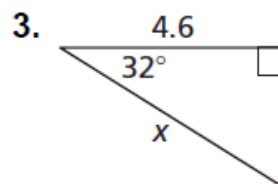
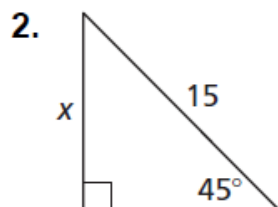
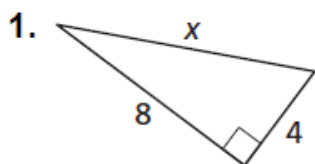


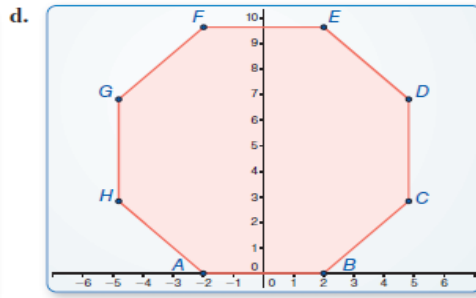
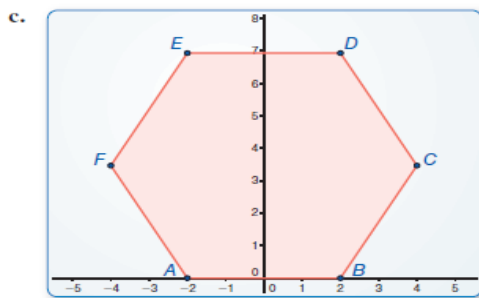
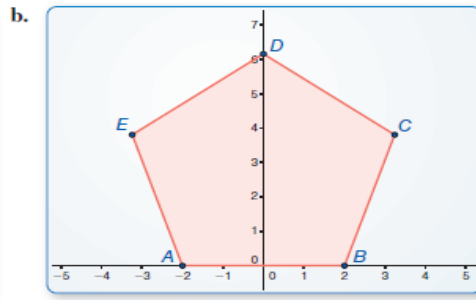
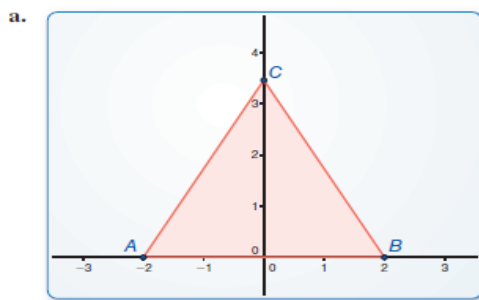
Find the value of x in the right triangle.



Essential Question

How can you find the area of a regular polygon?

Work with a partner. Use dynamic geometry software to construct each regular polygon with side lengths of 4, as shown. Find the apothem and use it to find the area of the polygon. Describe the steps that you used.

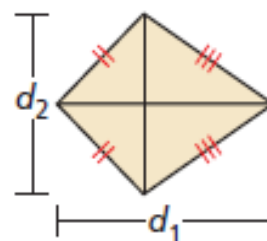
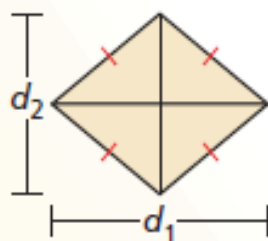


Work with a partner. Generalize the steps you used in Exploration 1 to develop a formula for the area of a regular polygon.

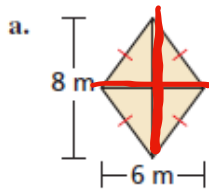
Core Concept

Area of a Rhombus or Kite

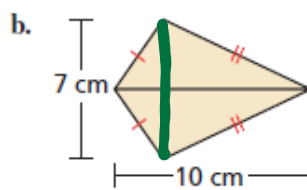
The area of a rhombus or kite with diagonals d_1 and d_2 is $\frac{1}{2}d_1d_2$.



Find the area of each rhombus or kite.



$$A = \frac{1}{2} (8m)(6m)$$
$$A = 24m^2$$

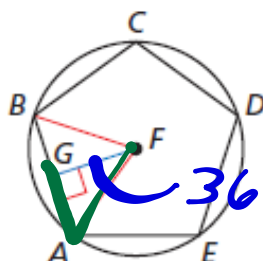


$$A = \frac{1}{2} (7cm)(10cm)$$
$$A = 35cm^2$$

1. Find the area of a rhombus with diagonals $d_1 = 4$ feet and $d_2 = 5$ feet.

2. Find the area of a kite with diagonals $d_1 = 12$ inches and $d_2 = 9$ inches.

In the diagram, $ABCDE$ is a regular pentagon inscribed in $\odot F$. Find each angle measure.



a. $m\angle AFB$

$$\frac{360}{5} = 72^\circ$$

b. $m\angle AFG$

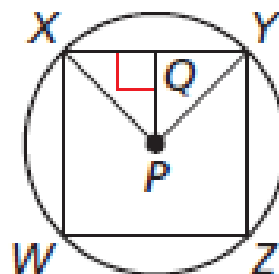
$$36^\circ$$

c. $m\angle GAF$

$$54^\circ$$

In the diagram, $WXYZ$ is a square inscribed in $\odot P$.

3. Identify the center, a radius, an apothem, and a central angle of the polygon.



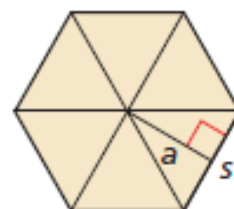
4. Find $m\angle XPY$, $m\angle XPQ$, and $m\angle PXQ$.

