

### 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:

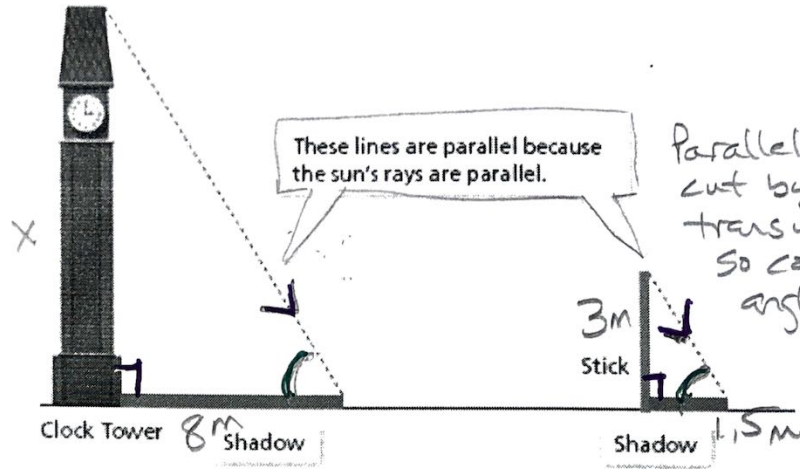
- length of the stick: 3 m
- length of the stick's shadow: 1.5 m
- length of the building's shadow: 8 m

AA~

$$\frac{3}{x} = \frac{1.5}{8}$$

$$1.5x = 24$$

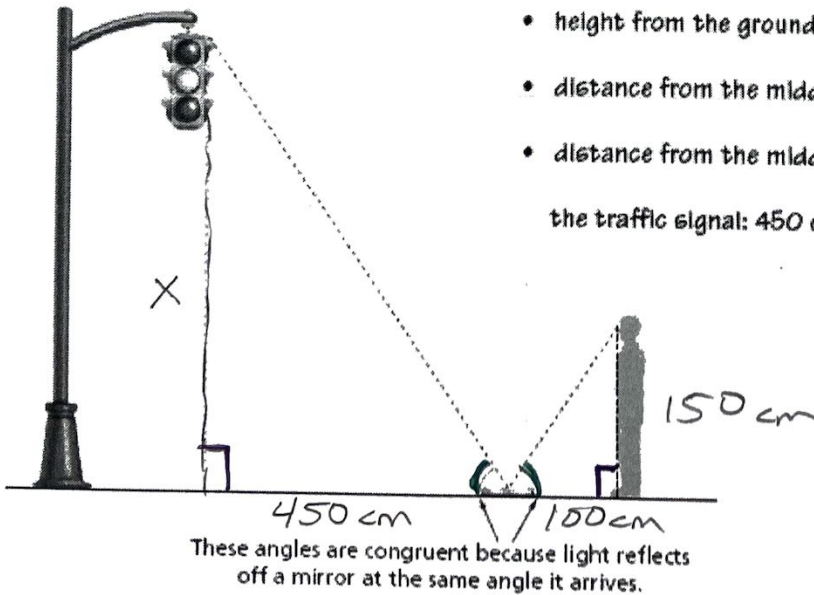
$$x = 16m$$



### 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



$$\frac{x}{150} = \frac{450}{100}$$

$$100x = 67,500$$

$$x = 675 \text{ cm}$$

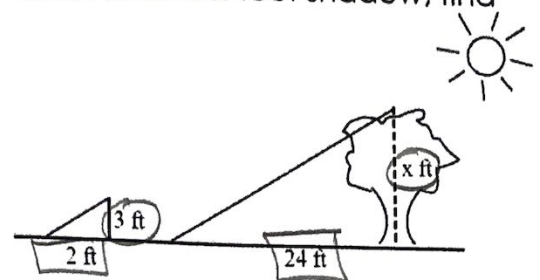
### CLASSWORK:

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.

