6.3 SIMILAR TRIANGLES

The Greek mathematician Thales wanted to measure the world's largest pyramid in Egypt, called the Great Pyramid of Khufu. He decided to discover the height of the pyramid by measuring its shadow, which was easier and safer than climbing to the top of the pyramid.

He used a stick to answer his question. He measured the height of the stick, and he reasoned that when the length of the stick's shadow equaled the height of the stick, the height of the pyramid would equal the length of its shadow. Measuring the shadow would be like measuring the height, only easier.

Thales waited until the stick's shadow was as long as the stick was tall. At that special time, Thales measured the pyramid's shadow. And he had the answer to his question, which was 481 feet tall.

Similar triangles can help to solve this type of problem.

But how do you know whether two triangles are similar?

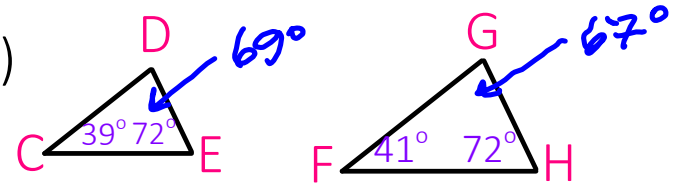
Postulate 25: AA Similarity Postulate (Angle-Angle)

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

Example 1

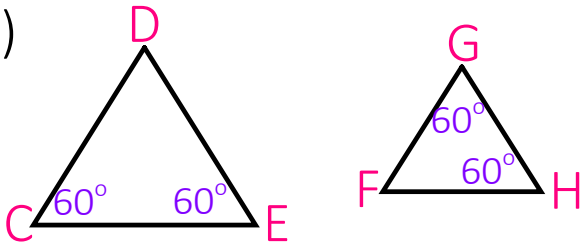
Determine whether ΔCDE ~ ΔFGH.

a)



not similar

b)

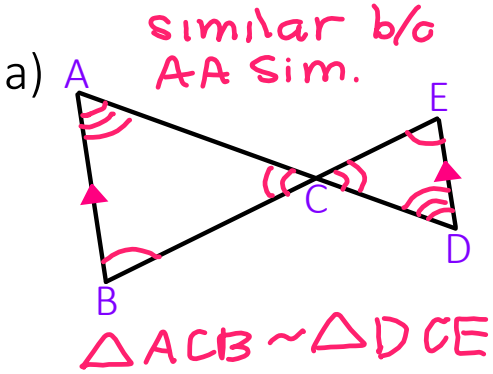


similar
AA Sim. Post.

Example 2

Determine whether the triangles are similar. If they are, write a similarity statement. If they are not, explain why.

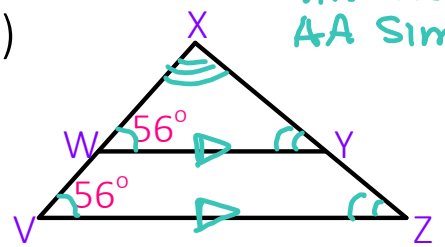
a)



similar b/c AA Sim.

ΔACB ~ ΔDCE

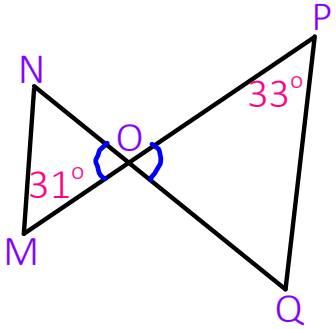
b)



Sim. b/c AA Sim.

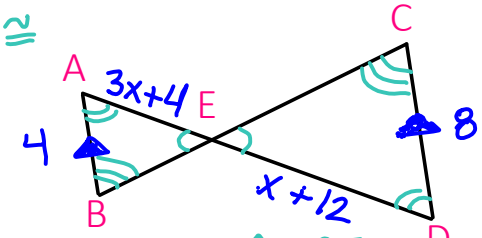
ΔWXY ~ ΔVXZ

c)



not similar

Example 3
Given AB || CD, alt int ∠s ≅
AB = 4, AE = 3x + 4,
CD = 8, and ED = x + 12.
Find AE and DE.



