7.3 Showing Triangles are Similar: AA

Goal

Show that two triangles are similar using the AA Similarity Postulate.

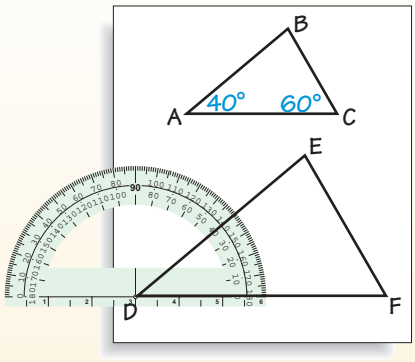
Key Words

- **similar polygons** p. 365

Geo-Activity Angles and Similar Triangles

1. Use a protractor to draw a triangle that has a 40° angle and a 60° angle. Label the triangle $\triangle ABC$.

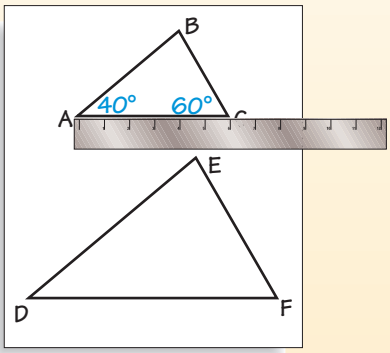
2. Use a protractor to draw a larger triangle that has a 40° and a 60° angle. Label this triangle $\triangle DEF$.



3. Use a protractor to measure the third angle of each triangle. It should measure 80°. Does it?

4. Use a ruler to measure the lengths of the sides of both triangles. Record your results.

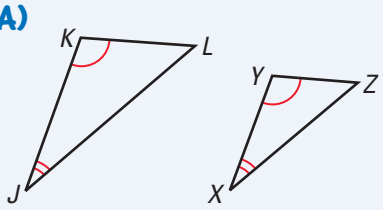
5. Are the triangles similar? Explain your reasoning.



POSTULATE 15

Angle-Angle Similarity Postulate (AA)

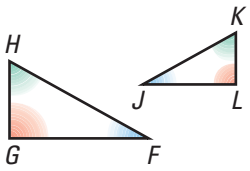
Words If two angles of one triangle are congruent to two angles of another triangle, then the two triangles are similar.



Symbols If $\angle K \cong \angle Y$ and $\angle J \cong \angle X$, then $\triangle JKL \sim \triangle XYZ$.

This postulate allows you to say that two triangles are similar if you know that two pairs of angles are congruent. In other words, you don't need to compare all of the side lengths and angle measures to show that two triangles are similar.

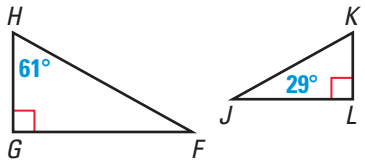
Visualize It!



Use colored pencils to show congruent angles. This will help you write similarity statements.

EXAMPLE 1 Use the AA Similarity Postulate

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



Solution

If two pairs of angles are congruent, then the triangles are similar.

1. $\angle G \cong \angle L$ because they are both marked as right angles.
2. Find $m\angle F$ to determine whether $\angle F$ is congruent to $\angle J$.

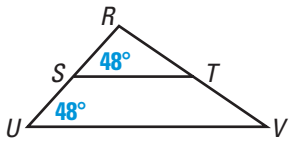
$$m\angle F + 90^\circ + 61^\circ = 180^\circ \quad \text{Triangle Sum Theorem}$$
$$m\angle F + 151^\circ = 180^\circ \quad \text{Add.}$$
$$m\angle F = 29^\circ \quad \text{Subtract } 151^\circ \text{ from each side.}$$

Both $\angle F$ and $\angle J$ measure 29°, so $\angle F \cong \angle J$.

ANSWER By the AA Similarity Postulate, $\triangle FGH \sim \triangle JLK$.

EXAMPLE 2 Use the AA Similarity Postulate

Are you given enough information to show that $\triangle RST$ is similar to $\triangle RUV$? Explain your reasoning.

