Applications of Similar Triangles

Wednesday, September 25, 2019 10:04 AM

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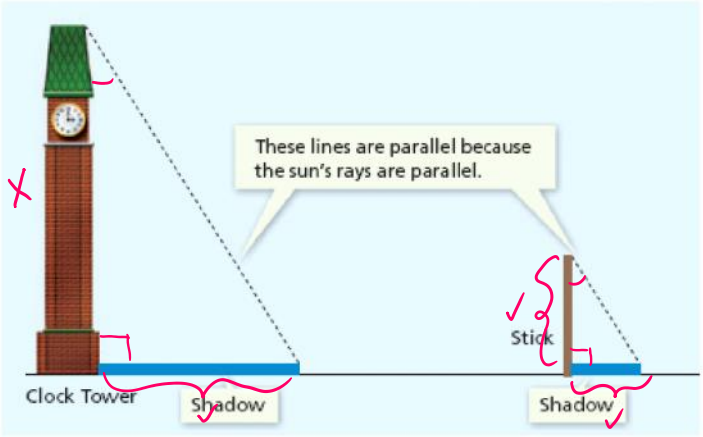
Applications using Similar Triangles

Using Shadows to Find Heights

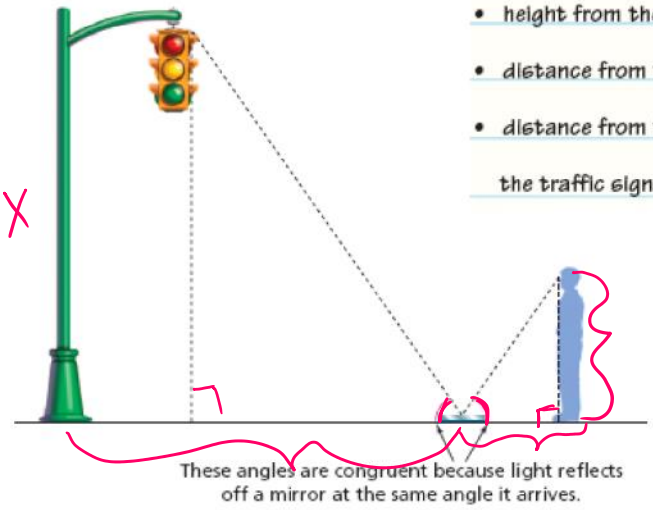
Suppose you want to use the shadow method to estimate the height of a building. You make the following measurements:



- length of the stick: 3 m
- length of the stick's shadow: 1.5 m
- length of the building's shadow: 8 m

Using Mirrors to Find Heights

Jim wants to find the height of the traffic light.



- height from the ground to Jim's eyes: 150 cm
- distance from the middle of the mirror to Jim's feet: 100 cm
- distance from the middle of the mirror to a point directly under the traffic signal: 450 cm

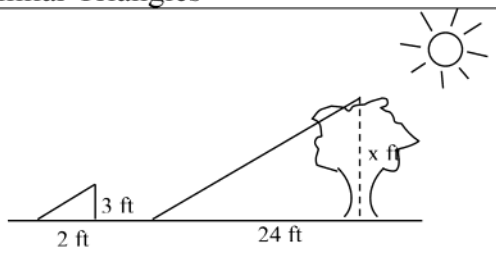
Name _____

Block _____

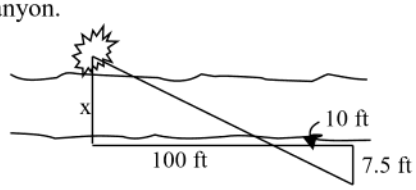
Application Problems using Similar Triangles

1) If a tree casts a 24-foot shadow at the same time that a yardstick casts a 2-foot shadow, find the height of the tree.

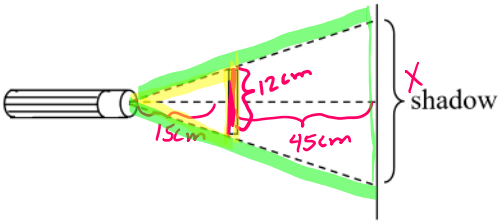
$\frac{3}{x} = \frac{2}{24}$ $x = 36$ ft



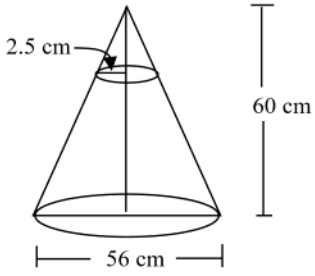
2) A bush is sighted on the other side of a canyon. Find the width of the canyon.



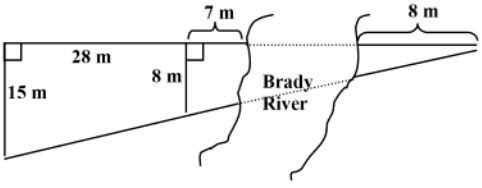
3) A 12-centimeter rod is held between a flashlight and a wall as shown. Find the length of the shadow on the wall if the rod is 45 cm from the wall and 15 cm from the light.



4) The cheerleaders at City High make their own megaphones by cutting off the small end of a cone made from heavy paper. If the small end of the megaphone is to have a radius of 2.5 cm, what should be the height of the cone that is cut off?



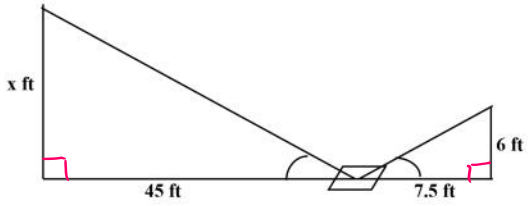
5) Find the width of the Brady River.



