D'($-\frac{3}{2}$, 1), E'($-\frac{1}{2}$, $-\frac{3}{2}$)
- 3) Dilation with scale factor 2 C'(4, 4), D'(-12, 8), E'(-4, -12)
- 4) Horizontal ~~stretch~~ ^{stretch} with scale factor 1/3, vertical ~~shrink~~ ^{shrink} with scale factor 1/3 C'($\frac{2}{3}$, $\frac{2}{3}$), D'(-2, $\frac{4}{3}$), E'($-\frac{2}{3}$, -2)
- 5) 21st Century Skill Check :

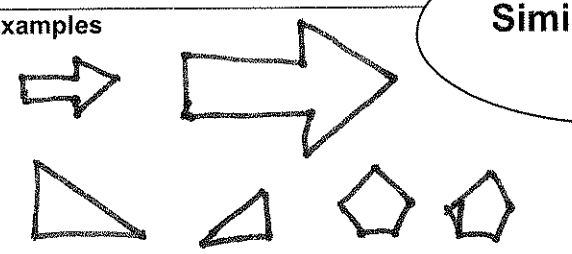
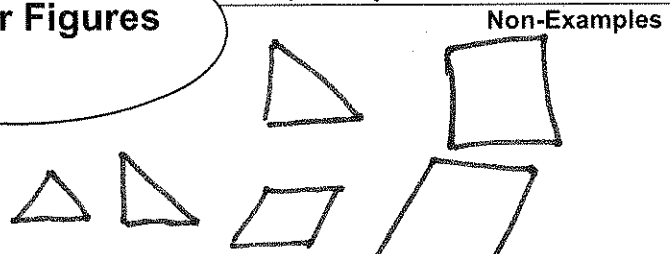
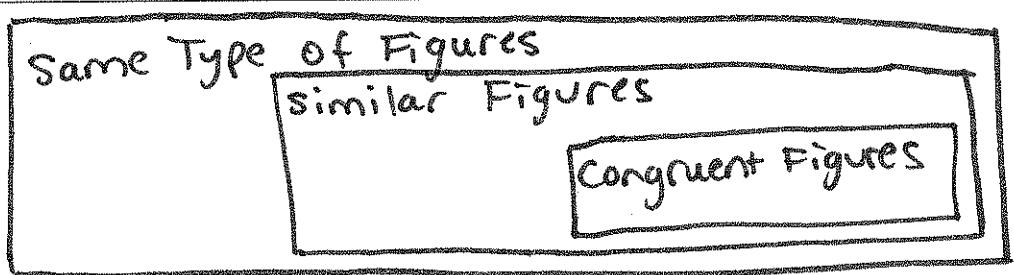
Triangle ABC and Triangle A'B'C' are shown on the right. The scale on each axis is 1.



Since Triangle A'B'C' is bigger than triangle ABC, Logan thinks that triangle A'B'C' can be obtained by applying a size transformation centered at the origin to triangle ABC. Do you agree or disagree with Logan? Explain your reasoning.

No! There is no common scale factor!
 $\rightarrow A(0, 2) \quad B(2, 3) \quad C(4, 0)$
 $\rightarrow A'(0, 5) \quad B'(3, 7) \quad C'(10, 0)$

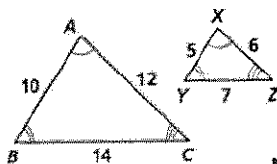
Similar Figures

<p>Definition</p> <p>Figures with the same shape, but of a proportional size</p>	<p>Characteristics</p> <p>All angle pairs are congruent All side pairs are proportional.</p>
<p>Examples</p> 	<p>Non-Examples</p> 
<p style="text-align: center;">Similar Figures</p> <p>Venn Diagram</p> 	

Foundational Practice:

Are these polygons similar? Write a similarity statement.

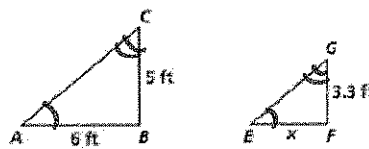
1)



$$\frac{10}{5} = \frac{12}{6} = \frac{14}{7}$$

SSS ~
SAS ~
AA ~

2)



$$\frac{6}{x} = \frac{5}{3.3}$$

$$5x = 19.8$$

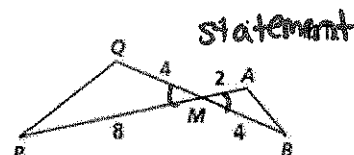
$$x = 3.96$$

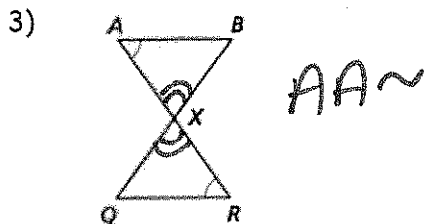
AA ~

Explain why the triangles are similar and write a similarity

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

SAS ~





4)

Application Practice:

- 1) A 6 ft tall tent standing next to a cardboard box casts a 9 ft shadow. If the cardboard box casts a shadow that is 6 ft long then how tall is it?

