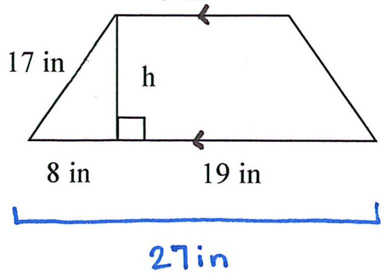
g.)



Trapezoid

$A = \frac{h(b_1+b_2)}{2}$

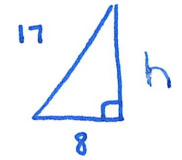
$A = \frac{15(9+27)}{2}$

$A = 270 \text{ in}^2$

$b_1 = 9\text{in}$

$b_2 = 27\text{in}$

$h = 15 \text{ in}$



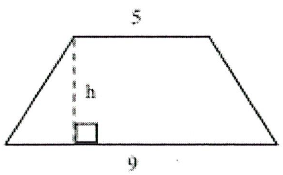
$h^2 + 8^2 = 17^2$

$h^2 = 225$

$h = 15$

Example #2: Use the given information to find the missing value.

a.) Trapezoid Area = 42 ft^2



$b_1 = 5\text{ ft}$

$b_2 = 9\text{ ft}$

$A = 42 \text{ ft}^2$

$A = \frac{h(b_1+b_2)}{2}$

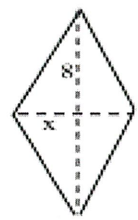
$42 = \frac{h(5+9)}{2}$

$42 = \frac{14h}{2}$

$\frac{42}{7} = \frac{7h}{7}$

$h = 6\text{ ft}$

b.) Rhombus Area= 48cm^2



$d_1 = 16\text{cm}$

$d_2 = 2x$

$A = 48\text{cm}^2$

$A = \frac{1}{2} d_1 \cdot d_2$

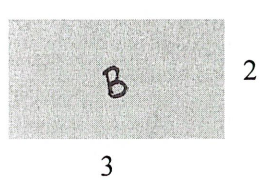
$48 = \frac{1}{2}(16)(2x)$

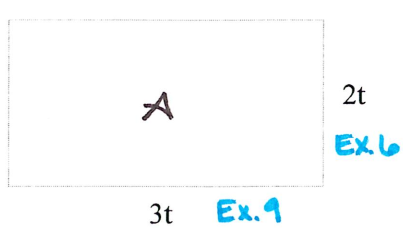
$\frac{48}{16} = \frac{16x}{16}$

$x = 3\text{cm}$

Chapter 11.3: Perimeter and Area of Similar Figures

Back in Chapter 6 you learned that if two polygons are similar, then the ratio of their perimeters, or of any two corresponding lengths, is equal to the ratio of their corresponding side lengths. Areas, however, have a different ratio. * Example: Let $t = 3$





$P = 3+2+3+2$

$P = 10 \text{ units}$

$A = (3)(2)$

$A = 6 \text{ units}^2$

$P = 3t + 2t + 3t + 2t$

$P = 10t \text{ units}$

$A = (3t)(2t)$

$A = 6t^2 \text{ units}^2$

Ex. $P = 6+9+6+9 = 30$

$A = (6)(9) = 54$

* A : B *

Ratio of Perimeters/corresponding sides

Ratio: $\frac{10t}{10} = t$ ("K"-value)

EX: Perimeter Ratio : $\frac{30}{10} = 3$

corr. side Ratio : $\frac{6}{2} = 3$ Same

Ratio of Areas * A : B *

Ratio: $\frac{6t^2}{6} = t^2$ ("K"-value squared)

EX: Area Ratio: $\frac{54}{6} = 9$

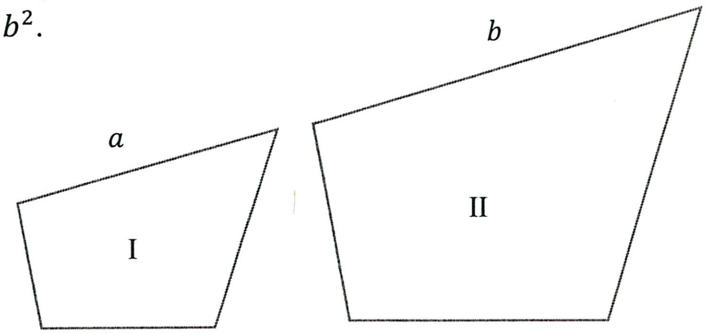
(which is 3^2)

Areas of Similar Polygons (Theorem 11.7):