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

$$2x = 72$$

$$x = 36 \text{ ft}$$

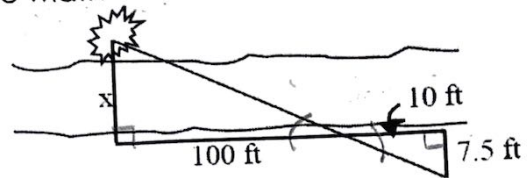


2) A bush is sighted on the other side of a canyon. Find the width of the canyon.

$$\frac{10}{100} = \frac{7.5}{x}$$

$$10x = 750$$

$$x = 75 \text{ ft}$$

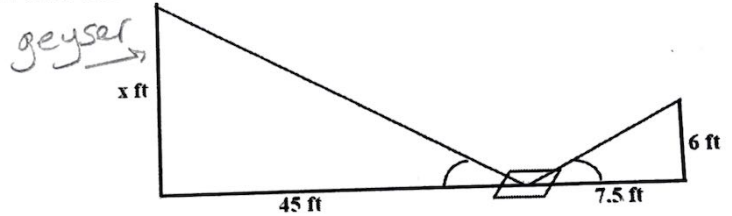


3. Ramon places a mirror on the ground 45 ft from the base of a geyser. He walks backward until he can see the top of the geyser in the middle of the mirror. At that point, Ramon's eyes are 6 ft above the ground, and he is 7.5 ft from the mirror. Use similar triangles to find the height of the geyser.

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

$$7.5x = 270$$

$$x = 36 \text{ ft.}$$

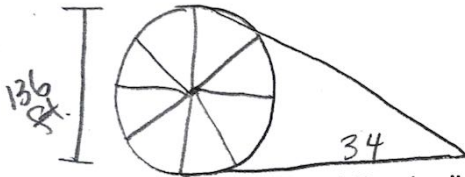


4. The Giant Wheel at Cedar Point in Ohio is one of the tallest Ferris wheels in the country at 136 feet tall. If the Giant Wheel casts a 34-foot shadow, write and solve a proportion to find the height of a nearby man who casts a 1.5-foot shadow.

$$\frac{x}{136} = \frac{1.5}{34}$$

$$34x = 204$$

$$x = 6 \text{ ft.}$$

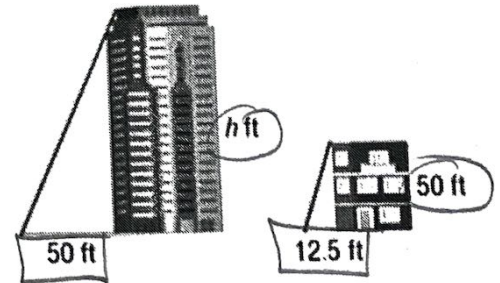


5. What is the height of the building?

$$\frac{h}{50} = \frac{50}{12.5}$$

$$12.5h = 2500$$

$$h = 200 \text{ ft.}$$



6. You use a mirror to estimate the height of the dinosaur skeleton. According to the laws of optics, the light reflects off a mirror at the same angle from which it strikes the mirror. How tall is the dinosaur?

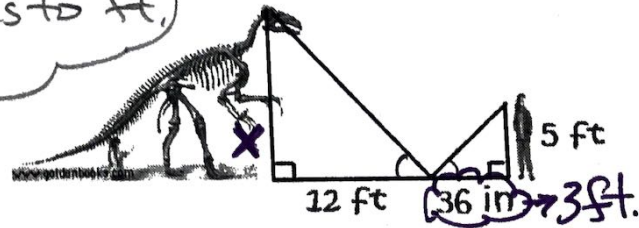
$$\frac{x}{5} = \frac{12}{3}$$

$$3x = 60$$

$$x = 20 \text{ ft.}$$

\* Convert 36 inches to ft.  
12 inches = 1 foot

$$\frac{36}{12} = 3$$

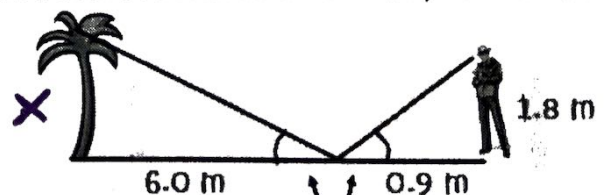


7. Lamar Prestley is planning to landscape his yard. First he needs to calculate the height of a palm tree in the backyard. He sights the top of the tree in a mirror that is 6.0 meters from the tree. It is on the ground and faces up. Lamar is 0.9 meters from the mirror and his eyes are 1.8 meters from the ground. How tall is the tree?

$$\frac{x}{1.8} = \frac{6}{.9}$$

$$.9x = 10.8$$

$$x = 12 \text{ m}$$



These angles are congruent because light reflects off a mirror at the same angle it arrives.