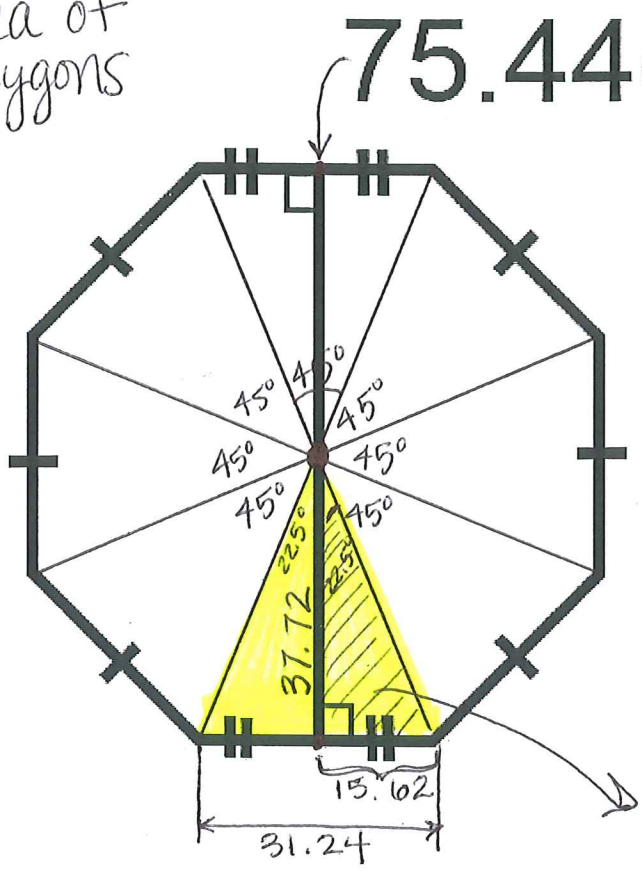
11-3 Area of Regular Polygons

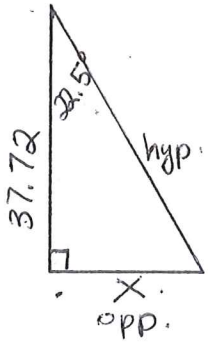


apothem = the segment from the center of a regular polygon to the side creating a right ∠.

SOH CAH TOA

$37.72 \cdot \tan 22.5 = \frac{x}{37.72} \cdot 37.72$

$x = 15.62$



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

$A = \frac{1}{2}(31.24)(37.72)$

$A = 589.19\ cm^2$

$A_{TOTAL} = 8(589.19)$

$= 4713.49\ cm^2$

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

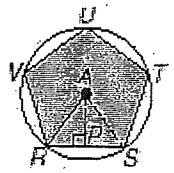
P: perimeter; a: apothem

NAME _____ Hour _____

11-3: Areas of Regular Polygons and Circles

Areas of Regular Polygons In a regular polygon, the segment drawn from the center of the polygon perpendicular to the opposite side is called the **apothem.** In the figure at the right, $\overline{AP}$ is the apothem and $\overline{AR}$ is the radius of the circumscribed circle.

Area of a Regular Polygon	If a regular polygon has an area of A square units, a perimeter of P units, and an apothem of a units, then $A = \frac{1}{2}Pa$.



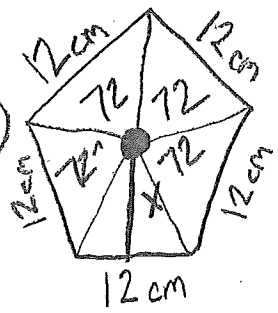
Example 1 Verify the formula $A = \frac{1}{2}Pa$ for the regular pentagon above.

Example 2 Find the area of regular pentagon *RSTUV* above if its perimeter is 60 centimeters.

