Scale, Scale Factor, and Indirect Measurment

Vocabulary

Scale: real world vs. on paper (model)

Scale Factor: In two similar geometrical shapes, the ratio of their corresponding sides.

Scale

Example 1:

On a map of Florida, the distance between two cities is 10.5 cm. What is the actual distance between them if the scale is 3 cm = 80 mi?

What two measurements are we comparing?

cm → miles

x = 280 miles

Set up a proportion

$\frac{3\text{cm}}{80\text{miles}} \nearrow\!\!\searrow \frac{10.5\text{cm}}{x}$

$\frac{3x}{3} = \frac{840}{3}$

Cross multiply and solve for x.

Scale

Example 2

A model house is 16 cm wide. If it was built with a scale of 4 cm: 15 ft, then how wide is the actual house?

$\frac{4\text{cm}}{15\text{ft}} \nearrow\!\!\searrow \frac{16\text{cm}}{x}$

$\frac{4x}{4} = \frac{240}{4}$

$x = 60\text{ft}$

Example 3

Johnny used a map to get to his grandma's house that used a scale of 2 cm : 85 mi. If Johnny actually drove 637.5 mi, how far apart was Johnny's house from his grandma's house on the map?

$\frac{2\text{cm}}{85\text{mi}} \nearrow\!\!\searrow \frac{x}{637.5\text{mi}}$

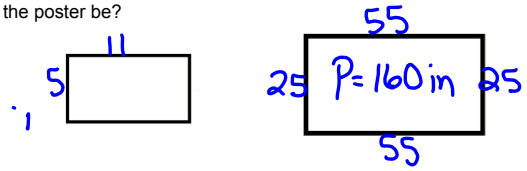
$\frac{85x}{85} = \frac{1275}{85}$

$x = 15\text{cm}$

Scale Factor

Example 1

A photograph was enlarged and made into a poster using a scale factor of 5. The photograph is 5 inches by 11 inches. What will the perimeter of the poster be?



Scale Factor

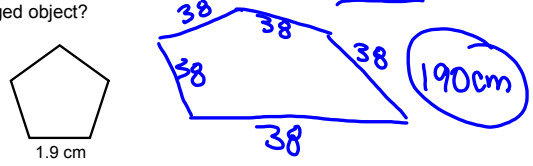
Example 2

A club house is 16 ft. long. On a scale model of the club house, the club house is 8 in. What is the scale of the model?

16ft ⟷ 8in

Example 3

In the scale drawing, each side is 1.9 cm long. If the drawing is going to be enlarged by a scale factor of 20, what is the perimeter of the enlarged object?



Indirect Measurement

using proportions to compute distances that are difficult to measure directly.

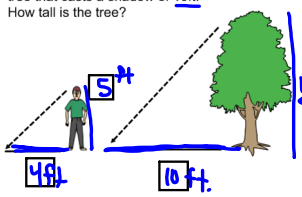
Steps:

1. Draw a picture
2. Set up a proportion to solve
3. Solve for the variable

Indirect Measurement

Example 1

A person that is 5ft tall that casts a shadow of 4ft is standing next to a tree that casts a shadow of 10ft. How tall is the tree?



$\frac{5}{4} = \frac{x}{10}$

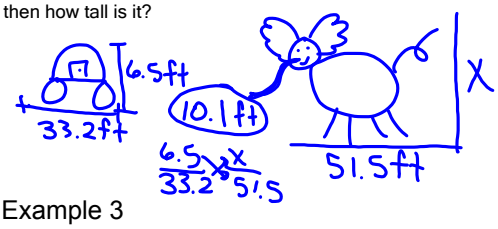
$\frac{4x}{4} = \frac{50}{4}$

$x = 12.5\text{ft}$

Indirect Measurement

Example 2

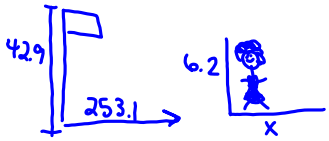
A 6.5 ft tall car ~~standing~~ parked next to an adult elephant casts a 33.2 ft shadow. If the adult elephant casts a shadow that is 51.5 ft long then how tall is it?



$\frac{6.5}{33.2} = \frac{x}{51.5}$

Example 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?



$\frac{42.9}{253.1} = \frac{6.2}{x}$

36.6ft

Indirect Measurement

Example 4

A fire hydrant 2.5 feet high casts a 5 foot shadow. How tall is a street light that casts a 26 foot shadow?

$\frac{2.5}{5} = \frac{x}{26}$

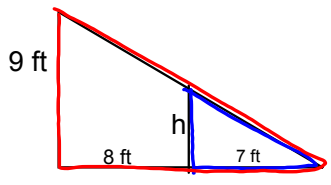
$\frac{5x}{5} = \frac{65}{5}$

$x = 13\text{ft}$

Indirect Measurement

Example 5

Find the value of h.



$\frac{9}{15} = \frac{h}{7}$

$\frac{15h}{15} = \frac{63}{15}$

$h = 4.2\text{ft}$

Warm up 12/4

Solve:

$-2\left(4^2 + \left(\frac{1}{2}\right)^2\right)$

$-2\left(16 + \frac{1}{4}\right)$

$-2(16.25)$

$-32\frac{1}{2}$ -32.5