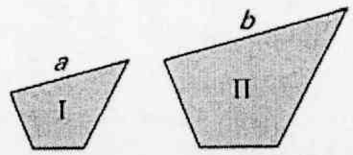
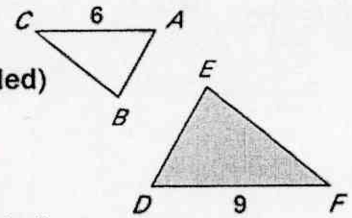
Section 11.3 Date ______

Perimeter and Area of Similar Figures

VOCABULARY	DEFINITION	EXAMPLE
THEOREM 11.7 AREA of SIMILAR POLYGONS	If two polygons are similar with lengths of corresponding sides in the ratio of a:b, then the ratio of their areas is $a^2 : b^2$. Ratio of sides $\frac{a}{b} \xrightarrow{x^2}$ Area $\frac{a^2}{b^2}$ *Ratio of the perimeters of similar polygons are $a:b$ by Theorem 6.1. (same as ratio of sides)	 Polygon I ~ Polygon II $\frac{\text{Side length of Polygon I}}{\text{Side length of Polygon II}} = \frac{a}{b}$ $\frac{\text{Area of Polygon I}}{\text{Area of Polygon II}} = \frac{a^2}{b^2}$ Ratio sides/perimeter $\frac{a}{b} \xrightarrow{x^2}$ Ratio Areas $\frac{a^2}{b^2}$; $\xleftarrow{\sqrt{x}}$ Ratio Areas = Areas $\frac{a^2}{b^2} = \frac{A(I)}{A(II)}$

EXAMPLES:

In the diagram, $\triangle ABC \sim \triangle DEF$. Find the indicated ratio.



a. Ratio (shaded to unshaded) of the perimeters

$\frac{DF}{AC} = \frac{9}{6} = \boxed{\frac{3}{2}}$ $\frac{a}{b}$

b. Ratio (shaded to unshaded) of the areas

$\frac{a}{b} = \frac{3}{2}$ then $\frac{a^2}{b^2} = \frac{3^2}{2^2} = \boxed{\frac{9}{4}}$

Rectangles I and II are similar. The perimeter of Rectangle I is 48 inches. Rectangle II is 30 inches by 18 inches. Find the area of Rectangle I.

I: $P = 48in$ $\boxed{A = 135in^2}$

II: 30in, 18in

$P = 2(30) + 2(18)$ $A = 30(18)$

$P = 96in$ $A = 540in^2$

Ratio of Sides Ratio Areas

$\frac{I}{II}$ $\frac{48}{96} = \frac{1}{2} \xrightarrow{x^2} \frac{1}{4}$

Ratio Areas = Areas

$\frac{1}{4} = \frac{x}{540}$

$4x = 540$

$x = 135$

Billboards 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.

12ft, 27ft, $A = 324ft^2$

$A = 12(27)$

$A = 144ft^2$, h

$\boxed{h = 8ft}$

Ratio Areas Ratio sides

$\frac{324}{144} = \frac{9}{4} \xrightarrow{\sqrt{x}} \frac{3}{2}$

Ratio sides = sides

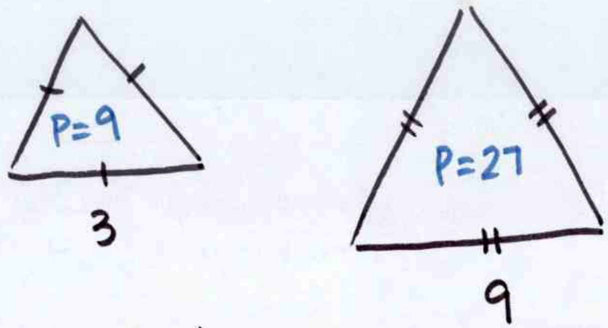
$\frac{3}{2} = \frac{12}{h}$

$3h = 24$

$h = 8$

Stop sign A stop sign rug is a regular octagon. Each side is 2 feet and the area is about 19.3 square feet. You make a stop sign mat with a perimeter of 72 inches. Find the area of the mat to the nearest tenth of a square inch.

omit



Ratio of Sides: $\frac{3}{9} = \boxed{\frac{1}{3}}$

Ratio of Perimeters: $\frac{9}{27} = \boxed{\frac{1}{3}}$

same

Ratio of sides = Ratio Perimeters

$\frac{a}{b} = \frac{1}{3} \quad = \quad \frac{a}{b} = \frac{1}{3}$

Ratios of Sides $\quad$ Ratio of Areas

$\frac{a}{b} = \frac{1}{3} \xrightarrow{x^2} \frac{a^2}{b^2} = \frac{1}{9}$

Ratio Sides/Perimeter	Ratio Areas
$a:b$	$a^2:b^2$
1	1
2	4
3	9
4	16
5	25
x	x^2
$\sqrt{x}$	x
20 $\xleftarrow{\sqrt{x}}$	400