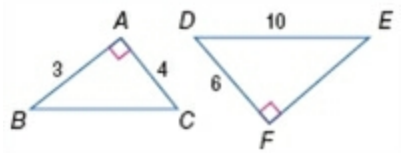
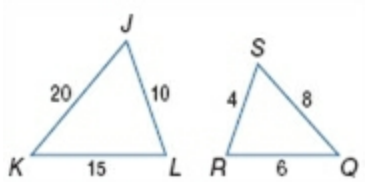
## 7-3 Similar Triangles

**Determine whether the triangles are similar. If so, write a similarity statement. Explain your reasoning.**

2. 


*ANSWER:*

Yes; $\Delta BAC \sim \Delta DFE$ by SAS Similarity.

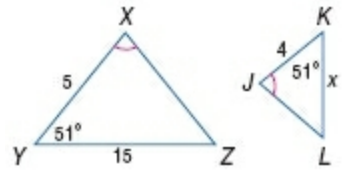
4. 


*ANSWER:*

Yes; $\Delta JLK \sim \Delta SRQ$ by SSS Similarity.

**CCSS STRUCTURE Identify the similar triangles. Find each measure.**

6. *KL*




*ANSWER:*

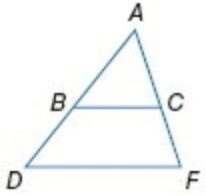
$\Delta XYZ \sim \Delta JKL$; 12

8. **COMMUNICATION** A cell phone tower casts a 100-foot shadow. At the same time, a 4-foot 6-inch post near the tower casts a shadow of 3 feet 4 inches. Find the height of the tower.

*ANSWER:*

135 ft

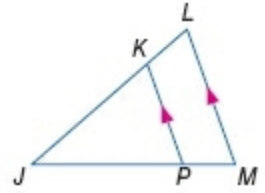
**Determine whether the triangles are similar. If so, write a similarity statement. If not, what would be sufficient to prove the triangles similar? Explain your reasoning.**

10. 


*ANSWER:*

No; $\overline{BC}$ needs to be parallel to $\overline{DF}$ for $\Delta DAF \sim \Delta BAC$ by AA Similarity.

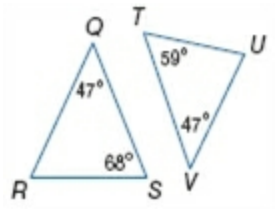
**Determine whether the triangles are similar. If so, write a similarity statement. If not, what would be sufficient to prove the triangles similar? Explain your reasoning.**

12. 


*ANSWER:*

Yes; $\Delta MLJ \sim \Delta PKJ$ by AA Similarity.

## 7-3 Similar Triangles

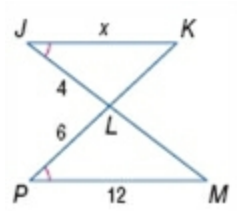
14. 


*ANSWER:*

No; the angles of the triangles can never be congruent, so the triangles can never be similar.

**ALGEBRA Identify the similar triangles. Then find each measure.**

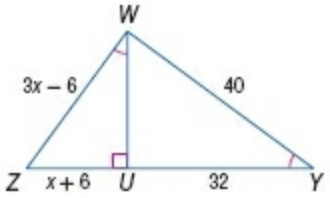
16. *JK*




*ANSWER:*

$\Delta JLK \sim \Delta PLM$; 8

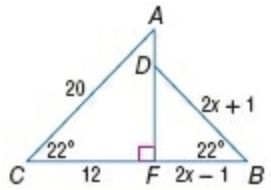
18. *WZ, UZ*




*ANSWER:*

$\Delta WUZ \sim \Delta YUW$; 30, 18

20. *DB, CB*




*ANSWER:*

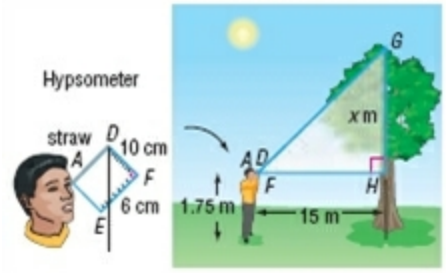
$\Delta DFB \sim \Delta AFC$; 5, 15

22. **STATUES** Mei is standing next to a statue in the park. If Mei is 5 feet tall, her shadow is 3 feet long, and the statue's shadow is $10\frac{1}{2}$ feet long, how tall is the statue?

