11.3

2) Two regular n-gons are similar. The ratio of their side lengths is 3:4. Do you need to know the value of n to find the ratio of the perimeters or the ratio of the areas?

NO b/c the ratio of the sides is equal to the ratio of the perimeter. and the ratio of the area is the ratio of sides squared (9:16).

	Ratio of corresponding side lengths	Ratio of Perimeters	Ratio of Areas
3)	6:11	6:11	36:121
4)	5:9	20:36 = 5:9	25:81

Find the ratios (red to blue) of the perimeters and areas. Find unknown area.

5) $A=2ft^2$, $A=?$, 2ft, 6ft

Ratio of: Perimeter $\frac{2}{6}=\frac{1}{3}$ $\xrightarrow{x^2}$ Area $\frac{1}{9}$

Ratio Area = Area

$\frac{1}{9}=\frac{2}{x}$

$x=18$

$A=18ft^2$

6) $A=?$, $A=240\,cm^2$, 15cm, 20cm

Ratio of: Perimeter $\frac{15}{20}=\frac{3}{4}$ $\xrightarrow{x^2}$ Area $\frac{9}{16}$

Ratio Area = Area

$\frac{9}{16}=\frac{x}{240}$

$16x=2160$

$x=135$

$A=135\,cm^2$

7) $A=?$, $A=210\,in^2$, 7in, 9in

Ratio of Perimeter $\frac{7}{9}$ $\xrightarrow{x^2}$ Area $\frac{49}{81}$

Ratio Area = Area

$\frac{49}{81}=\frac{x}{210}$

$81x=10290$

$x=127.0$

$A\approx 127\,in^2$

8) $A=40\,yd^2$, $A=?$, 5yd, 3yd

Ratio of Perimeter $\frac{5}{3}$ $\xrightarrow{x^2}$ Area $\frac{25}{9}$

Ratio Area = Area

$\frac{25}{9}=\frac{40}{x}$

$25x=360$

$x=14.4$

$A=14.4\,yd^2$

write the ratio of the corresonding side lengths.

9) Ratio of areas = 49:16

$\frac{a^2}{b^2}=\frac{49}{16}$ $\xrightarrow{\sqrt{x}}$ $\frac{a}{b}=\frac{7}{4}$

10) Ratio of areas = 16:121

$\frac{a^2}{b^2}=\frac{16}{121}$ $\xrightarrow{\sqrt{x}}$ $\frac{a}{b}=\frac{4}{11}$

11) Ratio of areas = 121:144

$\frac{a^2}{b^2}=\frac{121}{144}$ $\xrightarrow{\sqrt{x}}$ $\frac{a}{b}=\frac{11}{12}$

12) The area of $\triangle LMN$ is $18ft^2$ and the area of $\triangle FGH$ is $24ft^2$. If $\triangle LMN \sim \triangle FGH$, what is the ratio of LM to FG?

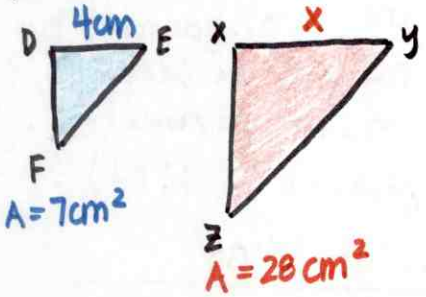
[A] 3:4 [B] 9:16

[C] $\sqrt{3}:2$ [D] 4:3

$\frac{\triangle LMN}{\triangle FGH}$ Ratio of Area $\frac{18}{24}=\frac{3}{4}$ $\xrightarrow{\sqrt{x}}$ Ratio of Perimeter/side $\frac{\sqrt{3}}{\sqrt{4}}=\frac{\sqrt{3}}{2}$

use the given area to find xy.