OR- $\frac{6}{9} = \frac{x}{6}$

6 | _____ x | _____
 9 6

$\frac{6}{x} = \frac{9}{6}$ $9x = 36$
 $x = 4 \text{ ft}$

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

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

8 | _____ x | _____
 4 2

$\frac{8}{x} = \frac{4}{2}$ $4x = 16$
 $x = 4 \text{ ft}$

- 3) A map has a scale of 3 cm : 18 km. If Riverside and Smithville are 54 km apart then they are how far apart on the map?

OR- $\frac{3}{18} = \frac{x}{54}$

$\frac{3}{18} = \frac{x}{54}$

$162 = 18x$
 $x = 9 \text{ cm}$

- 4) Find the distance between Riverside and Milton if they are 12 cm apart on a map with a scale of 4 cm : 21 km.

OR- $\frac{4}{12} = \frac{21}{x}$

$\frac{4}{21} = \frac{12}{x}$

$4x = 252$
 $x = 63 \text{ km}$

You Try!!

- 7) A map has a scale of 2 in : 6 mi. If Clayton and Centerville are 10 in apart on the map then how far apart are the real cities?

OR- $\frac{2}{6} = \frac{10}{x}$

$\frac{2}{10} = \frac{6}{x}$

$2x = 60$
 $x = 30 \text{ miles}$

- 8) A statue that is 12 ft tall casts a shadow that is 15 ft long. Find the length of the shadow that a 8 ft cardboard box casts.

OR- $\frac{12}{8} = \frac{15}{x}$

12 | _____ 8 | _____
 15 x

$\frac{12}{15} = \frac{8}{x}$

$12x = 120$
 $x = 10 \text{ ft}$

AA ~
SAS ~
SSS ~

Similar Polygons

Practice 8-2

Are the polygons similar? If they are, write a similarity statement, and give the similarity ratio. If they are not, explain.

1. **Yes**
AA ~
SAS ~
SSS ~

2. **Yes**
SAS ~
SSS ~

3. **NO**
 $\frac{5}{3} \neq \frac{3}{5}$

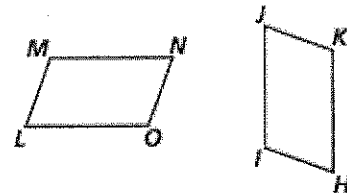
4. **NO.** \angle 's are not ~

5. **Yes** AA ~

6. **NO** sides not proportional

LMNO ~ HIJK. Complete the proportions and congruence statements.

7. $\angle M \cong ? \angle I$ 8. $\angle K \cong ? \angle O$ 9. $\angle N \cong ? \angle J$
10. $\frac{MN}{IJ} = \frac{?}{JK}$ **NO** 11. $\frac{HK}{?} = \frac{HL}{LM}$ 12. $\frac{IJ}{MN} = \frac{HK}{?LO}$



Algebra The polygons are similar. Find the values of the variables.

13. $\frac{6}{x} = \frac{5}{3.3}$
 $x = 3.96$

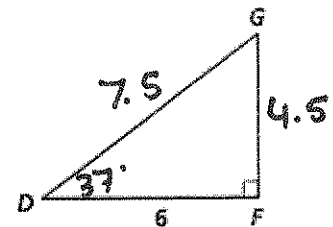
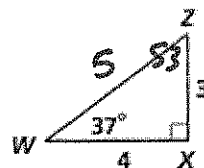
14. $\frac{5}{3} = \frac{8}{x}$
 $x = 4.8$

15. $\frac{4}{10} = \frac{1.5}{x}$
 $x = 3.75$

16. $\frac{15}{9} = \frac{x}{6}$
 $x = 10$

$\triangle WXZ \sim \triangle DFG$. Use the diagram to find the following.

17. the similarity ratio of $\triangle WXZ$ and $\triangle DFG$
18. $m\angle Z = 53^\circ$ 19. $DG = 7.5$ 20. $GF = 4.5$
21. $m\angle G = 37^\circ$ 22. $m\angle D = 37^\circ$ 23. $WZ = 5$