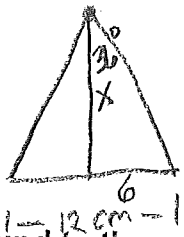
$A = \frac{1}{2}(P)(a)$

$A = \frac{1}{2}(60)(8.3)$

249 cm^2



$P = 60\ cm$



$\tan 36 \cdot x = \frac{6}{x} \cdot x$

$\frac{\tan 36x}{\tan 36} = \frac{6}{\tan 36}$

$X = 8.3$

Exercises: Find the area of each regular polygon. Round to the nearest tenth.

1.

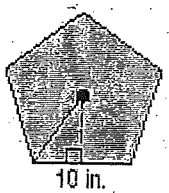
$\tan 60 = \frac{7}{x}$

$a = 4.04$

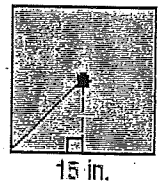
$\frac{1}{2}(42)(4.04)$

84.8 m^2

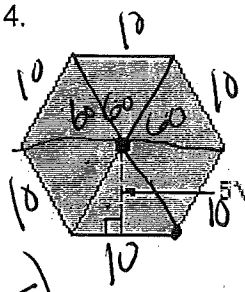
2.

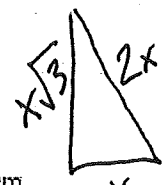


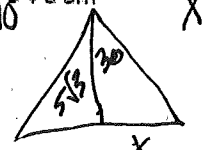
3.



4.







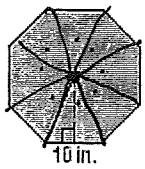
$\frac{1}{2}(P)(5\sqrt{3})$

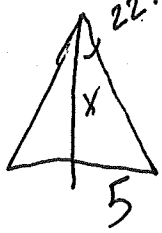
$\frac{1}{2}(60)(5\sqrt{3})$

$5+5\ 10$

259.8 cm²

5.



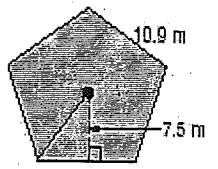


$\frac{1}{2}(80)(12.1)$

$\tan 22.5 = \frac{5}{x}$

484 in²

6.

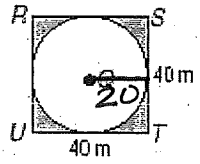


$\frac{1}{2}(7.5)(54.5)$

204.4 m²

Area of a Circle	If a circle has an area of A square units and a radius of r units, then  $A = \pi r^2$

Example Circle Q is inscribed in square $RSTU$. **Find the area of the shaded region.**



$A_\square - A_\odot$

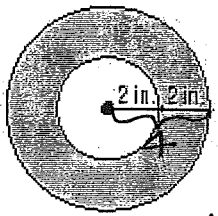
$A_\square = 40(40) = 1600 m^2$

$A_\odot = \pi(20)^2 = 1256.6 m^2$

$1600 - 1256.6 = \boxed{343.4 m^2}$

Exercises: Find the area of each shaded region. Assume that all polygons are regular. Round to the nearest tenth.

7. $A_{BIG\odot} - A_{SMALL\odot}$

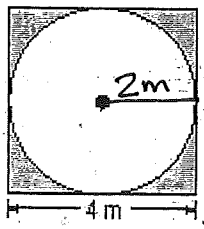


$A_{BIG} = \pi(4)^2 = 50.3 in^2$

$A_{SMALL} = \pi(2)^2 = 12.6 in^2$

$50.3 - 12.6 = \boxed{37.7 in^2}$

8. $A_\square - A_\odot$

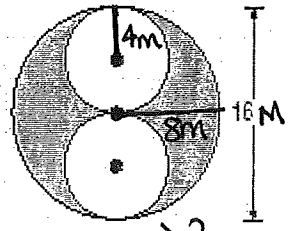


$A_\square = 4(4) = 16 m^2$

$A_\odot = \pi(2)^2 = 12.6 m^2$

$16 - 12.6 = \boxed{3.4 m^2}$

9. $Big_\odot - 2\,Small_\odot$



$A_{BIG} = \pi(8)^2 = 201.1 m^2$

$A_{small} = \pi(4)^2 = 50.3 m^2$

$201.1 - 50.3 - 50.3 = \boxed{100.5 m^2}$