

7.3 Indirect Measurement with Similar Triangles-Notes

Learning Target:

I can solve problems using properties of similar triangles.

Warm - up. Solve the proportions.

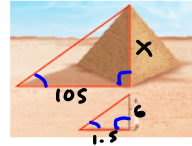
$$1.) \frac{4}{x} = \frac{9}{x-15}$$

$$x = -12$$

$$2.) \frac{x}{12} = \frac{x-10}{7}$$

$$x = 24$$

Thales is known as the first Greek scientist, engineer, and mathematician. Legend says that he was the first to determine the height of the pyramids in Egypt by examining the shadows made by the sun.



He considered three points: the top of the objects, the lengths of the shadows, and the bases.

a.) What appears to be true about the corresponding angles in the two triangles?

They are congruent

b.) What must be true about the triangles?

They are similar.

c.) If the shadow cast by the pyramid was 105 feet long, the length of the shadow of the stick held by Thales was 1.5 feet long, and the stick was 6 feet long, how tall was the pyramid?

$$\frac{1.5}{6} = \frac{105}{x} \quad \frac{1.5}{105} = \frac{6}{x}$$

$$1.5x = 630$$

$$x = 420$$

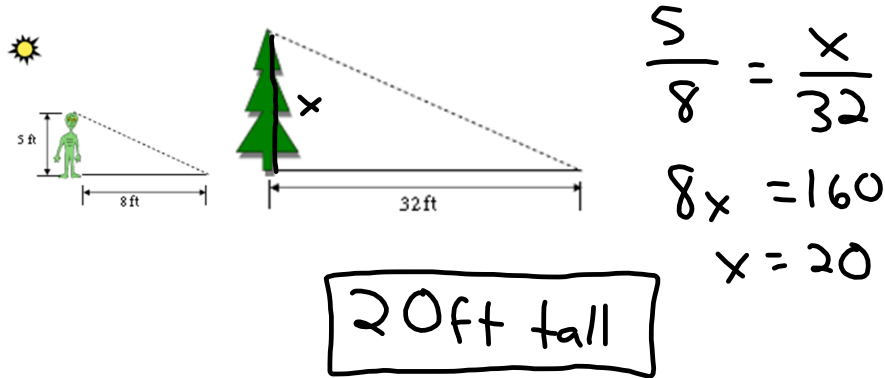
420 ft tall

Indirect measurement allows you to use properties of similar polygons to find distances or lengths that are difficult to measure directly.

To find these measurements, draw a diagram, find corresponding sides in the similar triangles, and set up a proportion.

Guided Practice. Draw a diagram, write a proportion and solve the problem.

1.) At a certain time of day, a 5 ft alien casts an 8 ft shadow. At the same time of the day, a tree casts a 32 ft shadow. How tall is the tree?



2.) A map has a scale of 3 cm: 18 km. If Riverside and Smithville are 54 km. apart, how far apart are they on the map?

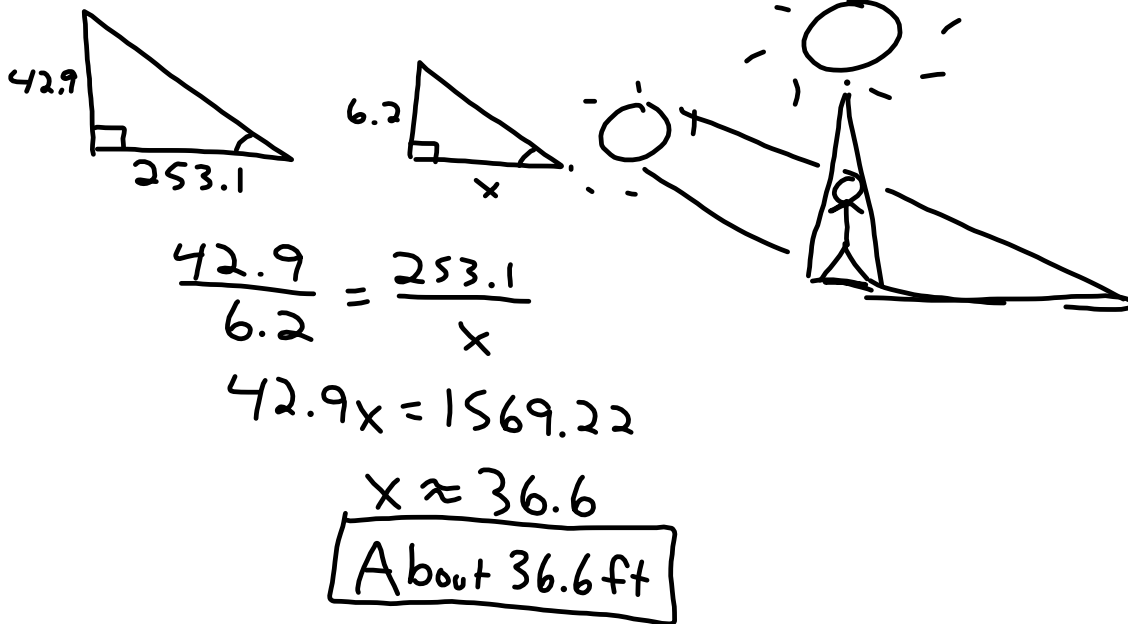
$$\frac{\text{map}}{\text{real}} \text{ or } \frac{\text{cm}}{\text{km}} \quad \frac{3}{18} = \frac{x}{54}$$