13) $\triangle DEF \sim \triangle XYZ$



Ratio of: Areas $\frac{7}{28} = \frac{1}{4} \xrightarrow{\sqrt{x}} \frac{1}{2}$ sides

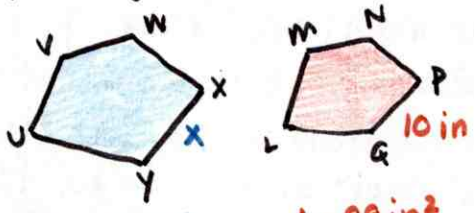
Ratio sides = sides

$\frac{1}{2} = \frac{4}{x}$

$x = 8$

$xy = 8$ cm

14) $UVWXY \sim LMNPQ$



Ratio of: Areas $\frac{198}{88} = \frac{9}{4} \xrightarrow{\sqrt{x}} \frac{3}{2}$ sides

Ratio sides = sides

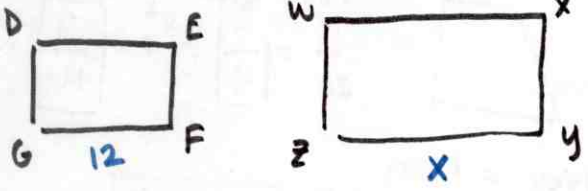
$\frac{3}{2} = \frac{x}{10}$

$2x = 30$

$x = 15$

$xy = 15$ in

15) Rectangles DEFG and WXYZ are similar. The ratio of the area of DEFG to the area of WXYZ is 1:4. Describe and correct the error in finding ZY.



$ZY = 4(12)$

$= 48$

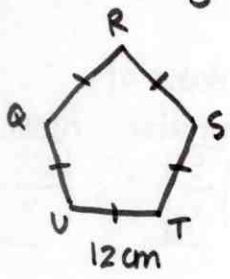
✗ can't use area ratio to find a side

Ratio of Areas $\frac{1}{4} \xrightarrow{\sqrt{x}} \frac{1}{2}$ Ratio of sides ✓

$\frac{1}{2} = \frac{12}{x}$

$ZY = 24$

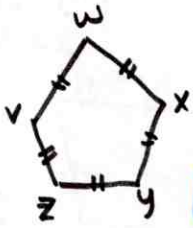
16) Regular pentagon QRSTU has a side length of 12 cm and an area of about 248 cm². Regular pentagon VWXYZ has a perimeter of 140 cm. Find its area.



$s = 12$ cm

$A = 248$ cm²

$P = 5(12)$



$P = 140$ cm

$s = 140/5$

$s = 28$ cm

$A = 1350$ cm²

Ratio sides $\frac{12}{28} = \frac{3}{7} \xrightarrow{x^2} \frac{9}{49}$ Ratio Areas

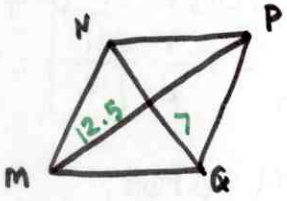
Ratio Areas = Area

$\frac{9}{49} = \frac{248}{x}$

$9x = 12152$

$x = 1350.\overline{2}$

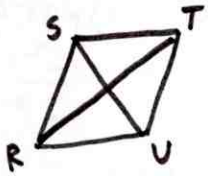
17) Rhombuses MNPQ and RSTU are similar. The area of RSTU is 28 ft². The diagonals of MNPQ are 25 ft and 14 ft. Find the area of MNPQ. Then use the ratio of the areas to find the lengths of the diagonals of RSTU.



$mP = 25$ ft

$NQ = 14$ ft

$A = 175$ ft²



$A = 28$ ft²

$RT = 10$ ft

$SU = 5.6$ ft

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

$A = 175$ ft²

Ratio of Area $\frac{175}{28} = \frac{25}{4} \xrightarrow{\sqrt{x}} \frac{5}{2}$ Ratio of sides

Ratio sides = sides

$\frac{5}{2} = \frac{25}{RT}$

$5(RT) = 50$

$RT = 10$

$\frac{5}{2} = \frac{14}{SU}$

$5(SU) = 28$

$SU = 5.6$

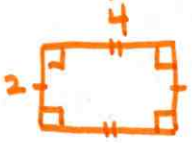
18) You enlarge the same figure 3 different ways. In each case, the enlarged figure is similar to the original. List the enlargements in order from smallest to largest. Explain

CASE 1 The side lengths of the original figure are multiplied by 3.

