7.5 Notes

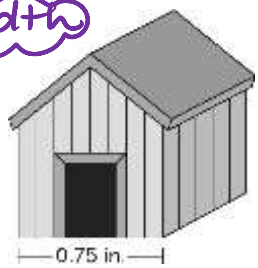
Using Proportional Relationships

Use ratios to make indirect measurements
Use scale drawings to solve problems

A **scale drawing** represents an object as Smaller or Larger than its actual size.

A **scale** is a ratio of any *length in the drawing* to the *corresponding actual length*.

Example 1: Mrs. Klotz wants to build a doghouse for Bear. Before she does, she decides to make a blue print using a scale of 1 in : 3 ft. If the width is .75 inches, find the ~~depth~~ width of the actual doghouse.



$$\frac{\text{in}}{\text{ft}} \quad \frac{1}{3} = \frac{.75}{x}$$

$$x = 2.25 \text{ ft}$$

Example 2: A rectangular fitness room is 45 feet long and 28 feet wide. Find the length and width for a scale drawing of the room, using a scale of 2 in : 3 ft. (*hint: you will need to solve two proportions, one for the length and one for the width*)

length

$$\frac{\text{in}}{\text{ft}} \quad \frac{2}{3} = \frac{l}{45}$$

$3l = 90$ so $l = 30$ in

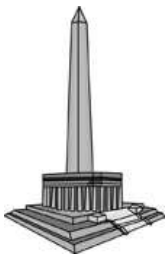
width

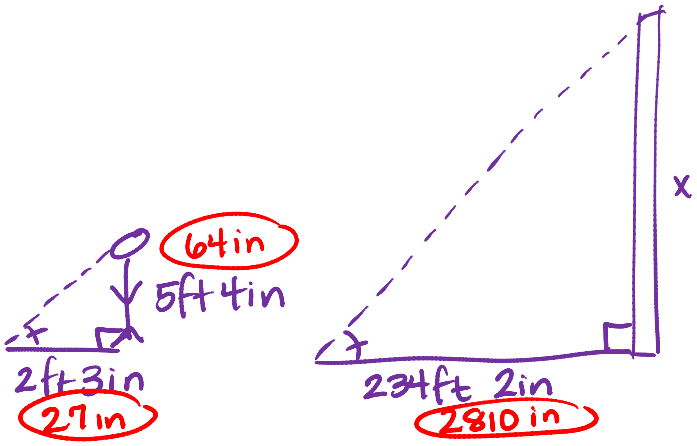
$$\frac{\text{in}}{\text{ft}} \quad \frac{2}{3} = \frac{w}{28}$$

$3w = 56$ so $w = \frac{56}{3}$ in or $18\frac{2}{3}$ in

Indirect Measurement: any method that uses formulas, ~ figures, and/or proportions to measure an object.

Example 3: On a trip to Washington, D.C., Jackie and Keri visited the Washington Monument. When they went to take a picture next to it, they were amazed by its size. Unfortunately they forgot their cell phones at home and could not look up the height of the monument. Luckily, they remembered that they could use indirect measurement to find the height of the monument. They knew that Jackie is 5 feet, 4 inches tall. At that time of day, they measured her shadow to be 2 feet, 3 inches long and the monument shadow to be 234 feet, 2 inches. Find the height of the Washington Monument.





$$\frac{x}{64} = \frac{2810}{27}$$

$27x = 179{,}840$

$x \approx 6{,}660.74$ in

or

$x \approx 555.06$ ft

Proportional Perimeters and Areas Theorems

FLASHBACK: Perimeter of Δ= distance around... ADD up all the sides!, Area of Δ = $\frac{b \cdot h}{2}$

Example 4: Complete the following ratios using the figure to the right.