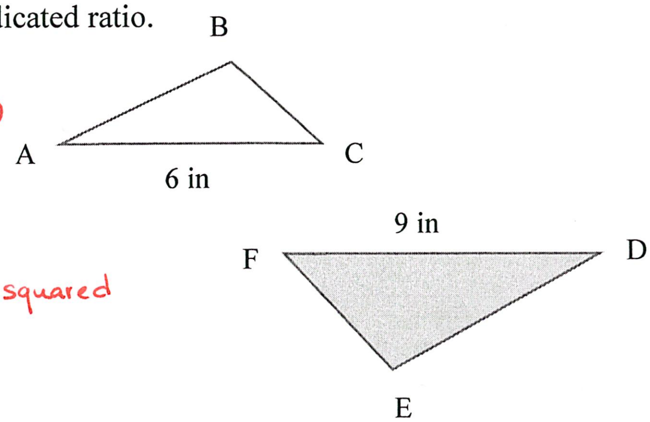
If two polygons are similar with the lengths of corresponding sides in the ratio of $a : b$, then the ratio of their area is $a^2 : b^2$.

$$\frac{\text{Side length of Polygon 1}}{\text{Side length of Polygon II}} = \frac{a}{b}$$

$$\frac{\text{Area of Polygon 1}}{\text{Area of Polygon II}} = \frac{a^2}{b^2}$$



Example #1: In the diagram, $\triangle ABC \sim \triangle DEF$. Find the indicated ratio.



a.) Ratio (shaded to unshaded) of the perimeters (same as the side ratio)

top bottom

$$\frac{9}{6} \xRightarrow{(\div 3)} \frac{3}{2}$$

b.) Ratio (shaded to unshaded) of the areas. ← side ratio squared

top bottom

$$\frac{3^2}{2^2} = \frac{9}{4}$$

Example #2: Fill-in the (simplified) ratios that missing in the chart.

reduced as much as possible

Ratio of corresponding side lengths	Ratio of Perimeters	Ratio of Areas
5:8 — same —	5 : 8	25 : 64 ← ($5^2 : 8^2$)
4:7 — same —	4:7	16 : 49 ← ($4^2 : 7^2$)
13:6 — same —	13 : 6 ← ($\sqrt{169} : \sqrt{36}$)	169:36
66:18= 11:3 — same —	11:3	121 : 9 ← ($11^2 : 3^2$)

Example #3: The ratio of the areas of two similar figures is given. Write the ratio of the lengths of corresponding sides.

a.) Ratio of areas = 16:81 ⇒ 4:9

$\sqrt{16} = 4$

$\sqrt{81} = 9$

b.) Ratio of areas =144:49 ⇒ 12:7

$\sqrt{144} = 12$

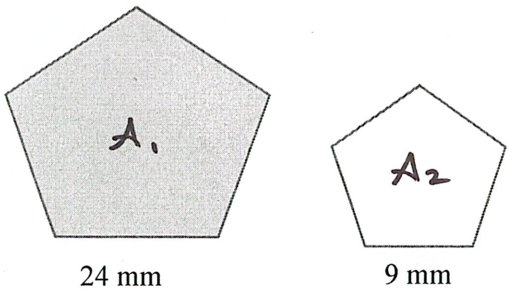
$\sqrt{49} = 7$

*P/S Ratio ⇒ Perimeter - Side Ratio

Example #4: Corresponding lengths in similar figures are given. Find the ratios (shaded to unshaded) of the perimeters and areas. Find the unknown area. ← Since we are finding area, we need to use the area ratio

top bottom

a.) Shaded Area= 1024 mm^2



P/S Ratio = $\frac{24}{9} \xrightarrow{(\div 3)} \frac{8}{3}$

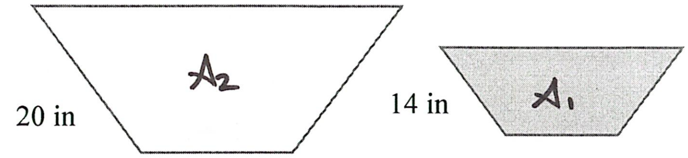
Area Ratio = $\frac{8^2}{3^2} \Rightarrow \frac{64}{9}$

$\frac{64}{9} = \frac{1024}{A_2}$

$\frac{64A_2}{64} = \frac{9216}{64}$

$A_2 = 144 mm^2$

b.) Unshaded Area= 400 in^2



P/S Ratio= $\frac{14}{20} \xrightarrow{(\div 2)} \frac{7}{10}$

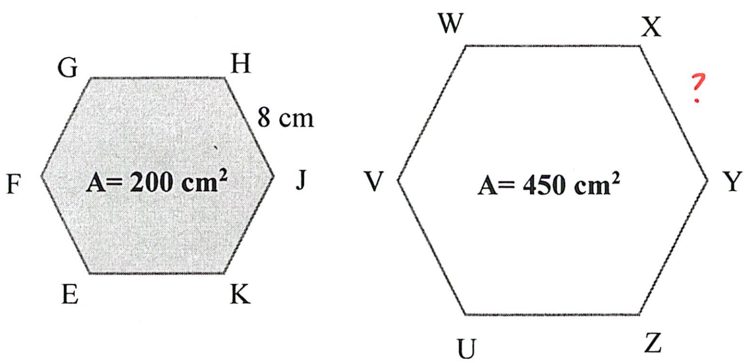
Area Ratio = $\frac{7^2}{10^2} \Rightarrow \frac{49}{100}$

$\frac{49}{100} = \frac{A_1}{400}$

$\frac{19600}{100} = \frac{100A_1}{100}$

$A_1 = 196 in^2$

Example #5: If EFGHJK~UVWXYZ, then use the given area to find XY ← Since we are finding a side length, we need to use the P/S ratio.