CASE 2 The perimeter of the original figure is multiplied by 4.

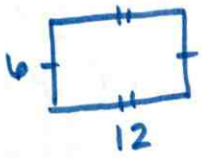
CASE 3 The area of the original figure is multiplied by 5.

Example of original figure



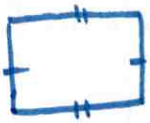
P = 12
A = 8

CASE 1



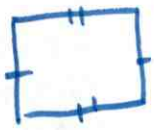
P = 36
A = 72

CASE 2



P = 4(12)
= 48

CASE 3



A = 5(8)
= 40

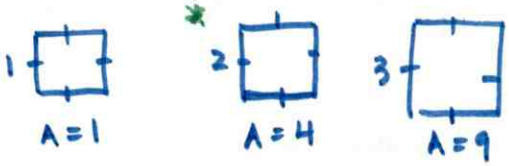
original to Case 1
Ratio of Sides: $\frac{12}{36} = \frac{1}{3}$
Areas: $\frac{1}{9}$

original to Case 2
Ratio of Sides: $\frac{12}{48} = \frac{1}{4}$
Areas: $\frac{1}{16}$

original to Case 3
Ratio of Areas: $\frac{8}{40} = \frac{1}{5}$
Sides: $\frac{1}{\sqrt{5}}$

Smallest to largest: Case 3, 1, 2

19) Doubling the side length of a square **sometimes** doubles the area.

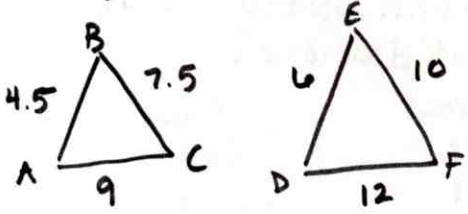


only when the side length is 2 the area is double.

4 | A = 16

20) Two similar octagons **sometimes** have the same perimeter.
only when the octagons are also congruent.

21) The sides of $\triangle ABC$ are 4.5 ft, 7.5 ft and 9 ft long. The area is about 17 ft^2. Explain how to use the area of $\triangle ABC$ to find the area of $\triangle DEF$ with side lengths of 6 ft, 10 ft, and 12 ft long.



$A = 17\ ft^2$

A =

The two triangles are similar.

$\frac{\triangle ABC}{\triangle DEF}$ $\frac{4.5}{6} = \frac{7.5}{10} = \frac{9}{12} = \frac{3}{4}$ is $\frac{a}{b}$

Ratio of the areas is $\frac{3}{4} \xrightarrow{x^2} \frac{9}{16}$

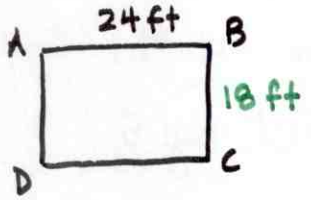
use the ratio of the are to find $\triangle DEF$ is area

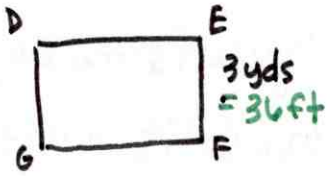
Ratio of Area = Area

$\frac{9}{16} = \frac{17}{x}$

$x = 30.2\ ft^2$

22) Rectangle ABCD and DEFG are similar. The length of ABCD is 24 ft and the perimeter is 84 ft. The width of DEFG is 3 yds. Find the ratio of the area of ABCD to the area of DEFG.





Ratio of sides $\frac{BC}{EF}$ $\frac{18}{36} = \frac{1}{2}$ $\xrightarrow{x^2}$ Ratio of Areas $\boxed{\frac{1}{4}}$

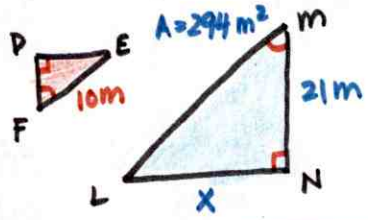
$\frac{18}{9} = \frac{2}{1}$ $\rightarrow \frac{4}{1}$

P = 84 ft.

