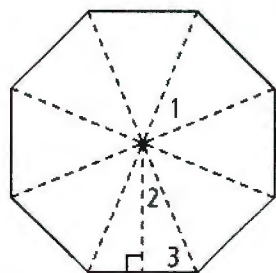


10.6 – Perimeter and Area of Regular Polygons

Each regular polygon has radii and apothem as shown. Find the measure of each numbered angle.

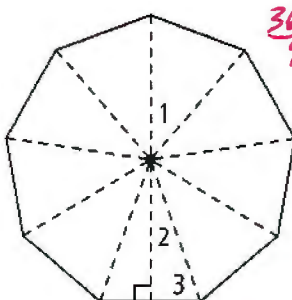
1)



$$\frac{360}{8} = 45^\circ$$

$$\begin{aligned} m\angle 1 &= 45^\circ \\ m\angle 2 &= 22.5^\circ \\ m\angle 3 &= 67.5^\circ \end{aligned}$$

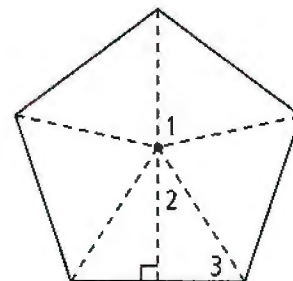
2)



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

$$\begin{aligned} m\angle 1 &= 40^\circ \\ m\angle 2 &= 20^\circ \\ m\angle 3 &= 70^\circ \end{aligned}$$

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



$$\begin{aligned} m\angle 1 &= 72^\circ \\ m\angle 2 &= 36^\circ \\ m\angle 3 &= 54^\circ \end{aligned}$$

Find the area of each regular polygon with the given apothem a and side length s . Round to the nearest 0.1 if necessary.

- 4) Pentagon
 $a = 4.9$ in.
 $s = 7.1$ in.

$$\begin{aligned} A &= \frac{1}{2} san \\ &= \frac{1}{2} \cdot 7.1 \cdot 4.9 \cdot 5 \\ &\approx 87.0 \text{ in}^2 \end{aligned}$$

- 5) Octagon
 $a = 20.8$ m
 $s = 17.2$ m

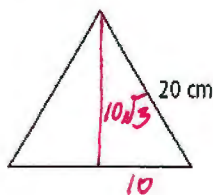
$$\begin{aligned} A &= \frac{1}{2} san \\ &= \frac{1}{2} \cdot 17.2 \cdot 20.8 \cdot 8 \\ &\approx 1431.0 \text{ m}^2 \end{aligned}$$

- 6) Dodecagon
 $a = 40.6$ m
 $s = 21.7$ m

$$\begin{aligned} A &= \frac{1}{2} san \\ &= \frac{1}{2} \cdot 21.7 \cdot 40.6 \cdot 12 \\ &\approx 5286.1 \text{ m}^2 \end{aligned}$$

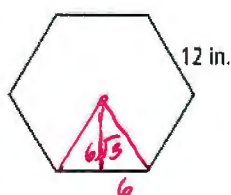
Find the area of each regular polygon. Round to the nearest 0.1 if necessary. (Clue: You may have to use your trigonometry to find some of the necessary measurements)

7)



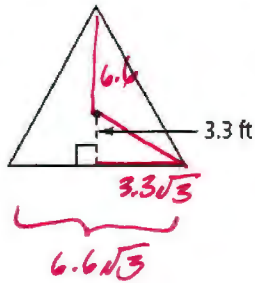
$$\begin{aligned} A &= \frac{1}{2} bh \\ &= \frac{1}{2} \times 20 \times 10\sqrt{3} \\ &= 100\sqrt{3} \\ &\text{or} \\ &\approx 173.2 \text{ cm}^2 \end{aligned}$$

8)



$$\begin{aligned} A &= \frac{1}{2} san \\ &= \frac{1}{2} \times 12 \times 6\sqrt{3} \times 6 \\ &= 216\sqrt{3} \\ &\text{or} \\ &\approx 374.1 \text{ in}^2 \end{aligned}$$

9) 30-60-90!