*ANSWER:*

$17\frac{1}{2}$ ft

24. **FORESTRY** A hypsometer, as shown, can be used to estimate the height of a tree. Bartolo looks through the straw to the top of the tree and obtains the readings given. Find the height of the tree.



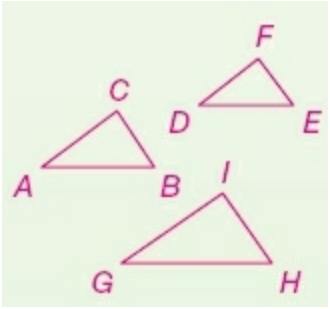

*ANSWER:*

10.75

**PROOF Write a two-column proof.**

26. Theorem 7.4

*ANSWER:*




Reflexive Property of Similarity

Given: $\Delta ABC$

Prove: $\Delta ABC \sim \Delta ABC$

Proof:

Statements (Reasons)

1. $\Delta ABC$ (Given)
2. $\angle A \cong \angle A$, $\angle B \cong \angle B$ (Refl. Prop.)
3. $\Delta ABC \sim \Delta ABC$ (AA Similarity)

Transitive Property of Similarity

Given: $\Delta ABC \sim \Delta DEF$ and $\Delta DEF \sim \Delta GHI$

Prove: $\Delta ABC \sim \Delta GHI$

Statements (Reasons)

1. $\Delta ABC \sim \Delta DEF, \Delta DEF \sim \Delta GHI$ (Given)
2. $\angle A \cong \angle D, \angle B \cong \angle E, \angle D \cong \angle G, \angle E \cong \angle H$ (Def. of $\sim$ polygons)
3. $\angle A \cong \angle G, \angle B \cong \angle H$ (Trans. Prop.)
4. $\Delta ABC \sim \Delta GHI$ (AA Similarity)

Symmetric Property of Similarity

Given: $\Delta ABC \sim \Delta DEF$

Prove: $\Delta DEF \sim \Delta ABC$

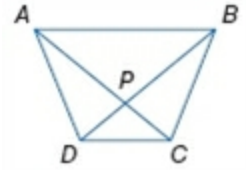
Statements (Reasons)

1. $\Delta ABC \sim \Delta DEF$ (Given)
2. $\angle A \cong \angle D, \angle B \cong \angle E$ (Def. of $\sim$ polygons)
3. $\angle D \cong \angle A, \angle E \cong \angle B$ (Symm. Prop.)
4. $\Delta DEF \sim \Delta ABC$ (AA Similarity)

**PROOF Write a two-column proof.**

28. **Given:** *ABCD* is a trapezoid.

**Prove:** $\frac{DP}{PB} = \frac{CP}{PA}$




*ANSWER:*

Proof:

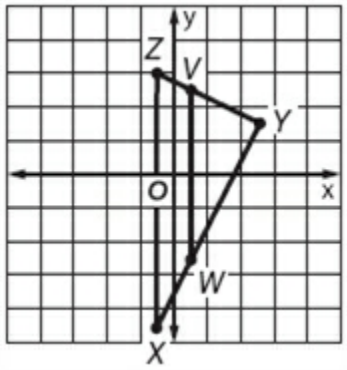
Statements (Reasons)

1. *ABCD* is a trapezoid. (Given)
2. $\overline{AB} \parallel \overline{DC}$ (Def. of trap.)
3. $\angle BDC \cong \angle ABD, \angle BAC \cong \angle DCA$ (Alt. Int. angle Thm.)
4. $\Delta DCP \sim \Delta BAP$ (AA Similarity)
5. $\frac{DP}{PB} = \frac{CP}{PA}$ (Corr. sides of $\sim \Delta$ s are proportional.)