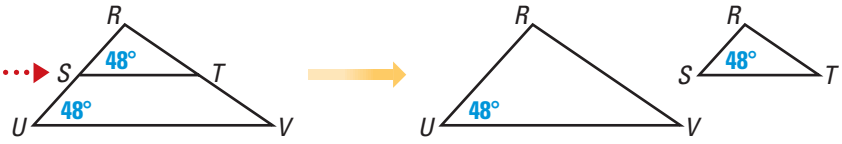


Student Help

VISUAL STRATEGY
Redraw overlapping triangles as two separate triangles, as shown on p. 356.

Solution

Redraw the diagram as two triangles: $\triangle RUV$ and $\triangle RST$.

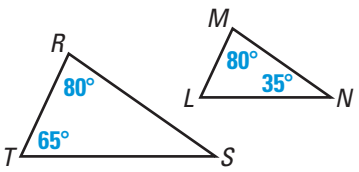


From the diagram, you know that both $\angle RST$ and $\angle RUV$ measure 48°, so $\angle RST \cong \angle RUV$. Also, $\angle R \cong \angle R$ by the Reflexive Property of Congruence. By the AA Similarity Postulate, $\triangle RST \sim \triangle RUV$.

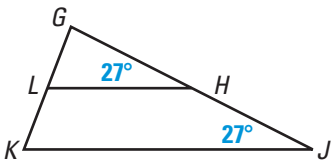
Checkpoint Use the AA Similarity Postulate

Determine whether the triangles are similar. If they are similar, write a similarity statement.

1.



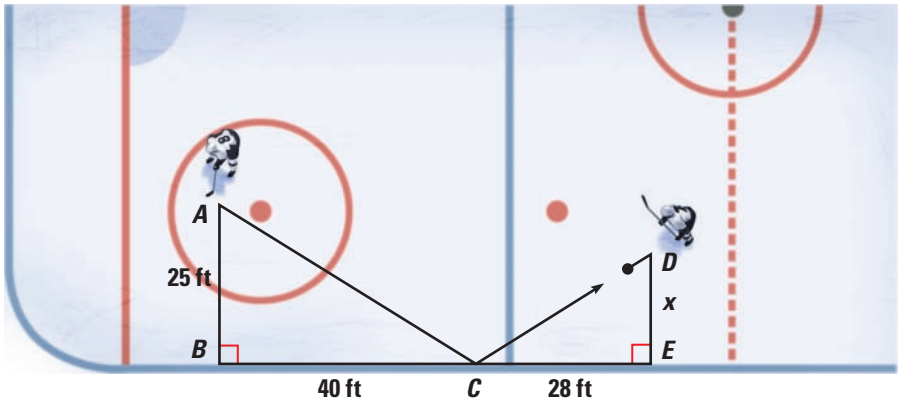
2.



Using Algebra

EXAMPLE 3 Use Similar Triangles

A hockey player passes the puck to a teammate by bouncing the puck off the wall of the rink, as shown below. According to the laws of physics, the angles that the path of the puck makes with the wall are congruent. How far from the wall will the teammate pick up the pass?



Student Help

STUDY TIP
In problems like Example 3, you must show that the triangles are similar before you can write and solve the proportion.

Solution

From the diagram, you know that $\angle B \cong \angle E$. From the laws of physics given in the problem, $\angle ACB \cong \angle DCE$. Therefore, $\triangle ABC \sim \triangle DEC$ by the AA Similarity Postulate.

$$\frac{DE}{AB} = \frac{EC}{BC}$$ Write a proportion.

$$\frac{x}{25} = \frac{28}{40}$$ Substitute x for DE, 25 for AB, 28 for EC, and 40 for BC.

$$x \cdot 40 = 25 \cdot 28$$ Cross product property

$$40x = 700$$ Multiply.

$$\frac{40x}{40} = \frac{700}{40}$$ Divide each side by 40.

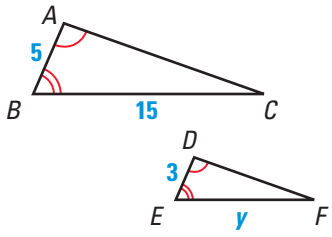
$$x = 17.5$$ Simplify.

ANSWER The teammate will pick up the pass 17.5 feet from the wall.

