$A = \frac{nas}{2}$ or $A = \frac{a \cdot P}{2}$

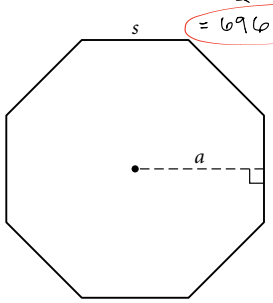
# Lesson 8.4 • Areas of Regular Polygons

Name Key Period _____ Date _____

In Exercises 1–3, the polygons are regular.

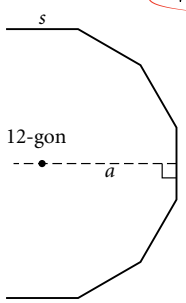
**1.** $s = 12$ cm
$a \approx 14.5$ cm
$A \approx$ _____

$A = \frac{8(12)(14.5)}{2}$
$= \frac{1392}{2}$
$= 696\text{ cm}^2$



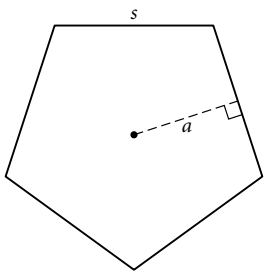

**2.** $s = 4.2$ cm
$A \approx 197$ cm$^2$
$a \approx$ _____

$2 \cdot 197 = \frac{12(4.2)a}{2} \cdot 2$
$\frac{394}{50.4} = \frac{50.4a}{50.4}$
$7.82\text{cm} \approx a$




**3.** $a = 6$ cm
$A \approx 130.8$ cm$^2$
$p \approx$ _____

$2 \cdot 130.8 = \frac{5(6)s}{2} \cdot 2$
$\frac{261.6}{30} = \frac{30s}{30}$
$8.72\text{cm} = s$



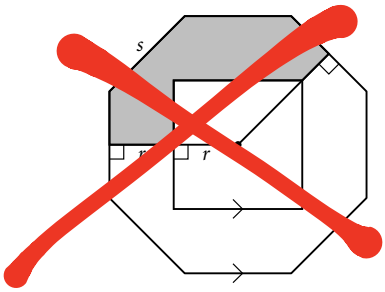

**4.** In a regular $n$-gon, $s = 4.8$ cm, $a \approx 7.4$ cm, and $A \approx 177.6$ cm$^2$. Find $n$.

$2 \cdot 177.6 = \frac{4.8(7.4)n}{2} \cdot 2$
$\frac{355.2}{35.52} = \frac{35.52(n)}{35.52}$
$10 = n$

Draw a regular pentagon so that it has perimeter 20 cm. Use the Regular Polygon Area Conjecture and a centimeter ruler to find its approximate area.

Use a compass and straightedge to construct a regular octagon and its apothem. Use a centimeter ruler to measure its side length and apothem, and use the Regular Polygon Area Conjecture to find its approximate area.

**7.** Find the area of the shaded region between the square and the regular octagon. $s \approx 5$ cm. $r = 3$ cm.





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$A=\pi r^2$

# Lesson 8.5 • Areas of Circles

Name _____ Period _____ Date _____

In Exercises 1–4, write your answers in terms of $\pi$.

**1.** If $r = 9$ cm, $A =$ $81\pi$ cm$^2$

$A = 9^2 \cdot \pi = 81\pi$

**2.** If $d = 6.4$ cm, $A =$ $10.24\pi$

$r = 3.2$

$A = (3.2)^2\pi$

**3.** If $A = 529\pi$ cm$^2$, $r =$ 23 cm

$\frac{529\pi}{\pi} = \frac{r^2\pi}{\pi}$ $\quad r = 23$

$\sqrt{529} = \sqrt{r^2}$

**4.** If $C = 36\pi$ cm, $A =$ $324\pi$ cm$^2$

$r = 18 \rightarrow (18)^2\pi$

In Exercises 5–8, round your answers to the nearest 0.01 unit.

Keep answers in terms of $\pi$.

**5.** If $r = 7.8$ cm, $A \approx$ $60.8\pi$ cm$^2$

$(7.8)^2\pi$

**6.** If $A = 136.46$, $C \approx$ $13.2\pi$ un

$\frac{136.46}{\pi} = \frac{r^2\pi}{\pi}$ ← use 3.14

$\sqrt{43.46} = \sqrt{r^2}$

$6.6 = r$

**7.** If $d = 3.12$, $A \approx$ $2.4\pi$ un$^2$

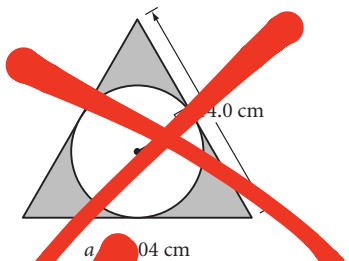
$r = 1.56 \rightarrow (1.56)^2\pi$

**8.** If $C = 7.85$, $A \approx$ $1.5\pi$ un$^2$

$\frac{7.85}{2\pi} = \frac{2r\pi}{2\pi}$

$1.25 = r$

For Exercises 9 and 10, refer to the figure of a circle inscribed in an equilateral triangle. Round your answers to the nearest 0.1 unit.

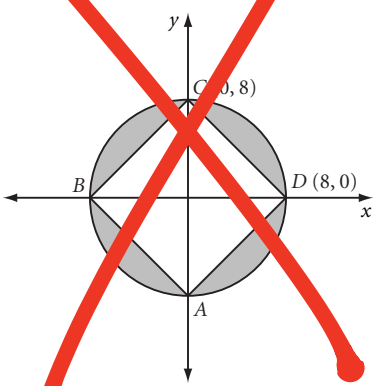



**9.** Find the area of the inscribed circle.

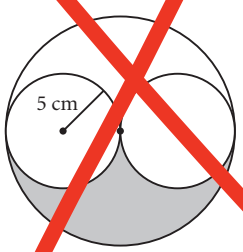
**10.** Find the area of the shaded region.

