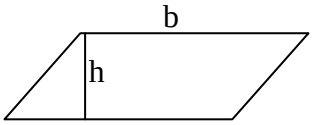
Popper #19
5 As

Math 1312
Section 8.1 - 8.2
Perimeter and Area of Polygons

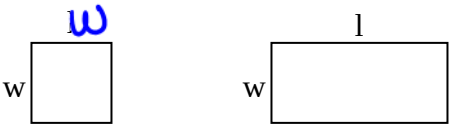
Area and Perimeter formulas

l = length	w = width
P = perimeter	b = base
h = height	d = diagonal
r = radius	m = median
a = apothem	

1. Parallelogram: $A = bh$

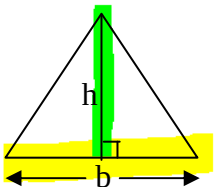


2. Rectangle/square: $A = lw$

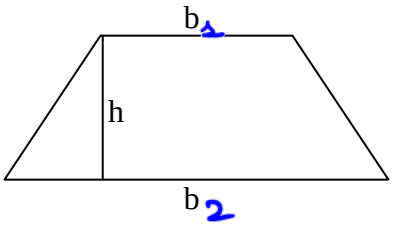


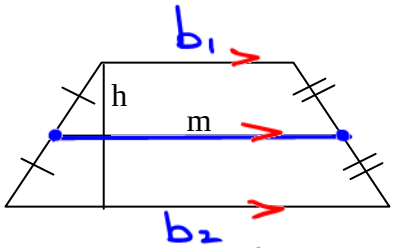
$A = w^2$

3. Triangle: $A = \frac{1}{2}bh$



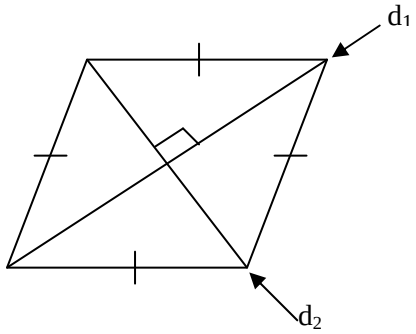
4. Trapezoid: $A = \frac{1}{2}h(b_1 + b_2)$ OR $A = mh$





$m = \frac{1}{2}(b_1 + b_2)$

5. Rhombus and kite: $A = \frac{1}{2} d_1 d_2$



Heron's Formula: For any triangle with sides of lengths a, b and c, the area is found by $A = \sqrt{s(s-a)(s-b)(s-c)}$ where s is the *semi*perimeter of ΔABC

$\left(s = \frac{1}{2}(a+b+c)\right)$

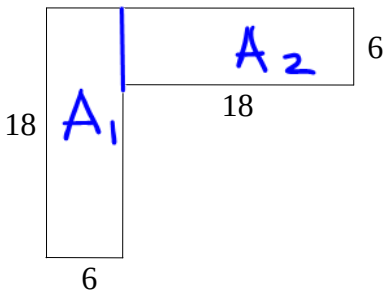
Brahmagupta's Formula: For a quadrilateral with sides a, b, c, and d the area is

$A = \sqrt{(s-a)(s-b)(s-c)(s-d)} \quad \left(s = \frac{1}{2}(a+b+c+d)\right)$

Theorem: The ratio of the areas of two similar triangles (or any similar polygons) equals the squares of the ratios of the lengths of any two corresponding sides.

$$\frac{A_1}{A_2} = \left(\frac{s_1}{s_2}\right)^2$$

Example 1: What is the total area of the figure below:

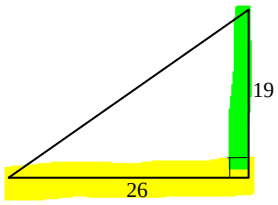


$A = A_1 + A_2$

$= 18(6) + 18(6)$

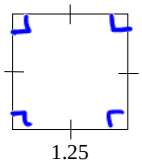
$= 108 + 108 = 216$

Example 2: Find the area of each figure below:



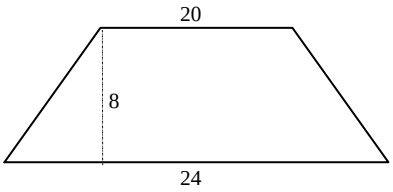
$A = \frac{1}{2}bh$

$= \frac{1}{2}(19)(26) = \boxed{247}$



$A = (1.25)^2 = \boxed{1.5625}$

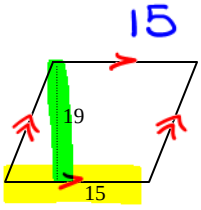
ℓ	P	A
in	in	in^2
cm	cm	cm^2
m	m	m^2



$A = \frac{1}{2}h(b_1 + b_2)$

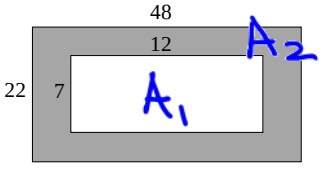
$= \frac{1}{2}(8)(20+24)$ (4)

$= 4(44) = \boxed{176}$



$A = bh$

$= 19(15) = \boxed{285}$

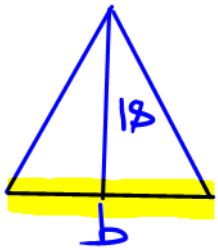


$A_{shaded} = A_2 - A_1$

$= 22(48) - 7(12)$

$= \boxed{972}$

Example 3: The area of a triangle is 216 square-units. If the height is 18 units, what is the length of the base?



$A = \frac{1}{2}hb$

$216 = \frac{1}{2}(18)b$

$\frac{216}{9} = \frac{9b}{9}$

$b = 24$ units

Example 4: The diagonals of a rhombus are 21 and 16 centimeters long. Find the area of the rhombus.

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

$A = \frac{1}{2}(21)(16) = 168\ cm^2$

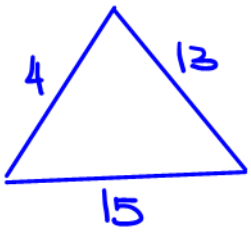
Example 5: Compare the areas of two similar triangles in which each side of the first triangle 3 times as long as each side of the second.

$\frac{A_1}{A_2} = \left(\frac{s_1}{s_2}\right)^2 = \left(\frac{3s_2}{s_2}\right)^2 = 9$

$\frac{A_1}{A_2} = 9 \qquad A_1 = 9A_2$

A_1 is 9 times larger than A_2.

Example 6: Find the area of a triangle with sides 4, 13, 15.



$$s = \frac{1}{2}(a+b+c)$$

$$s = \frac{1}{2}(4+13+15) = 16$$

$$A = \sqrt{s(s-a)(s-b)(s-c)}$$

$$A = \sqrt{16(16-4)(16-13)(16-15)}$$

$$= \sqrt{16(12)(3)} = \sqrt{16}\sqrt{36} = 4(6) = \boxed{24}$$