Checkpoint Use Similar Triangles

Write a similarity statement for the triangles. Then find the value of the variable.

3.



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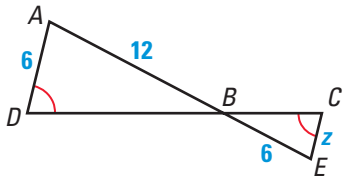


7.3 Exercises

Guided Practice

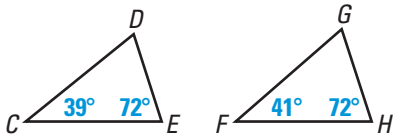
Vocabulary Check

1. Complete the statement: If two angles of one triangle are congruent to two angles of another triangle, then __?__.

Skill Check

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

2.



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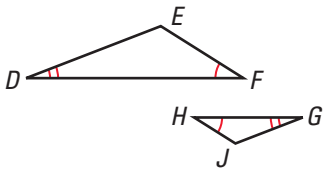

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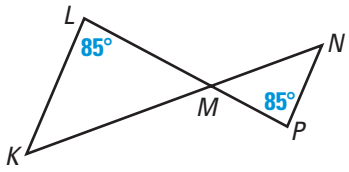

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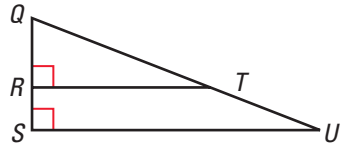
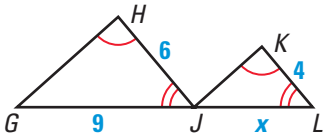


6. Write a similarity statement for the triangles. Then find the value of x.



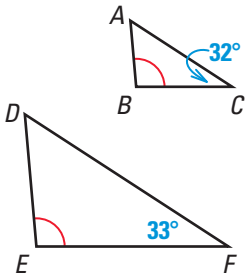
Practice and Applications

Extra Practice

See p. 687.

Using the AA Similarity Postulate **Determine whether the triangles are similar. If they are similar, write a similarity statement.**

7.



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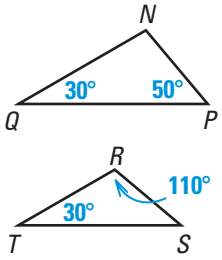

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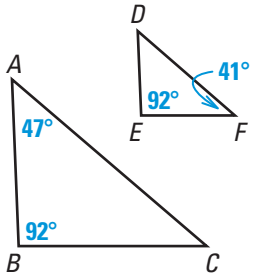
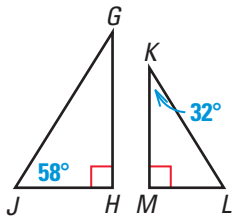


Homework Help

Example 1: Exs. 7–12, 31
Example 2: Exs. 13–15, 37
Example 3: Exs. 16–19, 21–26, 30–36

10.



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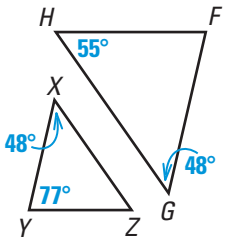

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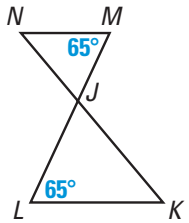
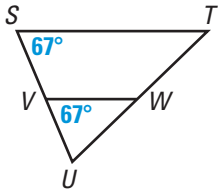


Using the AA Similarity Postulate **Determine whether you can show that the triangles are similar. If they are similar, write a similarity statement. Explain your reasoning.**

13.



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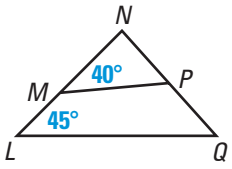

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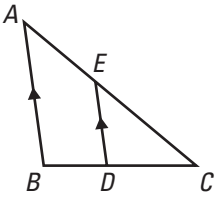


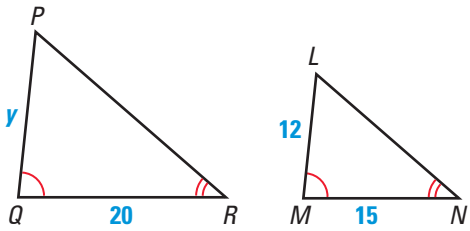
Similar Triangles **Use the diagram to complete the statement.**

16. $\triangle PQR \sim$?