Core Concept

Area of a Regular Polygon

The area of a regular n -gon with side length s is one-half the product of the apothem a and the perimeter P .

$$A = \frac{1}{2}aP, \text{ or } A = \frac{1}{2}a \cdot ns$$



A regular nonagon is
the area of the nonagon

$$A = \frac{1}{2} a \cdot n \cdot s = \frac{1}{2} (3.76)(9)(2.73)$$

$$A = 46.19 \text{ units}^2$$

$$\frac{360}{9} = 40^\circ$$

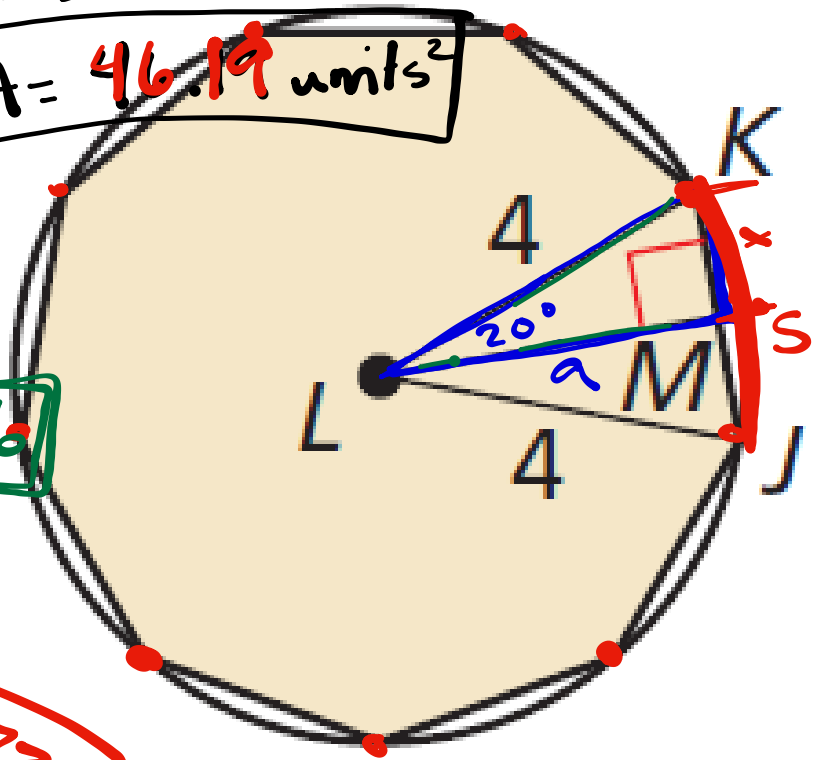
$$4 \cos 20^\circ = \frac{a}{4} \cdot 4$$

$$a = 4 \cos 20^\circ = 3.76$$

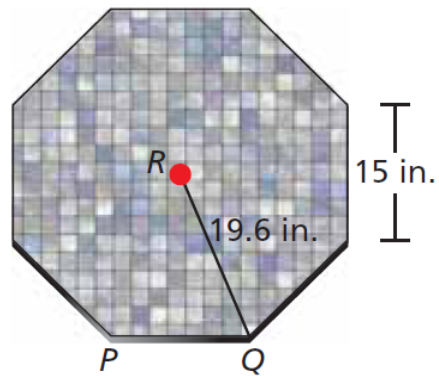
$$\sin 20^\circ = \frac{x}{4}$$

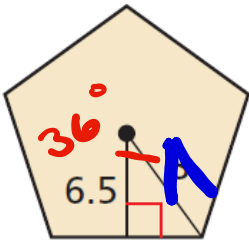
$$x = 4 \sin 20^\circ$$

$$s = 2.73$$



You are decorating the top of a table by covering it with small ceramic tiles. The tabletop is a regular octagon with 15-inch sides and a radius of about 19.6 inches. What is the area you are covering?



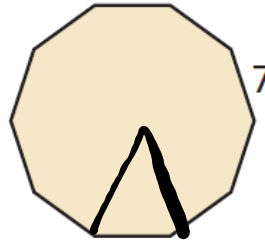


$a = 6.5$
 $n = 5$
 $S = 9.4$

$\frac{360}{5} = 72$
 $\frac{72}{2} = 36$
 $\sin 36 = \frac{y}{8}$
 152.75 units^2

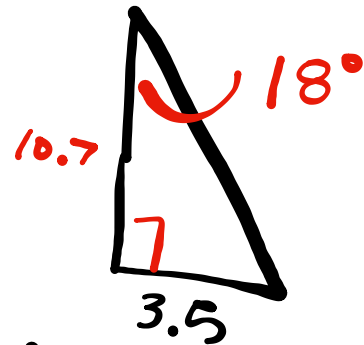
$y = 8 \sin 36 = 4.7$
 S

6.



$S = 7$
 $a = 10.7$
 $n = 10$

$\frac{360}{10} = 36$
 $\frac{36}{2} = 18$
 $\tan 18 = \frac{3.5}{a}$



$A = \frac{1}{2}(7)(10.7)(10)$
 $A = 374.5 \text{ units}^2$

- **Exit Ticket:** Find the area of a stop sign when the side length is 10 inches.

$$n = 8$$

$$S = 10$$

$$A = \frac{1}{2}(8)(10)(12.07)$$

$$\frac{360}{16} = 22.5$$

$$A = 482.4 \text{ in}^2$$

$$\tan 22.5 = \frac{10}{a}$$

$$a = 12.07$$