△ABE ~ △DCE

$\frac{8}{4} = \frac{x+12}{3x+4}$

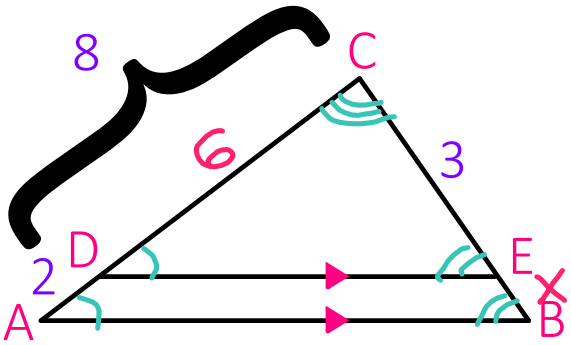
$4(x+12) = 8(3x+4)$
$4x+48 = 24x+32$
$-4x \quad -4x$
$48 = 20x+32$
$-32 \quad -32$
$\frac{16}{20} = \frac{20x}{20}$
$\frac{4}{5} = x$

$AE = 3(\frac{4}{5}) + 4$
$= \frac{12}{5} + \frac{20}{5}$
$AE = 32/5$

$DE = \frac{4}{5} + 12$
$DE = 12\frac{4}{5}$

Example 4
In the figure below, AB || DE,
DA = 2, CA = 8, and CE = 3. Find EB.

△DCE ~ △ACB



$\frac{3}{6} = \frac{3+x}{8}$

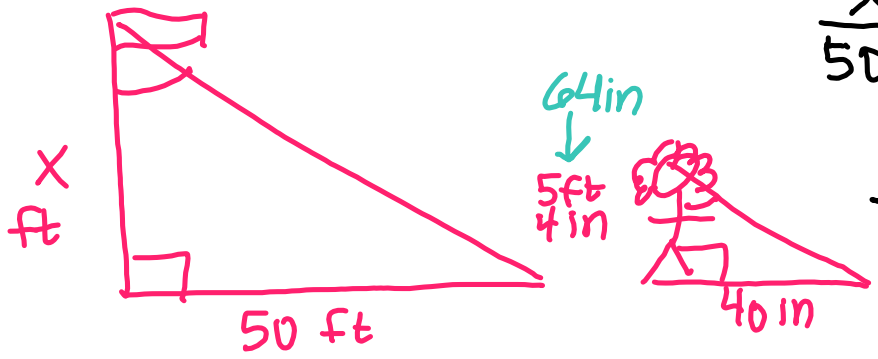
$\frac{8}{6} = \frac{3+x}{3}$

$6(3+x) = 3 \cdot 8$
$18 + 6x = 24$
$-18 \quad -18$
$\frac{6x}{6} = \frac{6}{6}$
$x = 1$

EB = 1

Example 5

A flagpole casts a shadow that is 50 feet long. At the same time, a woman standing nearby who is five feet four inches tall casts a shadow that is 40 inches long. How tall is the flagpole to the nearest foot?



$$\frac{x}{50} = \frac{64}{40}$$

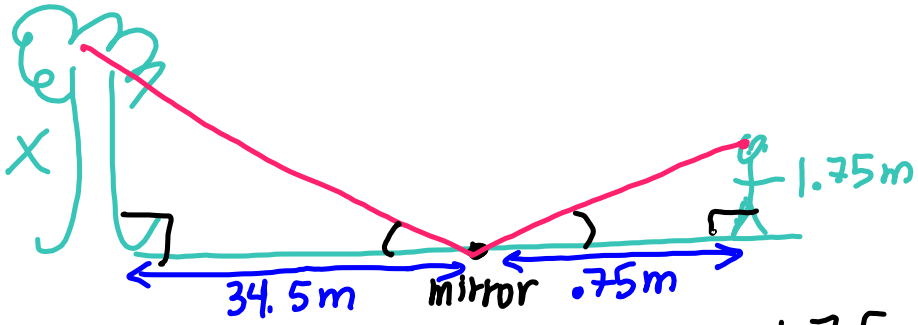
$$\frac{40x}{40} = \frac{3200}{40}$$

$$x = 80$$

80 ft

Example 6

To estimate the height of a tree, a Girl Scout sights the top of the tree in a mirror that is 34.5 meters from the tree. The mirror is on the ground and faces upward. The scout is 0.75 meters from the mirror, and the distance from her eyes to the ground is about 1.75 meters. How tall is the tree?



$$\frac{x}{34.5} = \frac{1.75}{.75}$$

$$\frac{.75x}{.75} = \frac{60.375}{.75}$$

$$x = 80.5\text{m}$$