17. $\frac{LM}{PQ} = \frac{?}{QR}$

18. $\frac{12}{y} = \frac{15}{?}$

19. $y =$?



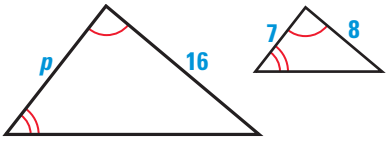
20. The scale factor of $\triangle LMN$ to $\triangle PQR$ is ?.

Student Help
CLASSZONE.COM

HOMEWORK HELP
Extra help with problem solving in Exs. 21–26 is at classzone.com

Using Similar Triangles **Find the value of the variable.**

21.



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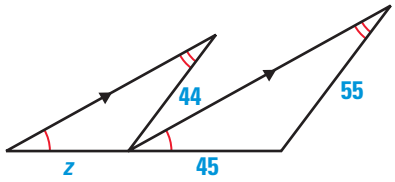

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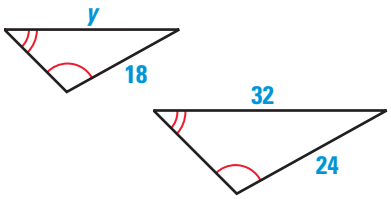

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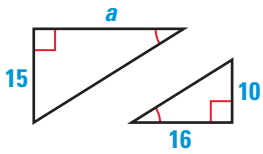

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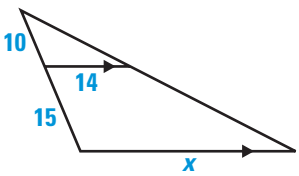

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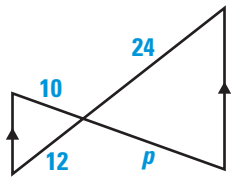


Logical Reasoning **Decide whether the statement is *true* or *false*.**

27. If an acute angle of a right triangle is congruent to an acute angle of another right triangle, then the triangles are similar.

28. Some equilateral triangles are not similar.

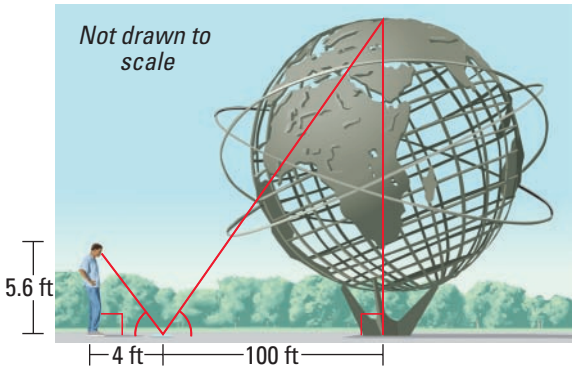
29. All isosceles triangles with a 40° vertex angle are similar.

Link to Public Art

UNISPHERE The Unisphere at Flushing Meadow Park in New York is a stainless steel model of Earth. The Unisphere was built for the 1964–65 World's Fair.

Application Links CLASSZONE.COM

30. Unisphere To estimate the height of the Unisphere, you place a mirror on the ground and stand where you can see the top of the model in the mirror, as shown in the diagram. Write and solve a proportion to estimate the height of the Unisphere.



Challenge ***ABCD*** **is a trapezoid,** ***AB*** **= 8,** ***AE*** **= 6,** ***EC*** **= 15, and** ***DE*** **= 10. Complete the statement.**

31. $\triangle ABE \sim$?

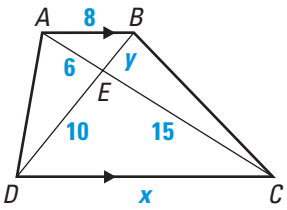
32. $\frac{AB}{?} = \frac{AE}{?} = \frac{BE}{?}$

33. $\frac{6}{?} = \frac{8}{?}$

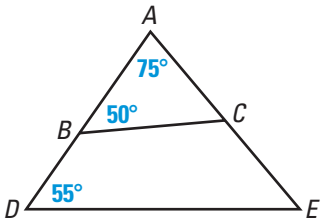
34. $\frac{15}{?} = \frac{10}{?}$

35. $x =$?