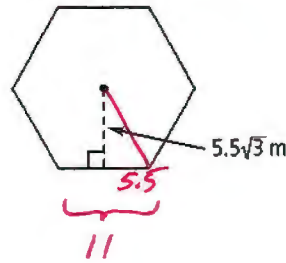
$$A = \frac{1}{2}bh$$

$$= \frac{1}{2} \times 6.6\sqrt{3} \times 9.9$$

$$\approx 56.6 \text{ ft}^2$$

10)

30-60-90!

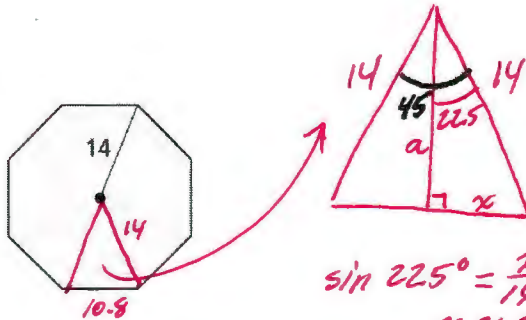


$$A = \frac{1}{2}san$$

$$= \frac{1}{2} \times 11 \times 5.5\sqrt{3} \times 6$$

$$\approx 314.4 \text{ m}^2$$

11)



$$\sin 22.5^\circ = \frac{x}{14}$$

$$x \approx 5.4$$

$$\cos 22.5^\circ = \frac{a}{14}$$

$$a \approx 12.9$$

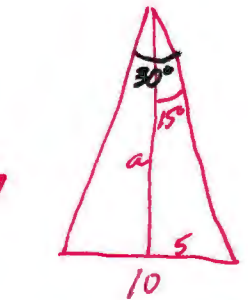
$$A = \frac{1}{2}san$$

$$= \frac{1}{2} \times 10.8 \times 12.9 \times 8$$

$$\approx 557.3 \text{ u}^2$$

12)

12-gon.



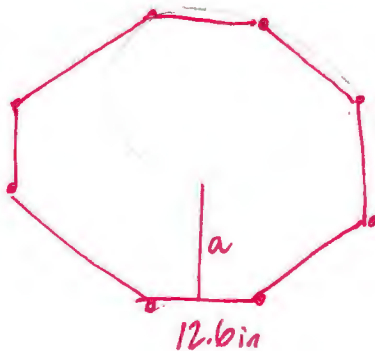
$$\tan 15^\circ = \frac{5}{a}$$

$$a \approx 18.7$$

$$A = \frac{1}{2} \times 10 \times 18.7 \times 12$$

$$\approx 1122 \text{ u}^2$$

13) A stop sign is a regular octagon. Each side of the sign is 12.6 in. long. The area of the stop sign is 770 in.². What is the length of the apothem to the nearest whole number?



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

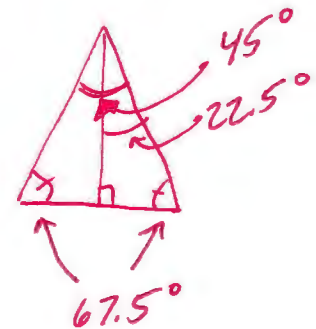
$$770 = \frac{1}{2} \times 12.6 \times a \times 8$$

$$770 = 50.4a$$

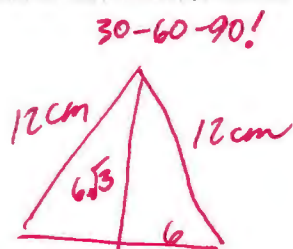
$$15.3 \approx a$$

$$\text{stop sign } a \approx 15 \text{ in}$$

14) A quilter is cutting fabric for her quilt. She has several pieces of fabric from an old project that are in the shape of regular octagons. She wants to cut the octagons into right triangles. If she divides each octagon into 16 triangles, what is the measure of the non-right angles of each triangle?

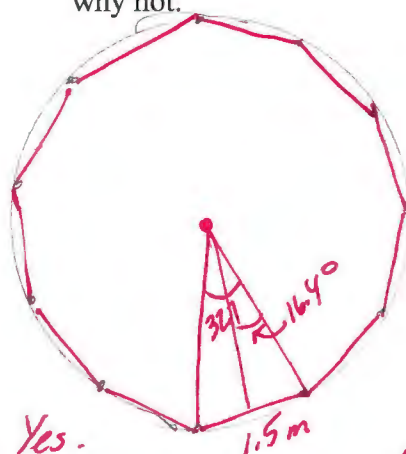


- 15) An equilateral triangle has a perimeter of 36 cm. Find its area to the nearest tenth.
- 16) The perimeter of a regular 11-gon is 16.5 meters. Is this enough information to find the area? If so, find the area and explain your reasoning. If not, explain why not.