**COORDINATE GEOMETRY** $\Delta XYZ$ **and** $\Delta WYV$ **have vertices** $X(-1, -9)$, $Y(5, 3)$, $Z(-1, 6)$, $W(1, -5)$, **and** $V(1, 5)$.

30. Graph the triangles, and prove that $\Delta XYZ \sim \Delta WYV$.

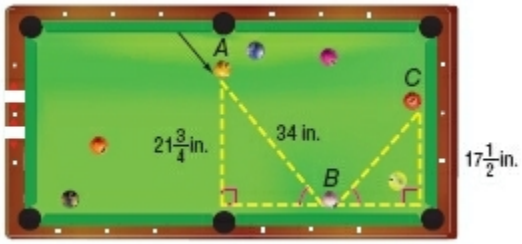
*ANSWER:*




$XY = \sqrt{12^2 + 6^2} = \sqrt{180}$ or $6\sqrt{5}$; $YZ = \sqrt{3^2 + (-6)^2} = \sqrt{45}$ or $3\sqrt{5}$; $ZX = 6 - (-9) = 15$; $VW = 5 - (-5) = 10$; $WY = \sqrt{8^2 + 4^2} = \sqrt{80}$ or $4\sqrt{5}$; $YV = \sqrt{2^2 + (-4)^2} = \sqrt{20} = 2\sqrt{5}$.

$\frac{XY}{WY} = \frac{6\sqrt{5}}{4\sqrt{5}}$ or $\frac{3}{2}$, $\frac{YZ}{YV} = \frac{3\sqrt{5}}{2\sqrt{5}}$ or $\frac{3}{2}$, $\frac{ZW}{VW} = \frac{15}{10}$ or $\frac{3}{2}$. Since $\frac{XY}{WY} = \frac{YZ}{YV} = \frac{ZX}{VW} = \frac{3}{2}$, $\Delta XYZ \sim \Delta WYV$ by SSS Similarity.

32. **BILLIARDS** When a ball is deflected off a smooth surface, the angles formed by the path are congruent. Booker hit the orange ball and it followed the path from $A$ to $B$ to $C$ as shown below. What was the total distance traveled by the ball from the time Booker hit it until it came to rest at the end of the table?




*ANSWER:*

about 61 in.

34. **CHANGING DIMENSIONS** Assume that $\Delta ABC \sim \Delta JKL$.

**a.** If the lengths of the sides of $\Delta JKL$ are half the length of the sides of $\Delta ABC$, and the area of $\Delta ABC$ is 40 square inches, what is the area of $\Delta JKL$? How is the area related to the scale factor of $\Delta ABC$ to $\Delta JKL$?

**b.** If the lengths of the sides of $\Delta ABC$ are three times the length of the sides of $\Delta JKL$, and the area of $\Delta ABC$ is 63 square inches, what is the area of $\Delta JKL$? How is the area related to the scale factor of $\Delta ABC$ to $\Delta JKL$?

*ANSWER:*

**a.** 10 $in^2$; The ratio of the areas is the square of the scale factor.

**b.** 7 $in^2$; The ratio of the areas is the cube of the scale factor.

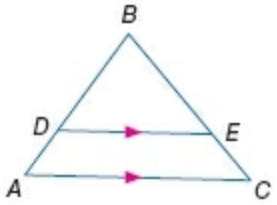
36. **MULTIPLE REPRESENTATIONS** In this problem, you will explore proportional parts of triangles.

**a. GEOMETRIC** Draw a $\Delta ABC$ with $\overline{DE}$ parallel to $\overline{AC}$ as shown.

**b. TABULAR** Measure and record the lengths $AD$, $DB$, $CD$, and $EB$ and

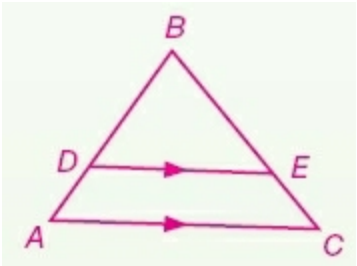
the ratios $\frac{AD}{DB}$ and $\frac{CE}{EB}$ in a table.