36. $y =$?



37. You be the Judge Meredith claims that the triangles shown at the right are similar. Brian thinks that they are not similar. Who is right? Explain your reasoning.



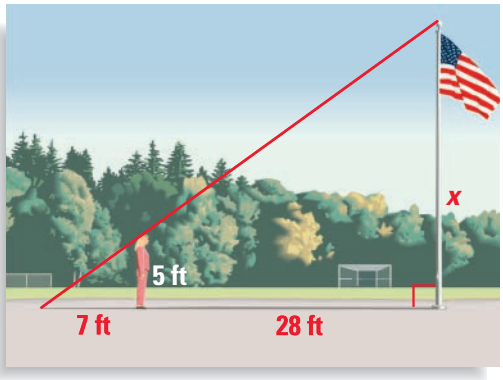
Standardized Test Practice

38. Multi-Step Problem Julia uses the shadow of a flagpole to estimate its height. She stands so that the tip of her shadow coincides with the tip of the flagpole's shadow as shown.

a. Explain why the two overlapping triangles in the diagram are similar.

b. Using the similar triangles, write a proportion that models the situation.

c. Solve the proportion to calculate the height of the flagpole.



Mixed Review

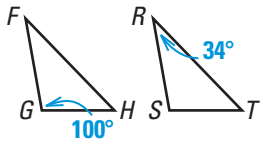
Congruent Triangles In the diagram, $\triangle FGH \cong \triangle RST$. Complete the statement. *(Lesson 5.1)*

39. $m\angle F =$? °

40. $m\angle T =$? °

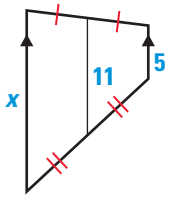
41. $\overline{GH} \cong$?

42. $\triangle TSR \cong$?



Trapezoid Midsegments Find the value of x. *(Lesson 6.5)*

43.



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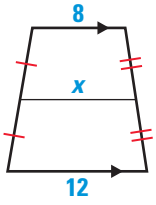

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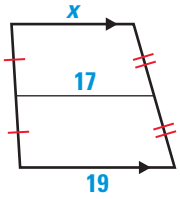


Algebra Skills

Plotting Points Plot the points in a coordinate plane. *(Skills Review, p. 664)*

46. $A(-4, 5)$

47. $B(-1, -3)$

48. $C(0, 7)$

49. $D(2, -6)$

50. $F(7, 2)$

51. $G(-8, -1)$

52. $J(7, -7)$

53. $K(-3, 3)$

Quiz 1

Solve the proportion. *(Lesson 7.1)*

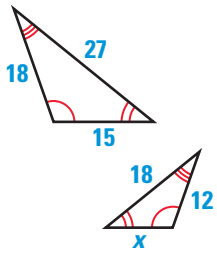
1. $\frac{x}{16} = \frac{3}{4}$

2. $\frac{5}{8} = \frac{25}{y}$

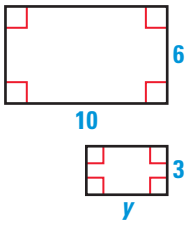
3. $\frac{11}{2} = \frac{z+3}{6}$

The two polygons are similar. Find the value of the variable. *(Lesson 7.2)*

4.



5.



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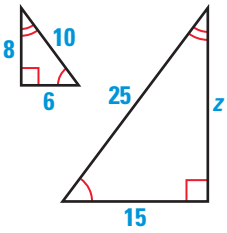
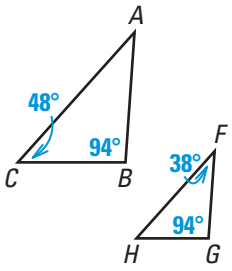
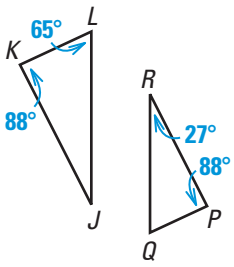


Determine whether the triangles are similar. If they are similar, write a similarity statement. Explain your reasoning. *(Lesson 7.3)*

7.



8.



9.