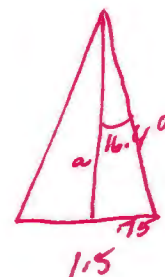
12 cm

$$\begin{aligned}
 A &= \frac{1}{2}bh \\
 &= \frac{1}{2} \times 12 \times 6\sqrt{3} \\
 &\approx 62.4 \text{ cm}^2
 \end{aligned}$$



Yes.

You can find the necessary info by division and trigonometry



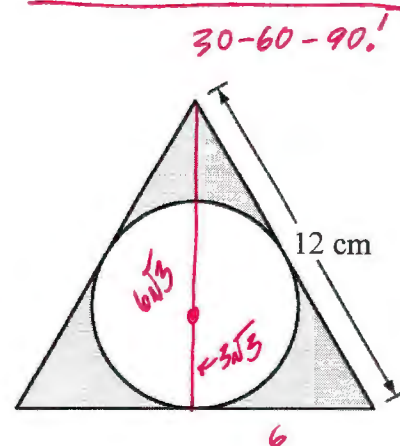
$$\begin{aligned}
 \tan 16.4^\circ &= \frac{.75}{a} \\
 a &\approx 2.5
 \end{aligned}$$

$$\begin{aligned}
 A &= \frac{1}{2}sa_{11} \\
 &= \frac{1}{2} \times 1.5 \times 2.5 \times 11 \\
 &\approx 20.6 \text{ m}^2
 \end{aligned}$$

For #17 & 18, refer to the figure of a circle inscribed in an equilateral triangle. Leave your answer in simplest radical form.

- 17) Find the area of the inscribed circle.

$$\begin{aligned}
 A &= \pi r^2 \\
 &= \pi (3\sqrt{3})^2 \\
 &= 27\pi \text{ cm}^2
 \end{aligned}$$



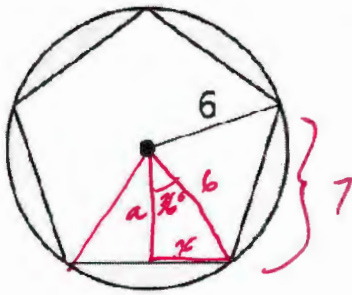
- 18) Find the area of the shaded region.

$$\begin{aligned}
 A &= \text{Triangle} - \text{Circle} \\
 &= \frac{1}{2}bh - \pi r^2 \\
 &= \frac{1}{2} \times 12 \times 6\sqrt{3} - \pi (3\sqrt{3})^2 \\
 &= 36\sqrt{3} - 27\pi \text{ cm}^2
 \end{aligned}$$

Find the area of the shaded region. Round to the nearest 0.1 if necessary.

30-60-90!

19)



$$\sin 36^\circ = \frac{x}{6}$$

$$x \approx 3.5$$

$$\cos 36^\circ = \frac{a}{6}$$

$$a \approx 4.9$$

$$A = \text{Circle} - \text{Reg. Pentagon}$$

$$= \pi r^2 - \frac{1}{2} s a n$$

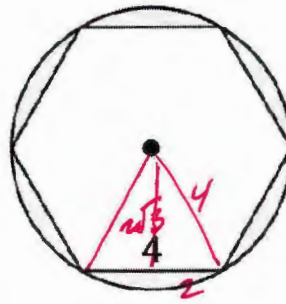
$$= 3.14 \times 6^2 - \frac{1}{2} \times 7 \times 4.9 \times 5$$

$$= 113.04 - 85.75$$

$$= 27.29$$

$$\approx 27.3 \text{ u}^2$$

20)



$$A = \text{Circle} - \text{Reg. Hexagon}$$

$$= \pi r^2 - \frac{1}{2} s a n$$

$$= 3.14 \times 4^2 - \frac{1}{2} \times 4 \times 2\sqrt{3} \times 6$$

$$= 50.24 - 24\sqrt{3}$$

$$\approx 8.7 \text{ u}^2$$