$$\frac{\text{real}}{\text{map}} \text{ or } \frac{\text{km}}{\text{cm}} \quad 162 = 18x$$

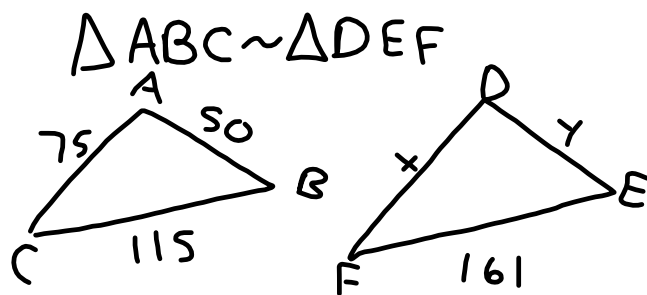
$$9 = x$$

9cm apart

3.) If a 42.9 ft. tall flagpole casts a 253.1 ft. long shadow, then how long is the shadow that a 6.2 ft. tall woman casts? Round your answer to the nearest tenth.



4.) $\triangle ABC$ is similar to $\triangle DEF$. The lengths of the sides of ABC are $AB = 50\text{cm}$, $BC = 115\text{cm}$ and $AC = 75\text{cm}$. The length of the longest side in $\triangle DEF$ is 161cm . Find the other two sides of $\triangle DEF$, and then find the perimeter of $\triangle DEF$.



$$\frac{75}{x} = \frac{115}{161} \quad \frac{50}{y} = \frac{115}{161}$$

$$115x = 12075 \quad 115y = 8050$$

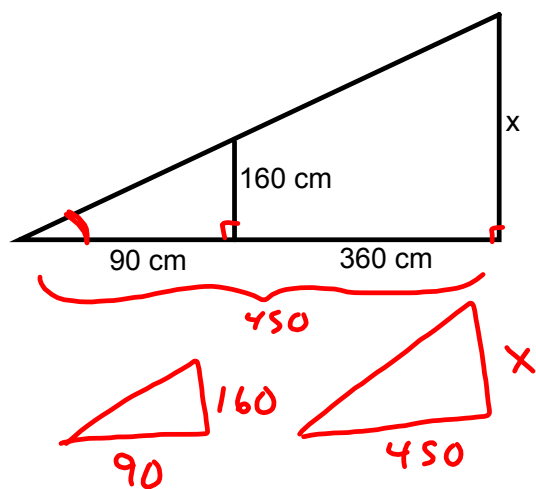
$$x = 105 \quad y = 70$$

$DF = 105\text{cm}$

$DE = 70\text{cm}$

$P_{DEF} = 336\text{cm}$

5.) A girl 160 cm tall, stands 360 cm from a lamp post at night. Her shadow from the light is 90 cm long. How high is the lamp post?



$$\frac{90}{450} = \frac{160}{x}$$

$$90x = 72000$$

$$x = 800$$

$$\boxed{800\text{cm}}$$

Homework. 7.3 Indirect Measure Practice