

Objective: TSWBAT- use proportions and similar figures to solve problems

Vocabulary

① indirect measurement- uses proportions and similar triangles to measure distances that would be difficult to measure directly

What You'll Learn

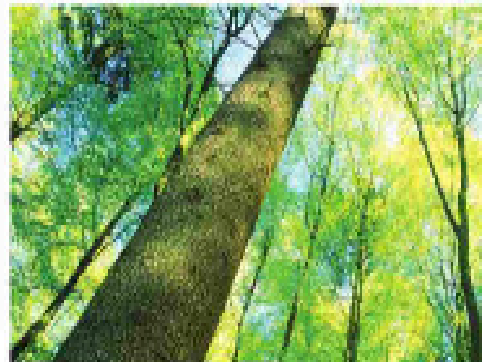
To use proportions and similar figures to solve problems

🔊 **New Vocabulary** indirect measurement

Why Learn This?

When measuring large objects, such as trees, it is not practical to use tools such as rulers.

Indirect measurement uses proportions and similar triangles to measure distances that would be difficult to measure directly.



EXAMPLE**Measuring Indirectly**

- 1 A student is 5 ft tall and casts a shadow 15 ft long. A nearby tree casts a shadow 75 ft long. Find the height h of the tree.

$$\frac{5h}{15s} = \frac{N}{75s} \quad N = 25 \text{ ft}$$

$$\frac{15N}{15} = \frac{375}{15}$$

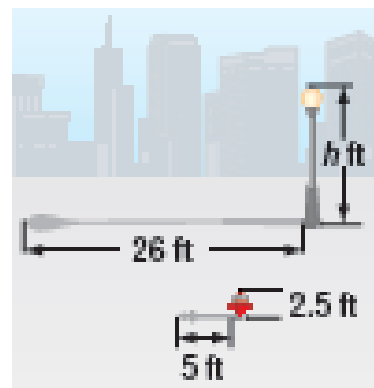
Quick Check

1. A school 40 ft high casts a 160-ft shadow. A nearby cellular phone tower casts a 210-ft shadow. Find the height of the tower.

$$\frac{40h}{160s} = \frac{N}{210s} \quad N = 52.5 \text{ ft}$$

$$\frac{160N}{160} = \frac{8400}{160}$$

CITY PROPERTY A fire hydrant 2.5 feet high casts a 5-foot shadow. How tall is a street light that casts a 26-foot shadow at the same time? Let h represent the height of the street light.



$$\frac{2.5h}{5s} = \frac{N}{26s}$$

$$\frac{65}{5} = \frac{5N}{5}$$

$$N = 13 \text{ ft}$$

CHECK Your Progress

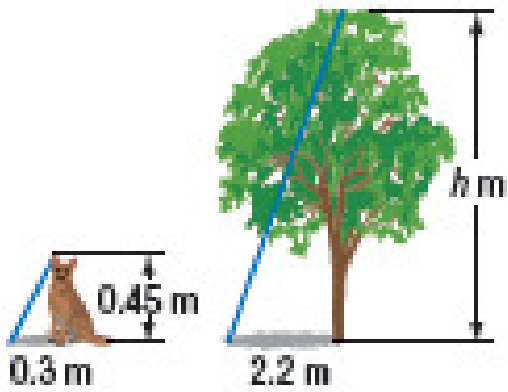
- a. **STREETS** At the same time a 2-meter street sign casts a 3-meter shadow, a telephone pole casts a 12.3-meter shadow. How tall is the telephone pole?

$$\frac{2h}{3s} = \frac{N}{12.3s}$$

$$N = 8.2 \text{ m}$$

$$\frac{24.6}{3} = \frac{3N}{3}$$

TREES How tall is the tree?



$$\frac{0.45h}{0.3m} = \frac{N}{2.2}$$

$$\frac{0.99}{0.3} = \frac{0.3N}{0.3}$$

$$N = 3.3$$

EXAMPLE Application: Surveying

- 2 A civil engineer took the measurements shown in the figure at the right, where $\triangle JKL \sim \triangle NML$. Find d , the distance across the river.

Use similar triangles to set up a proportion.

$$\frac{JK}{NM} = \frac{KL}{ML}$$

$$\frac{d}{525} = \frac{300}{450}$$

$$450d = 157,500$$



Quick Check

2. In Example 2, NL is about 691 m. Find LJ . Round to the nearest tenth.

$$\frac{450}{691} = \frac{300}{x}$$

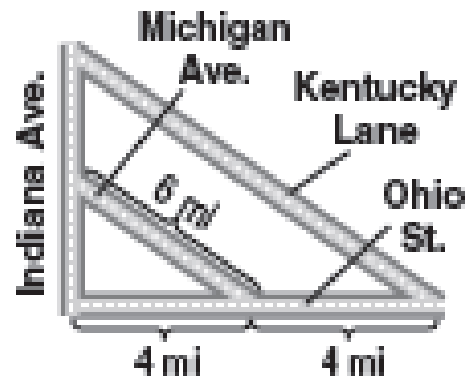
$$\frac{207,300}{450} = \frac{450x}{450}$$

$$x = 460.7 \text{ m}$$



CHECK Your Progress

- b. **STREETS** Find the length of Kentucky Lane.

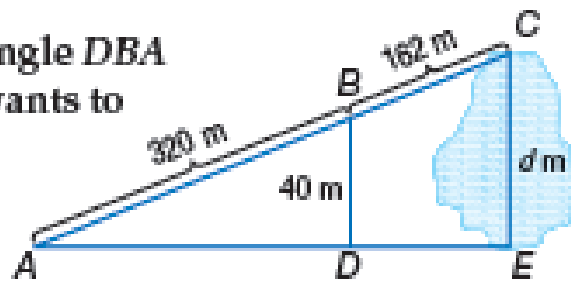


$$\frac{4}{6} = \frac{8}{N}$$

$$N = 12$$

- 2 **LAKES** In the figure at the right, triangle DBA is similar to triangle ECA . Ramon wants to know the distance across the lake.

\overline{AB} corresponds to \overline{AC} and \overline{BD} corresponds to \overline{CE} .

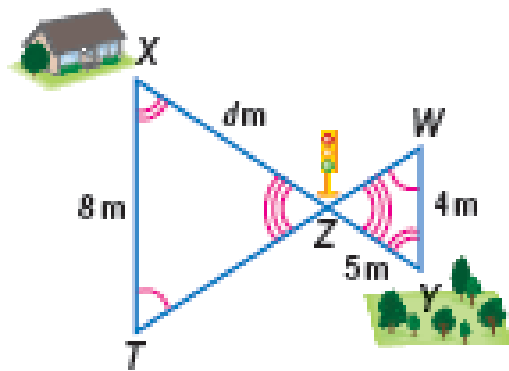


$$\frac{40}{320} = \frac{d}{482}$$

$$\frac{19,280}{320} = \frac{320d}{320}$$

$$d = 60.25 \text{ m}$$

WALKING Find the distance from the park to the house.



$$\frac{4}{5} = \frac{8}{N}$$

$$N = 10$$