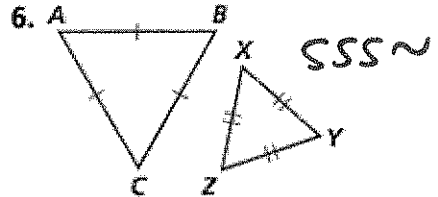
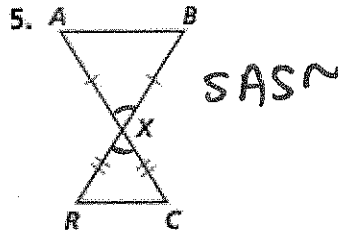
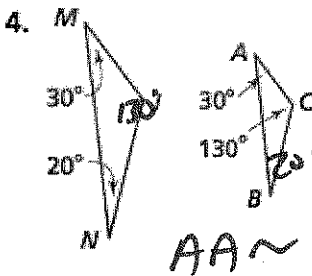
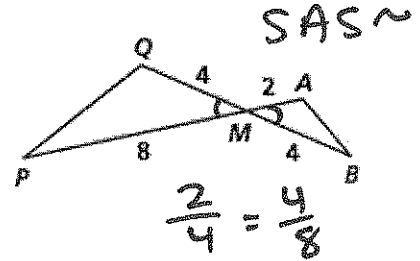
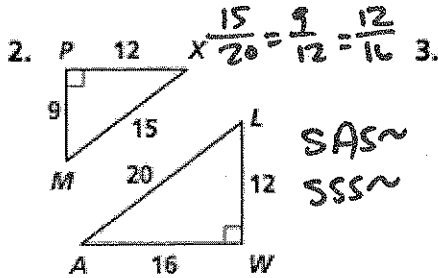
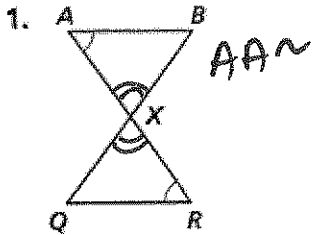
$a^2 + b^2 = c^2$

$\frac{4}{6} = \frac{3}{x}$
 $4x = 18$
 $x = 4.5$

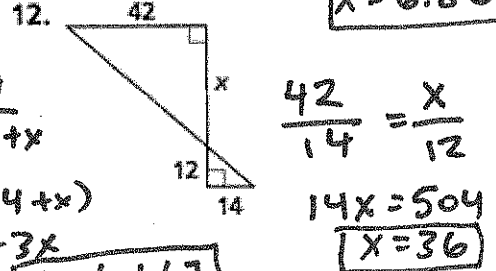
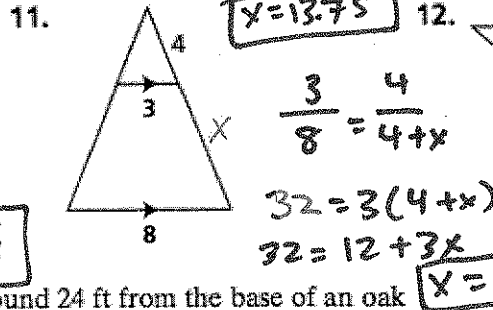
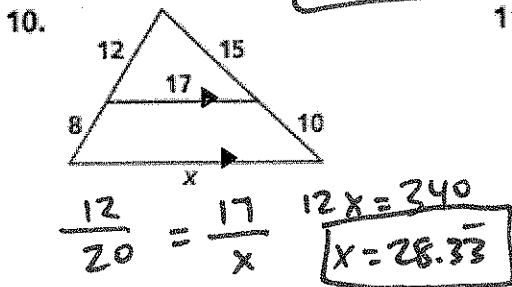
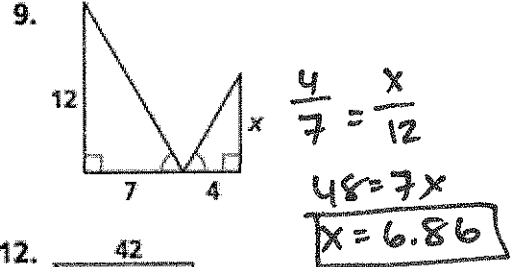
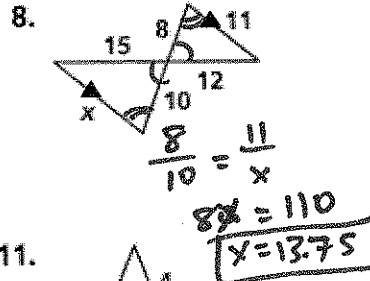
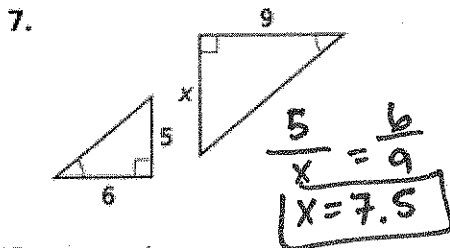
Practice 8-3

Proving Triangles Similar

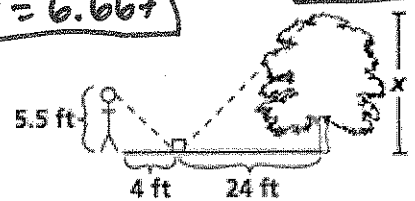
Explain why the triangles are similar. Write a similarity statement for each pair.



Algebra Find the value of x.



13. Natasha places a mirror on the ground 24 ft from the base of an oak tree. She walks backward until she can see the top of the tree in the middle of the mirror. At that point, Natasha's eyes are 5.5 ft above the ground, and her feet are 4 ft from the image in the mirror. Find the height of the oak tree.



$\frac{4}{24} = \frac{5.5}{x}$

$4x = 132$
 $x = 33 \text{ ft}$