11.3 Angle-Angle Similarity

Common Core Standard

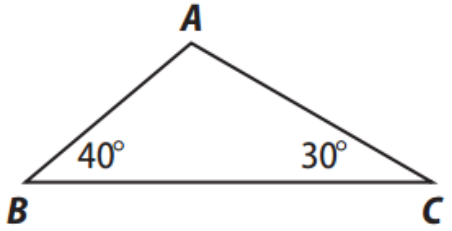
8.G.5
Use informal arguments to establish facts about the angle sum and exterior angle of trangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.

8.EE.6
Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y=mx$ for a line through the origin and the equation $y=mx+b$ for a line intercepting the vertical axis at b

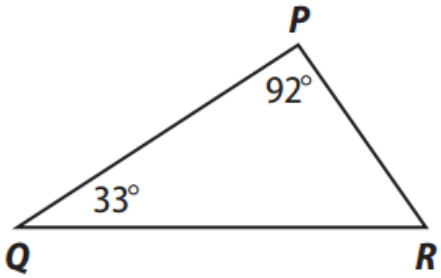
8.EE.7
Solve linear equations in one variable

Find the missing angle measure.

1.

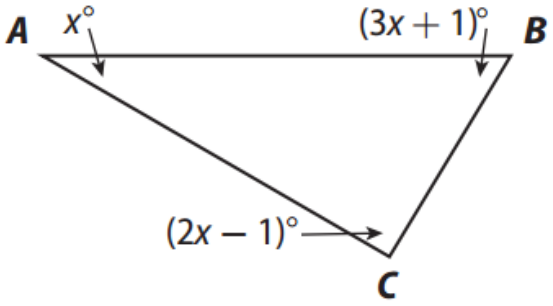


2.

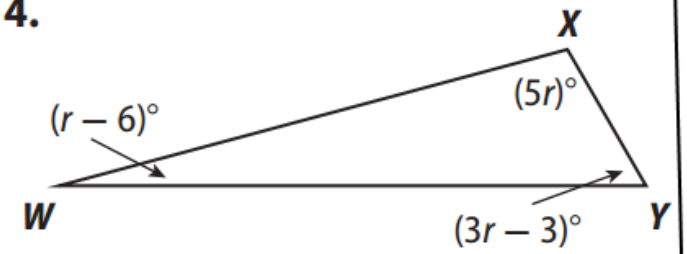


Use the Triangle Sum Theorem to find the measure of each angle in degrees.

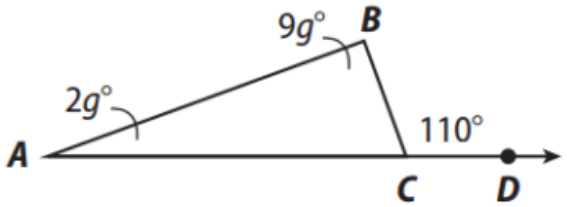
3.



4.



5. Use the Exterior Angle Theorem to find the measures of $\angle A$, $\angle B$, and $\angle ACB$.



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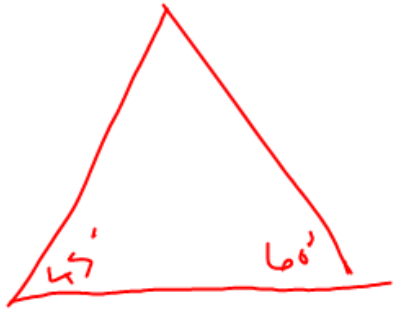
8.EE.7
Solve linear equations in one variable

Similar figures - have the same shape, but may have different sizes

Similar triangles - triangle are similar if their corresponding angles are congruent and the lengths of their corresponding sides are proportional

A Use your protractor and a straightedge to draw a triangle. Make one angle measure 45° and another angle measure 60°.



B Compare your triangle to those drawn by your classmates. How are the triangles the same?

_____

How are they different?

_____

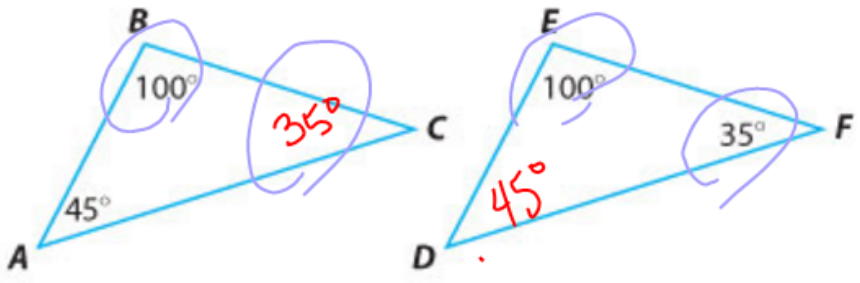
C Use the Triangle Sum Theorem to find the measure of the third angle of your triangle.

