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 \( \angle K \equiv \angle Y \) and \( \angle J \equiv \angle X \), 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.
**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 $\angle J$.

$$m\angle F + 90^\circ + 61^\circ = 180^\circ \quad \text{Triangle Sum Theorem}$$

$$m\angle F + 151^\circ = 180^\circ \quad \text{Add.}$$

$$m\angle F = 29^\circ \quad \text{Subtract 151° from each side.}$$

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.

**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. $\triangle RST$ and $\triangle MNL$.
2. $\triangle GHL$ and $\triangle KJH$.
**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?

**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.

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.

4.

The teammate will pick up the pass 17.5 feet from the wall.
1. Complete the statement: If two angles of one triangle are congruent to two angles of another triangle, then ______.

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

2.

3.

4.

5.

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

Practice and Applications

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

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12.
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. \[ \triangle SUT \sim ? \]

14. \[ \triangle MNP \sim ? \]

15. \[ \triangle ABE \sim ? \]

Similar Triangles  Use the diagram to complete the statement.

16. \[ \triangle PQR \sim ? \]

17. \[ \frac{LM}{PQ} = ? \]

18. \[ \frac{12}{y} = \frac{15}{?} \]

19. \[ y = ? \]

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

Using Similar Triangles  Find the value of the variable.

21. \[ x \]

22. \[ z \]

23. \[ y \]

24. \[ a \]

25. \[ x \]

26. \[ p \]

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.
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.

![Diagram of Unisphere and mirror setup](image)

**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.

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. $m \angle F = \_\_ \_ ^\circ$

40. $m \angle T = \_\_ \_ ^\circ$

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

42. $\triangle TSR \cong \_\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_$

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

43.

44.

45.

**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.

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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.

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