# Section 11.3
## Perimeters and Areas of Similar Figures

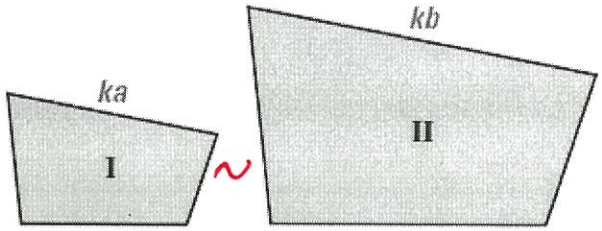
**THEOREM**

**THEOREM 11.5** *Areas of Similar Polygons*

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

PERIMETER $\frac{\text{Side length of Quad. I}}{\text{Side length of Quad. II}} = \frac{a}{b}$

AREAS $\frac{\text{Area of Quad. I}}{\text{Area of Quad. II}} = \frac{a^2}{b^2}$

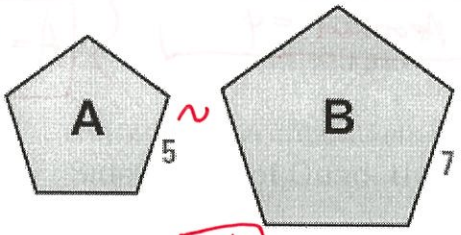



Quad. I ~ Quad. II

*Examples*

The polygons are similar. Find the ratio (A to B) of their perimeters and of their areas.

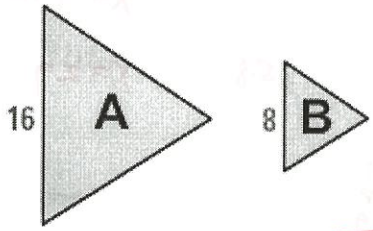
1.




PERIMETER $= \frac{5}{7}$

AREAS $= \frac{5^2}{7^2} = \frac{25}{49}$

2.




PERIMETER $= \frac{16}{8} = \frac{2}{1}$

AREAS $= \frac{2^2}{1^2} = \frac{4}{1}$

Solve.

3. The ratio of the lengths of corresponding sides of two similar polygons is 5:12. What is the ratio of their areas?

PERIMETER $= \frac{5}{12} \rightarrow$ AREAS $= \frac{5^2}{12^2} = \frac{25}{144}$

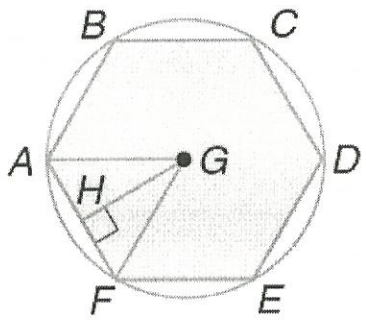
4. The ratio of the areas of two similar triangles is 16:9. What is the ratio of the lengths of corresponding sides?

AREAS $= \frac{16}{9} \rightarrow$ PERIMETERS $= \frac{\sqrt{16}}{\sqrt{9}} = \frac{4}{3}$

5. The ratio of the lengths of corresponding sides of two similar triangles is 3:7. The smaller triangle has an area of 18 $cm^2$. What is the area of the larger triangle?

AREAS $= \frac{3^2}{7^2} = \frac{9}{49} \rightarrow \frac{9}{49} = \frac{18}{x} \rightarrow x = 98$

# Section 11.2B
# Areas of Regular Polygons



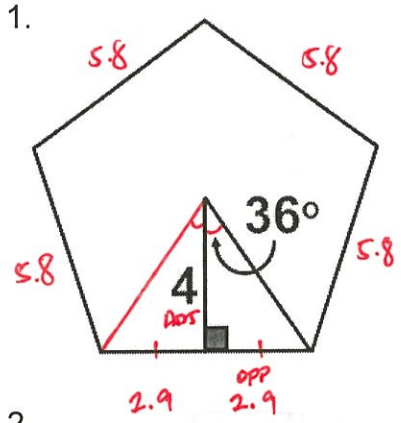

## Area of a Regular Polygon

$$Area\ of\ a\ Regular\ Polygon = \frac{Perimeter\ of\ polygon \bullet Apothem}{2}$$

*Examples*

Find the area of a regular polygons.

1.




$\tan 36° = \frac{x}{4}$

$x = 4 \tan 36°$

$x = 2.9$

PERIMETER $= 5.8(5)$

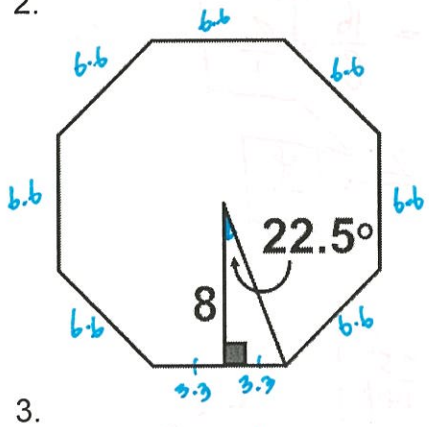
PERIMETER $= 29$

APOTHEM $= 4$

$A = \frac{29(4)}{2}$

$A = 58$ UNITS$^2$

2.




$\tan 22.5° = \frac{x}{8}$

$x = 8 \tan 22.5°$

$x = 3.3$

PERIMETER $= 6.6(8)$

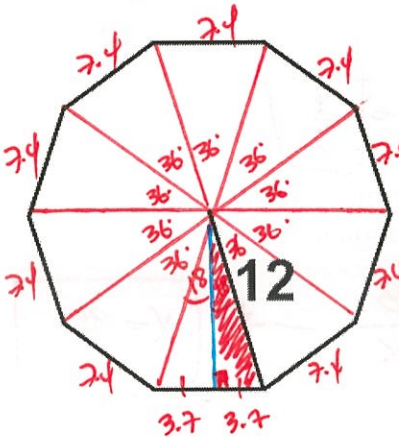
PERIMETER $= 52.8$

APOTHEM $= 8$

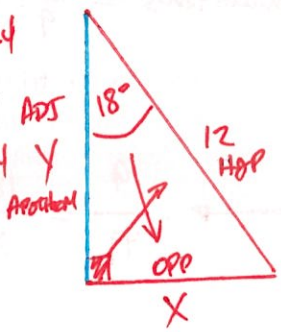
$A = \frac{52.8(8)}{2}$

$A = 211.2$ UNITS$^2$

3.




$\frac{360°}{10} = 36°$




$\sin 18° = \frac{x}{12}$

$x = 12 \sin 18°$

$x = 3.7$

PERIMETER $= 7.4(10)$

PERIMETER $= 74$

$\cos 18° = \frac{y}{12}$

$y = 12 \cos 18°$

$y = 11.4$ (APOTHEM)

$A = \frac{74(11.4)}{2}$

$A = 421.8$ UNITS$^2$