_____

Angle-Angle (AA) Similarity Postulate

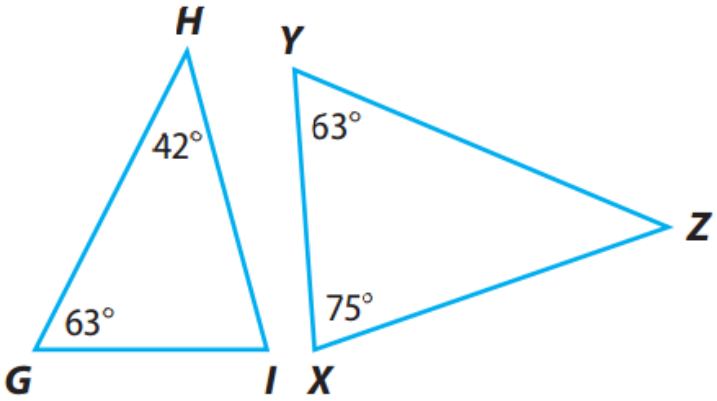
If 2 angles of one triangle are congruent to 2 angles of another triangle, then the triangles are similar

Explain whether the triangles are similar.



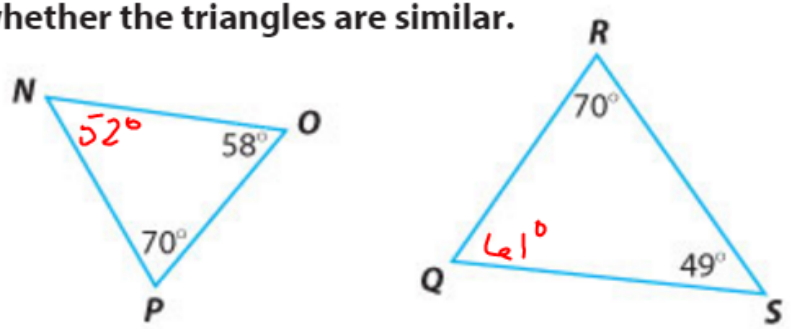
The figure shows only one pair of congruent angles. Find the measure of the third angle in each triangle.

Explain whether the triangles are similar.



yes they are similar based on the AA Similarity Postulate

3. Explain whether the triangles are similar.

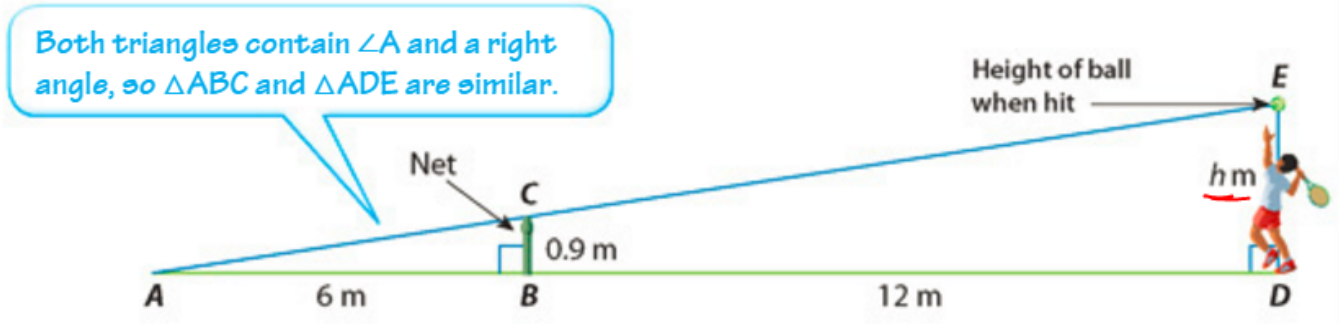


Not Similar

Do not have

2 congruent angles

While playing tennis, Matt is 12 meters from the net, which is 0.9 meter high. He needs to hit the ball so that it just clears the net and lands 6 meters beyond the base of the net. At what height should Matt hit the tennis ball?



In similar triangles, corresponding side lengths are proportional.