In Exercises 11 and 12, find the area of the shaded region. Write your answers in terms of $\pi$.

**11.** $ABCD$ is a square.




**12.** The three circles are tangent.





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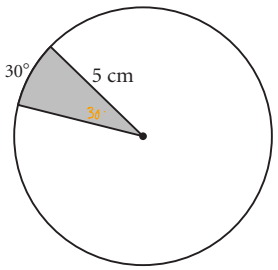
# Lesson 8.6 • Any Way You Slice It

Name _____ Period _____ Date _____

CA/360 = Sector Area/πr²

In Exercises 1–6, find the area of the shaded region. Write your answers in terms of $\pi$ and rounded to the nearest 0.01 $cm^2$.

**1.**

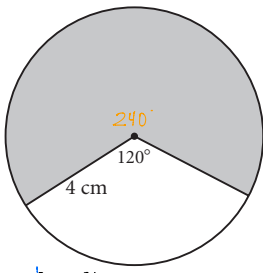



$\frac{30}{360} = \frac{x}{(5)^2\pi}$

$\frac{1}{12} = \frac{x}{25\pi}$

$\frac{25}{12}\pi cm^2 = x$

**2.**

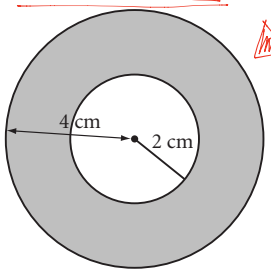



$\frac{240}{360} = \frac{x}{(4)^2\pi}$

$\frac{2}{3} = \frac{x}{16\pi}$

$\frac{32}{3}\pi cm^2 = x$

**3.** Area Big ○ − Area small ○

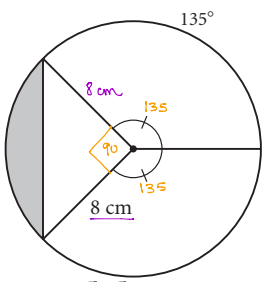



$(4)^2\pi - (2)^2\pi$

$= 16\pi - 4\pi = 12\pi cm^2$

Area of Sector − Area of △

**4.**

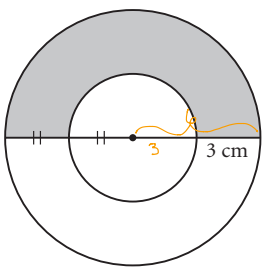



$\left[8^2\pi \cdot \frac{90}{360}\right] - \left[\frac{8 \cdot 8}{2}\right]$

$\left[64\pi \cdot \frac{1}{4}\right] - [32]$

$16\pi - 32 cm^2$

**5.**




R = 6
r = 3

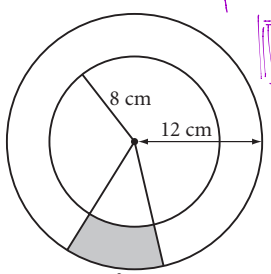
$\frac{1}{2}\left[(6)^2\pi - (3)^2\pi\right]$

$= \frac{1}{2}\left[36\pi - 9\pi\right]$

$= \frac{1}{2}\left(\frac{27\pi}{1}\right)$

$= 13.5\pi cm^2$

**6.**




$\frac{45}{360} = \frac{1}{8}$

R = 12
r = 8

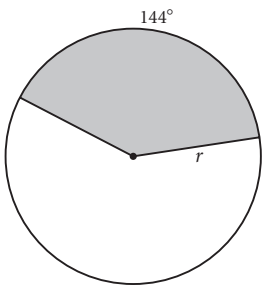
$\frac{1}{8}\left[(12)^2\pi - (8)^2\pi\right]$

$= \frac{1}{8}\left[144\pi - 64\pi\right]$

$= \frac{1}{8}\left[80\pi\right]$

$= 10\pi cm^2$

**7.** Shaded area is $40\pi$ $cm^2$. Find *r*.




$\frac{144}{360} = \frac{40\pi}{r^2\pi}$

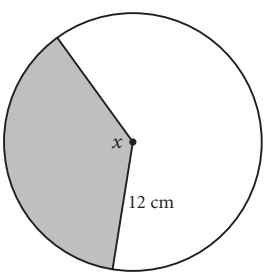
$\frac{2}{5} = \frac{40}{r^2}$

$\frac{2r^2}{2} = \frac{200}{2}$

$\sqrt{r^2} = \sqrt{100}$

$r = 10$

**8.** Shaded area is $54\pi$ $cm^2$. Find *x*.



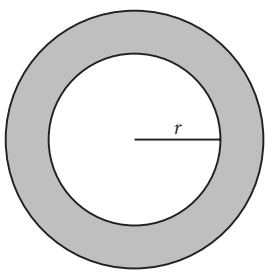

$\frac{x}{360} = \frac{54\pi}{144\pi}$

$\frac{x}{360} = \frac{3}{8}$

$\frac{8x}{8} = \frac{1080}{8}$

$x = 135°$

**9.** Shaded area is $51\pi$ $cm^2$. The diameter of the larger circle is 20 cm. Find *r*.




$51\pi = (20)^2\pi - (r)^2\pi$

$51\pi = 400\pi - r^2\pi$

$\frac{51\pi}{\pi} = \frac{(400 - r^2)\pi}{\pi}$

$51 = 400 - r^2$

$r^2 = 400 - 51$

$\sqrt{r^2} = \sqrt{349}$

$r \approx 18.7 cm$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