Name: _____

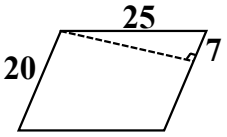
Determining Area When Parts are Missing

For two-dimensional area, most of the pieces that you need in order to determine area meet at a right angle. This means that they often create hidden right triangles inside of a figure. Up to this point, the parts of the figure that you have needed have been given. Today, you have to figure out what those lengths are. This is where those right triangles will come in handy.

We know three ways to determine the sides of a right triangle: the Pythagorean theorem ($a^2 + b^2 = c^2$), trigonometry (sin, cos, & tan), and special triangles (30-60-90).

For each figure below, use these methods to **determine the height or apothem** of the figure. Then, **determine area.**

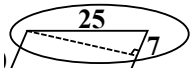
EXAMPLE



$\boldsymbol{A = bh}$, *b=20, but h=?*

I have two sides of a right triangle…

Pythagorean theorem!



$a^2 + b^2 = c^2$

$h^2 + 7^2 = 25^2$

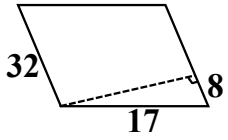
$h^2 + 49 = 625$

$h^2 = 576$

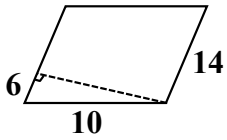
$h = \sqrt{576} = 24$

$A = bh = (20)(24) = \boxed{480}$

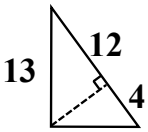
1.



2.

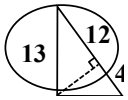


EXAMPLE



$\boldsymbol{A = \frac{bh}{2}}$, $b = 12 + 4 = 16, h =$?

Pythagorean Theorem!



$a^2 + b^2 = c^2$

$h^2 + 12^2 = 13^2$

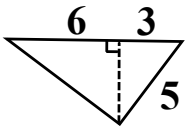
$h^2 + 144 = 169$

$h^2 = 25$

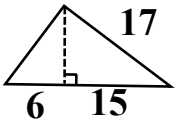
$h = \sqrt{25} = 5$

$A = \frac{bh}{2} = \frac{(16)(5)}{2} = (8)(5) = \boxed{40}$

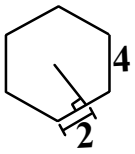
3.



4.

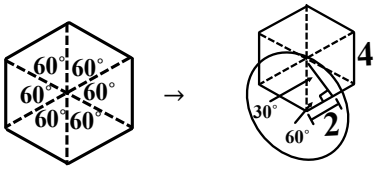


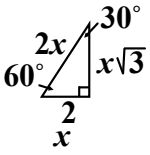
EXAMPLE



$\boldsymbol{A = \frac{aP}{2}}, a = ?, P = ?$

We need triangles in order to solve foe the apothem length. If you break the hexagon up using the diagonals you get 6 triangles with a center angle of 60˚, because 360÷6=60.

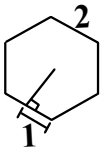




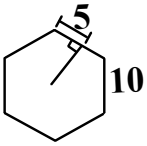
The apothem cuts the big triangle in half, creating a 30-60-90 triangle. Use special triangles (or trig).

$a = x\sqrt{3} = 2\sqrt{3}$
$P = (6)(4) = 24$
$A = \frac{2\sqrt{3}(24)}{2} = \sqrt{3}(12) = \boxed{12\sqrt{3}}$

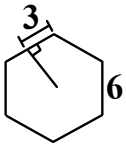
5.



6.

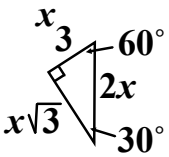


EXAMPLE



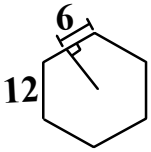
$\boldsymbol{A = \frac{aP}{2}}, a = ?, P = ?$

This is another hexagon. Create 6 congruent triangles (60˚ angles). The apothem will cut one of them in half to create a 30-60-90 triangle. Simplify to find the apothem.



$a = x\sqrt{3} = 3\sqrt{3}$
$P = (6)(6) = 36$
$A = \frac{3\sqrt{3}(36)}{2}$
$A = 3\sqrt{3}(18)$
$A = \boxed{54\sqrt{3}}$

7.



8.