Area Ratio = $\frac{200}{450} \xrightarrow{(\div 50)} \frac{4}{9}$

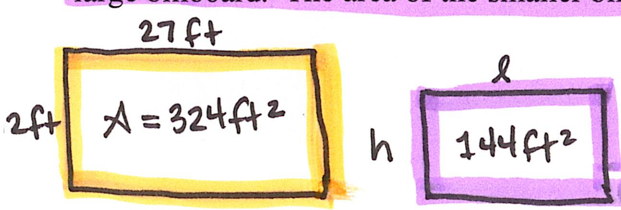
P/S Ratio = $\frac{\sqrt{4}}{\sqrt{9}} \Rightarrow \frac{2}{3}$

$\frac{2}{3} = \frac{8}{XY} \Rightarrow \frac{2XY}{2} = \frac{24}{2}$

$XY = 12 cm$

Example #6: A large rectangular billboard is 12 feet high and 27 feet long. A smaller billboard is similar to the large billboard. The area of the smaller billboard is 144 square feet. Find the height of the smaller billboard.

Since we are finding a side length, we need to use the P/S ratio.



Area Ratio = $\frac{144}{324} \xrightarrow{(\div 36)} \frac{4}{9}$

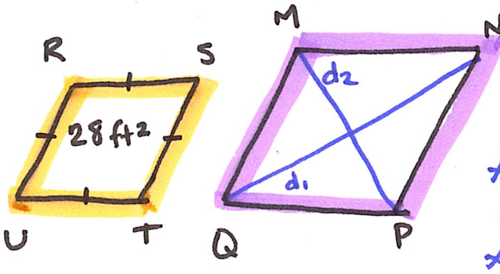
P/S Ratio = $\frac{\sqrt{4}}{\sqrt{9}} \Rightarrow \frac{2}{3}$

$\frac{2}{3} = \frac{h}{12}$

$\frac{24}{3} = \frac{3h}{3}$

$h = 8 ft$

Example #7: Rhombuses MNPQ and RSTU are similar. The area of RSTU is 28 square feet. The diagonals of MNPQ are 25 feet long and 14 feet long. Find the area of MNPQ. Then use the ratio of the areas to find the lengths of the diagonals of RSTU. ← need to use P/S ratio



Rhombus

$A = \frac{1}{2} d_1 \cdot d_2$

$A = \frac{1}{2}(25)(14)$

$A = 175 ft^2$

Area Ratio $= \frac{28}{175} \overset{(\div 7)}{\Rightarrow} \frac{4}{25}$

P/S Ratio $= \frac{\sqrt{4}}{\sqrt{25}} \Rightarrow \frac{2}{5}$

$A = 28 ft^2$ $d_1 = 25 ft$

d_1 = long $d_2 = 14 ft$

d_2 = short

$\frac{2}{5} = \frac{d_1}{25}$ $\frac{2}{5} = \frac{d_2}{14}$

$\frac{50}{5} = \frac{5d_1}{5}$ $\frac{28}{5} = \frac{5d_2}{5}$

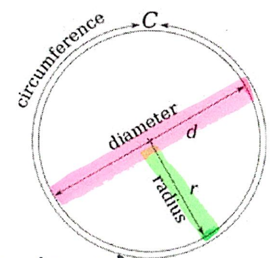
$d_1 = 10 ft$ $d_2 = 5.6 ft$

Chapter 11.4: Circumference and Arc Length

Circumference of a Circle (Theorem 11.8):

The circumference C of a circle is $C = d\pi$ OR $C = 2\pi r$

Where d is the diameter of the circle and r is the radius of the circle



Exact Measure:

Putting your answers in terms of π. (NO DECIMALS)

EX. $d = 8 in$ $C = 8\pi in$ $C = 25.1327...$

Exact

Approx. because @ some point you would need to round the answer.

Example #1: Find the indicated measure.

a.) Circumference of a circle with radius 9 cm

$C = 2\pi r \Rightarrow C = 2\pi(9)$

Exact → $C = 18\pi cm$

Approximate → $C \approx 56.55 cm$

b.) Radius of a circle with circumference 26 m

$C = 2\pi r \Rightarrow \frac{26}{2\pi} = \frac{2\pi \cdot r}{2\pi}$

Exact → $\frac{13}{\pi} m = r$

Approximate → $4.14 m \approx r$