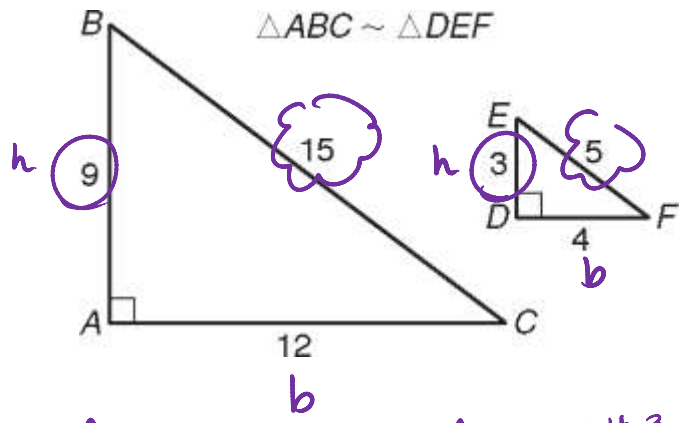
$\frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD} = \frac{9}{3} = \frac{15}{5} = \frac{12}{4} = \boxed{\frac{3}{1}}$

$\frac{\text{perimeter of } \Delta ABC}{\text{perimeter of } \Delta DEF} = \frac{36}{12} = \boxed{\frac{3}{1}}$

$P_{\Delta ABC} = 15 + 12 + 9 = 36$

$P_{\Delta DEF} = 3 + 4 + 5 = 12$

$\frac{\text{area of } \Delta ABC}{\text{area of } \Delta DEF} = \frac{54}{6} = \boxed{\frac{9}{1}}$



$A_{\Delta ABC} = \frac{12 \cdot 9}{2} = 54$ $A_{\Delta DEF} = \frac{4 \cdot 3}{2} = 6$

Explain the relationship between each of the ratios you just found:

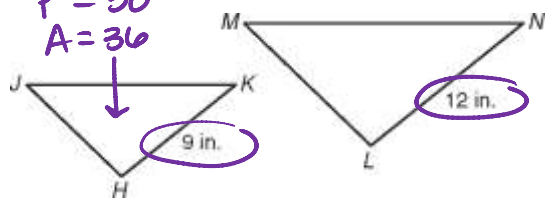
Let's summarize together: If two figures are similar and the ratio of corresponding sides (the similarity ratio) is $\frac{a}{b}$, then

- ➔ the ratio of the perimeters is $\frac{a}{b}$, and
- ➔ the ratio of the areas is $\left(\frac{a}{b}\right)^2 = \frac{a^2}{b^2}$

Example 5: △HJK ~ △LMN. The perimeter of △*HJK* is 30 inches, and the area of △HJK is36 square inches. Find the perimeter and area of △*LMN*.

ratio of sides $= \frac{9}{12} = \frac{3}{4}$ △HJK △LMN

P = 30
A = 36



Perimeter: $\frac{3}{4} = \frac{30}{p}$

$3p = 120$

$\boxed{p = 40 \text{ in}}$

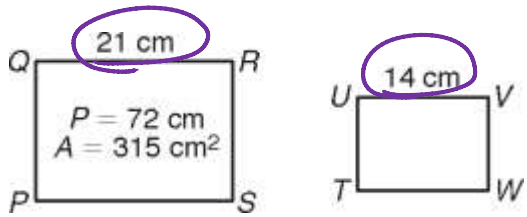
Area: $\left(\frac{3}{4}\right)^2 = \frac{36}{A}$

$\frac{9}{16} = \frac{36}{A}$

$9A = 576$ so $\boxed{A = 64 \text{ in}^2}$

Example 6: ▭ *PQRS* ~ ▭ *TUVW*. Find the perimeter and area of ▭ *TUVW*.

ratio of sides: $\frac{21}{14} = \frac{3}{2}$



Perimeter: $\frac{3}{2} = \frac{72}{p}$

$3p = 144$

$\boxed{p = 48 \text{ cm}}$

Area: $\left(\frac{3}{2}\right)^2 = \frac{315}{A}$

$\frac{9}{4} = \frac{315}{A}$

$9A = 1260$ so $\boxed{A = 140 \text{ cm}^2}$