1. Set up proportion
2. Cross multiply
3. Solve for variable

hit tennis ball at 2.7 meters high

$\overline{AD} = 6 + 12 = 18$

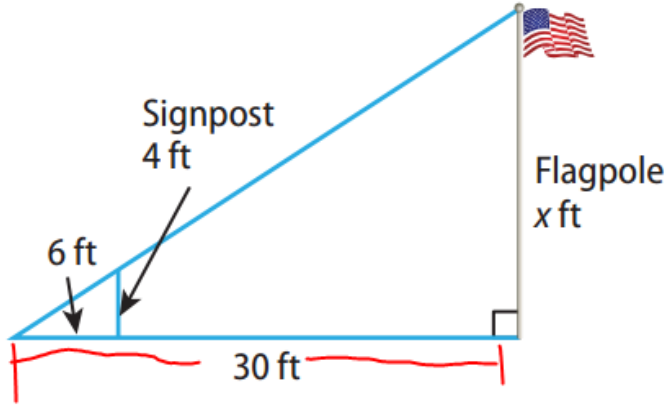
$\overline{AB} = 6$

$\frac{6}{.9} = \frac{18}{x}$

$\frac{6x}{6} = \frac{16.2}{6}$

$x = 2.7$

A flagpole casts a shadow that is 30 feet long. A signpost near the flagpole is 4 feet tall, and it casts a shadow that is 6 feet long. How tall is the flagpole?



* follow Steps

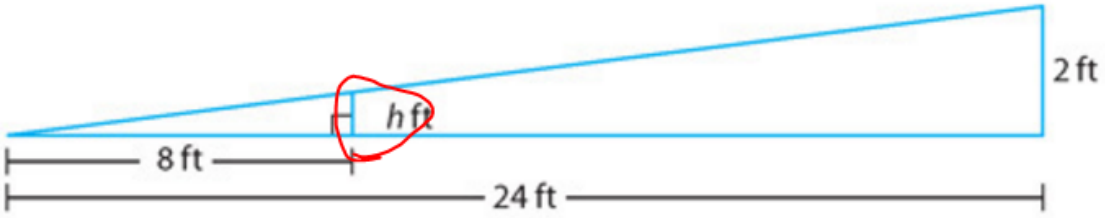
$\frac{30}{x} = \frac{6}{4}$

$\frac{120}{6} = \frac{6x}{6}$

$20 = x$

Flagpole is 20 ft tall

5. Rosie is building a wheelchair ramp that is 24 feet long and 2 feet high. She needs to install a vertical support piece 8 feet from the end of the ramp. What is the length of the support piece in inches?



$\frac{h}{8} = \frac{2}{24}$

$\frac{24h}{24} = \frac{16}{24}$

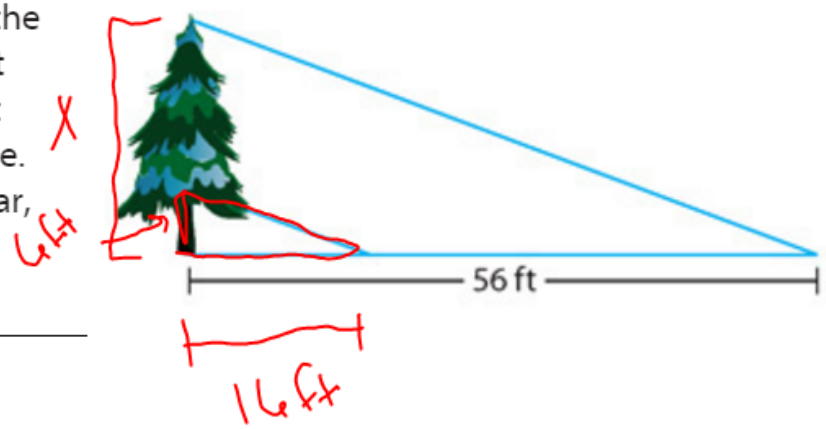
$h = \frac{16}{24} = \frac{2}{3}$ ft

$2/3 \times 12$

8 inches

6. The lower cable meets the tree at a height of 6 feet and extends out 16 feet from the base of the tree. If the triangles are similar, how tall is the tree?

21 ft



$\frac{6}{16} = \frac{X}{56}$ $\frac{16x}{16} = \frac{336}{16}$

$X = 21$

Using Similar Triangles to Explain Slope

You can use similar triangles to show that the slope of a line is constant.

A Draw a line ℓ that is not a horizontal line. Label four points on the line as A, B, C, and D.

B Draw the rise and run for the slope between points *A* and *B*. Label the intersection as point *E*. Draw the rise and run for the slope between points *C* and *D*. Label the intersection as point *F*.

C Write expressions for the slope between *A* and *B* and between *C* and *D*.