6) The foot of a ladder is 1.2 m from a fence that is 1.8 m high. The ladder touches the fence and rests against a building that is 1.8 m behind the fence. Draw a diagram, and determine the height on the building reached by the top of the ladder.

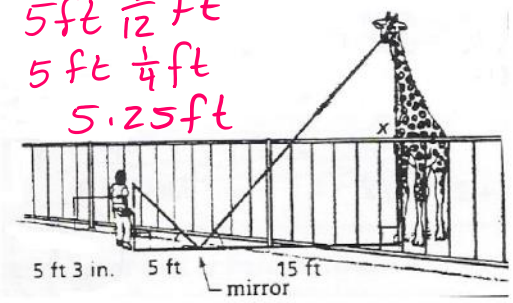
7) Ramon places a mirror on the ground 45 ft from the base of a geyser. He walks backward until he can see the top of the geyser in the middle of the mirror. At that point, Ramon's eyes are 6 ft above the ground and he is 7.5 ft from the mirror. Use similar triangles to find the height of the geyser.

$\frac{45}{7.5} = \frac{x}{6}$ $x = 36$ ft

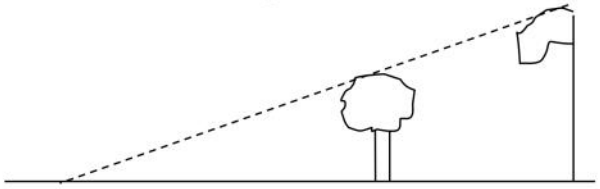


8) Find the height of the giraffe in the diagram below.

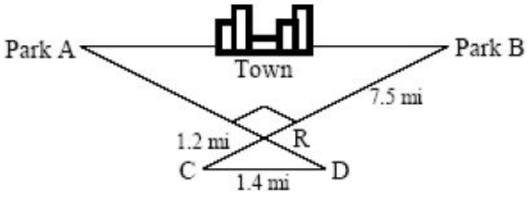
5ft $\frac{3}{12}$ ft
5 ft $\frac{1}{4}$ ft
5.25ft



9) On level ground, the base of a tree is 20 ft from the bottom of a 48-ft flagpole. The tree is shorter than the pole. At a certain time, their shadows end at the same point 60 ft from the base of the flagpole. How tall is the tree?



10) Mason Construction wants to connect two parks on opposite sides of town with a road. Surveyors have laid out a map as shown. The road can be built through the town or around town through point R. The roads intersect at a right angle at point R. The line joining Park A to Park B is parallel to the line joining C and D.

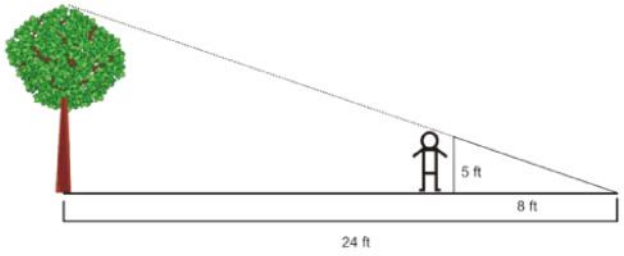


Note: The figure is not drawn to scale.

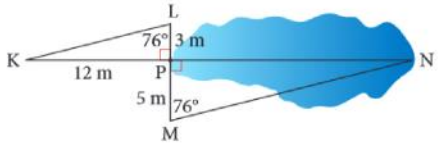
a. What is the distance between the parks through town?

b. What is the distance from Park A to Park B through point R?

11) A tree casts a shadow that is 24 feet long. A person who is 5 feet tall is standing in front of the tree, and his shadow is 8 feet long. Approximately how tall is the tree?

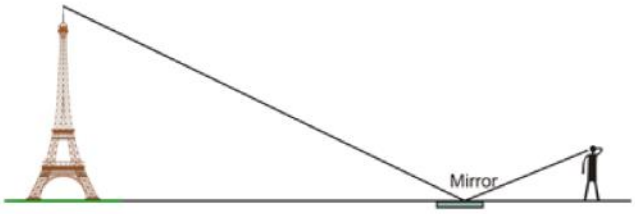


12) To find the length of a pond, a surveyor took some measurements. She recorded them on this diagram. What is the length of the pond?



13) Movie screens often have an aspect ratio of 16 by 9. This means that for every 16 ft of width along the base of the screen, there is 9 ft of height. The width of the screen at the Airport Cinemas is about 115 ft. The screen has a 16:9 aspect ratio. About how tall is the screen?

14) Anatole is visiting Paris, and wants to know the height of the Eiffel Tower. Since he's unable to speak French and his phone isn't working, he decides to measure it in 3 steps.



1. He measures out a point 500 meters from the base of the tower, and places a small mirror flat on the ground.
2. He stands behind the mirror in such a spot that standing upright he sees the top of the tower reflected in the mirror.
3. He measures both the distance from the spot where he stands to the mirror (2.75 meters) and the height of his eyes from the ground (1.8 meters).

Write a proportion and calculate the height of the Eiffel Tower in meters.

How tall is the Eiffel Tower in feet?

15) Yolanda uses the shadow method to estimate the height of a flagpole. Her height of 5 feet casts a 4 foot shadow. At the same time, she finds that the school's flagpole casts a shadow that is 21 feet long. Sketch a diagram and use a proportion to find the height of the flagpole?

16) I wanted to enlarge a 4" x 6" photo from my trip to Italy. The frame I had said it held an 8"x10" photo. When I picked up my enlargement, it was cut off like this. Using what you know about similarity, explain why this happened?