**c. VERBAL** Make a conjecture about the segments created by a line parallel to one side of a triangle and intersecting the other two sides.




*ANSWER:*

**a.** Sample answer:

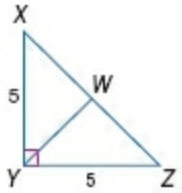



**b.** Sample answer:

| Lengths | | Ratios | |
|---|---|---|---|
| $AD$ | 0.9 cm | $\frac{AD}{DB}$ | $\frac{1}{2}$ |
| $DB$ | 1.8 cm | | |
| $CE$ | 1.1 cm | $\frac{CE}{EB}$ | $\frac{1}{2}$ |
| $EB$ | 2.2 cm | | |

c. Sample answer: The segments created by a line || to one side of a $\Delta$ and intersecting the other two sides are proportional.

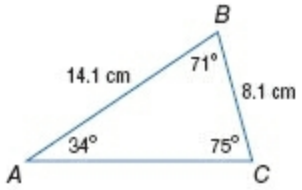
38. **CHALLENGE** $\overline{YW}$ is an altitude of $\Delta XYZ$. Find $YW$.




*ANSWER:*

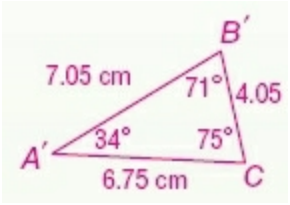
$\frac{5\sqrt{2}}{2}$

40. **OPEN ENDED** Draw a triangle that is similar to $\Delta ABC$ shown. Explain how you know that it is similar.




*ANSWER:*

Sample answer:




$\Delta ABC \sim \Delta A'B'C'$ because the measures of each side are half the measure of the corresponding side and the measures of corresponding angles are equal.

42. **PROBABILITY** $\frac{x!}{(x-3)!} =$

**A** 3.0
**B** 0.33
**C** $x^2 - 3x + 2$
**D** $x^3 - 3x^2 + 2x$

*ANSWER:*
D

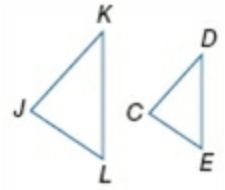
44. **ALGEBRA** Which polynomial represents the area of the shaded region?


**F** $\pi r^2$
**G** $\pi r^2 + r^2$
**H** $\pi r^2 + r$
**J** $\pi r^2 - r^2$

*ANSWER:*
J

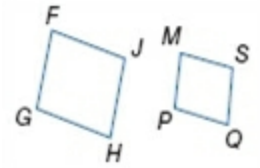
**List all pairs of congruent angles, and write a proportion that relates the corresponding sides for each pair of similar polygons.**

46. $\Delta JKL \sim \Delta CDE$




*ANSWER:*
$\angle L \cong \angle E, \angle K \cong \angle D, \angle J \cong \angle C; \frac{KL}{DE} = \frac{JK}{CD} = \frac{JL}{CE}$

48. $FGHJ \sim MPQS$




*ANSWER:*
$\angle G \cong \angle P, \angle F \cong \angle M, \angle J \cong \angle S, \angle H \cong \angle Q;$
$\frac{JH}{SQ} = \frac{GH}{PQ} = \frac{GF}{PM} = \frac{FJ}{MS}$

**Solve each proportion.**

50. $\frac{x}{10} = \frac{22}{50}$

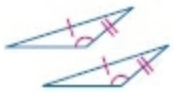
*ANSWER:*
4.4

52. $\frac{x-2}{2}=\frac{3}{8}$

*ANSWER:*

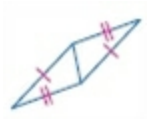
2.8

**Determine which postulate can be used to prove that the triangles are congruent. If it is not possible to prove congruence, write *not possible*.**

54. 

*ANSWER:*

not possible

56. 

*ANSWER:*

SSS