$P = 2l + 2w$
$84 = 2(24) + 2w$
$84 = 48 + 2w$
$36 = 2w$
$w = 18$

Explain why the red and blue triangles are similar. Find the ratio (red to blue) of the areas of the triangles. Show your steps

23)



$\triangle DEF \sim \triangle NLM$ by AA

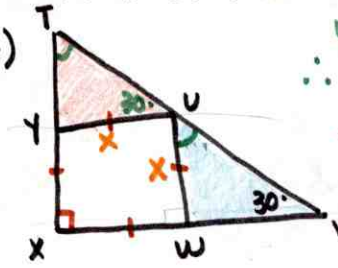
① $294 = \frac{21(LN)}{2}$
$588 = 21LN$
$LN = 28$

② $(LM)^2 = 21^2 + 28^2$
$(LM)^2 = 441 + 784$
$(LM)^2 = 1225$
$LM = 35$

③ Ratio Sides $\frac{FE}{ML} = \frac{10}{35} = \frac{2}{7}$

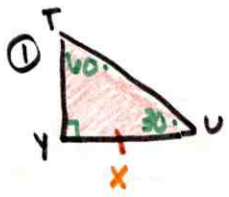
④ Ratio Areas $\frac{2}{7} \xrightarrow{x^2} \boxed{\frac{4}{49}}$

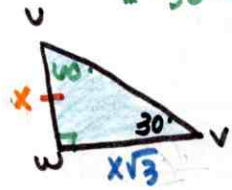
24)



wxyu is a square
$\therefore \overline{yu} \parallel \overline{xw}$ and $\overline{yx} \parallel \overline{uw}$

$\angle YTU \cong \angle WUV$ CA
$\angle YUT \cong \angle WVU$ CA
$\therefore \triangle TYU \sim \triangle UWV$ AA
* 30°-60°-90°

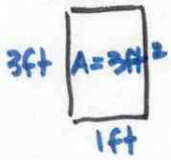




② Ratio of sides $\frac{YU}{WV} = \frac{X}{X\sqrt{3}} = \frac{1}{\sqrt{3}}$

③ Ratio Areas $\frac{1}{\sqrt{3}} \xrightarrow{x^2} \frac{(1)^2}{(\sqrt{3})^2} = \boxed{\frac{1}{3}}$

26) Two rectangular banners are shown. Organizers want a new banner to be similar to the banner whose dimensions are shown. The length of the longest side of the new banner will be 5 ft. What will be the area of the new banner?



A (original) = 3(1)
$= 3 ft^2$

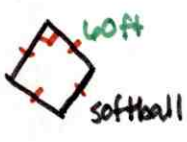
$\boxed{A(NEW) = 8.\overline{3} ft^2}$ or $8\frac{1}{3}$

Ratio sides $\frac{3}{5} \xrightarrow{x^2}$ Areas $\frac{9}{25}$

Ratio Areas = Areas
$\frac{9}{25} = \frac{3}{x}$
$9x = 75$
$x = 8.\overline{3}$

28) you need 20 pounds of grass seed to plant grass inside the baseball diamond. About how many pounds do you need to plant inside the softball diamond?

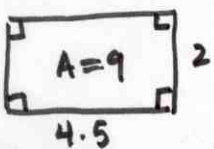
A 6 B 9
C 13 D 20



Ratio sides $\frac{60}{90} = \frac{2}{3} \xrightarrow{x^2}$ Areas $\frac{4}{9}$

$\frac{4}{9} = \frac{x \text{ lbs}}{20 \text{ lbs}}$
$x = 8.88$

32) The ratio of the areas of two similar polygons is 9:6. Draw two polygons to fit the description. Find the ratio of their perimeters. Then write the ratio in simplest radical form.



Ratio Areas $\frac{9}{6} \xrightarrow{\sqrt{x}}$ Ratio Perimeters $\frac{3}{\sqrt{6}}$

$\frac{3}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{3\sqrt{6}}{6} = \frac{1\sqrt{6}}{2}$

$\boxed{\sqrt{6} : 2}$