Slope between *A* and *B*: $\frac{BE}{\square}$ Slope between *C* and *D*: $\frac{\square}{CF}$

D Extend $\overleftrightarrow{AE}$ and $\overleftrightarrow{CF}$ across your drawing. $\overleftrightarrow{AE}$ and $\overleftrightarrow{CF}$ are both horizontal lines, so they are parallel.

Line ℓ is a _____ that intersects parallel lines.

E Complete the following statements:

$\angle BAE$ and _____ are corresponding angles and are _____ .

$\angle BEA$ and _____ are right angles and are _____ .

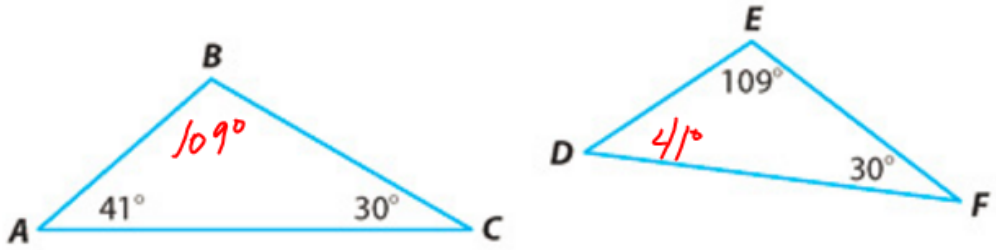
F By Angle–Angle Similarity, $\triangle ABE$ and _____ are similar triangles.

G Use the fact that the lengths of corresponding sides of similar triangles are proportional to complete the following ratios: $\frac{BE}{DF} = \frac{\square}{CF}$

H Recall that you can also write the proportion so that the ratios compare parts of the same triangle: $\frac{\square}{AE} = \frac{DF}{\square}$.

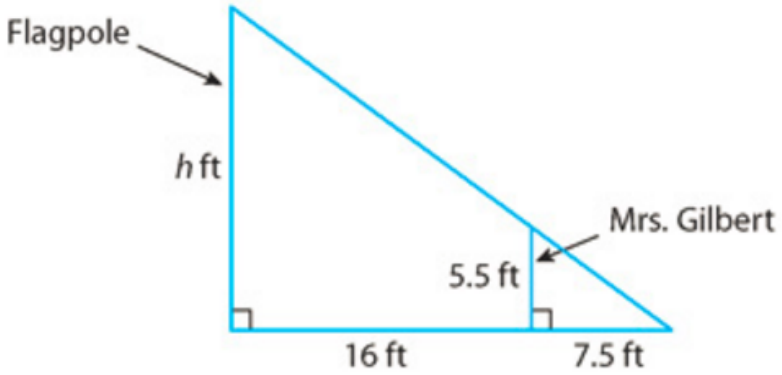
I The proportion you wrote in step **H** shows that the ratios you wrote in **C** are equal. So, the slope of line ℓ is constant.

1. Explain whether the triangles are similar. Label the angle measures in the figure. (Explore Activity 1 and Example 1)



$\triangle ABC$ has angle measures 41°, 109°, 30° and $\triangle DEF$ has angle measures 41°, 109°, 30°. Because 2 angles in one triangle are congruent to 2 angles in the other triangle, the triangles are similar.

2. A flagpole casts a shadow 23.5 feet long. At the same time of day, Mrs. Gilbert, who is 5.5 feet tall, casts a shadow that is 7.5 feet long. How tall in feet is the flagpole? Round your answer to the nearest tenth. (Example 2)

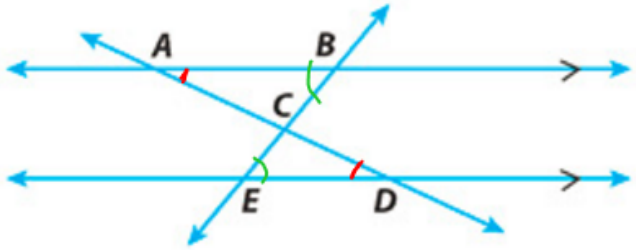


$$\frac{5.5}{7.5} = \frac{h}{23.5}$$

h = 17.2 feet

$$\frac{7.5h}{7.5} = \frac{129.25}{7.5}$$

3. Two transversals intersect two parallel lines as shown. Explain whether $\triangle ABC$ and $\triangle DEC$ are similar. (Example 1)



$\angle BAC$ and $\angle EDC$ are Congruent since they are Alternate Interior .

$\angle ABC$ and $\angle DEC$ are Congruent since they are Alternate Interior .

By AA Similarity, $\triangle ABC$ and $\triangle DEC$ are similar .

HW

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(5-11)