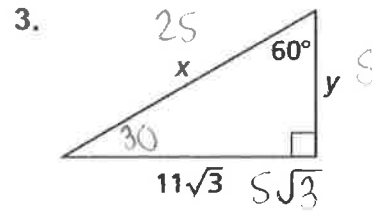
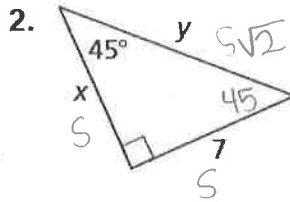
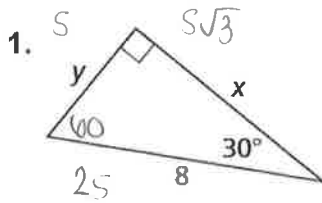


11.2 Area of Circles and Sectors

Find the values of x and y without using a calculator. Write your answers in simplest form.



$25 = 8$
 $S = 4$

$y = 4$
 $x = 4\sqrt{3}$

$S = 7$
 $x = 7$
 $y = 7\sqrt{2}$

$\frac{S\sqrt{3}}{\sqrt{3}} = \frac{11\sqrt{3}}{\sqrt{3}}$
 $S = 11$

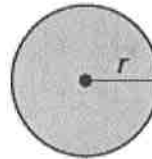
$y = 11$
 $x = 22$

Area of a Circle

The area of a circle is

$$A = \pi r^2$$

where r is the radius of the circle.



Video: Deriving Area of a Circle

Find the indicated measure. Provide your answer in terms of π and rounded to the nearest hundredth.

1. radius of a circle with an area of 100π square miles

$A = \pi r^2$
 $\frac{100\pi}{\pi} = \frac{\pi r^2}{\pi}$
 $\sqrt{r^2} = \sqrt{100}$
 $r = 10 \text{ mi}$

2. diameter of a circle with an area of 42 square meters

$A = \pi r^2$
 $\frac{42}{\pi} = \frac{\pi r^2}{\pi}$
 $\sqrt{r^2} = \sqrt{\frac{42}{\pi}}$
 $r \approx 3.66$
 $D = 2(3.66)$
 $D = 7.32 \text{ m}$

3. area of a circle with a circumference of 12 centimeters

$C = \pi d$
 $\frac{12}{\pi} = \frac{\pi d}{\pi}$
 $d = \frac{12}{\pi}$
 $d = 3.82$
 $\frac{3.82}{2} = 1.91$
 $r = 1.91$
 $A = \pi r^2$
 $= \pi(1.91)^2$
 $A = 11.46 \text{ cm}^2$

Find the indicated measure. Provide your answer in terms of pi and rounded to the nearest hundredth.

- a. circumference of a circle with an area of 25 square centimeters

$$A = \pi r^2 \quad \sqrt{r^2} = \sqrt{\frac{25}{\pi}}$$

$$\frac{25}{\pi} = \frac{\pi r^2}{\pi} \quad r = 2.82 \quad C = 2\pi r$$

$$= 2\pi(2.82)$$

$$C = 17.72 \text{ cm} \quad 5.64\pi \text{ cm}$$

- b. diameter of a circle with an area of 36π square centimeters

$$\frac{36\pi}{\pi} = \frac{\pi r^2}{\pi} \quad r = 6 \quad D = 2(6)$$

$$\sqrt{36} = \sqrt{r^2}$$

$$D = 12 \text{ cm}$$

- c. area of a circle with a circumference of 12π meters.

$$\frac{12\pi}{2\pi} = \frac{2\pi r}{2\pi} \quad A = \pi r^2$$

$$6 = r \quad = \pi(6)^2$$

$$A = 36\pi \text{ m}^2 = 113.10 \text{ m}^2$$

- d. circumference of a circle with an area of 81π square feet.

$$\frac{81\pi}{\pi} = \frac{\pi r^2}{\pi} \quad C = 2\pi r$$

$$\sqrt{81} = \sqrt{r^2} \quad = 2\pi(9)$$

$$9 = r \quad C = 18\pi \text{ ft} = 56.55 \text{ ft}$$

The population density of a city, county, or state is a measure of how many people live within a given area.

$$\text{Population Density} = \frac{\text{Number of People}}{\text{Area of Land}}$$

a. About 430,000 people live in a 5-mile radius of a city's town hall.

Find the population density in people per square mile.

$$A = \pi(5)^2$$

$$A = 25\pi$$

$$A \approx 78.54$$

$$\text{Pop. Density} = \frac{\# \text{ people}}{\text{area land}}$$

$$= \frac{430,000}{25\pi} \approx 5474.9$$

$$\approx 5475 \text{ people}$$

b. A region with a 3-mile radius has a population density of about 6195 people per square mile. Find the number of people who live in the region.

$$A = \pi(3)^2$$

$$= 9\pi$$

$$\frac{6195}{1} = \frac{X}{9\pi}$$

$$X = 9\pi(6195)$$

$$\approx 175159.4$$

$$\approx 175,159 \text{ people}$$

3. About 58,000 people live in a region with a 2-mile radius. Find the population density in people per square mile.

$$A = \pi(2)^2 \quad \text{P. D.} = \frac{58,000}{4\pi}$$

$$= 4\pi$$

$$\text{P. D.} = 4615.4$$

$$\text{about } 4615 \text{ people}$$

4. A region with a 3-mile radius has a population density of about 1,000 people per square mile. Find the number of people who live in the region.

$$A = \pi(3)^2$$

$$= 9\pi$$

$$\frac{1000}{1} = \frac{X}{9\pi}$$

$$X = 9\pi(1000)$$

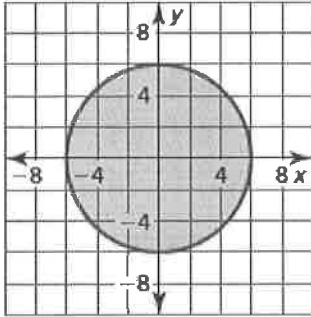
$$\approx 28,274.3$$

$$\approx 28,274 \text{ people}$$

A sector of a circle is the region bounded by two radii of the circle and their intercepted arc.

Find the area of each shaded circle or sector of a circle.

a. entire circle

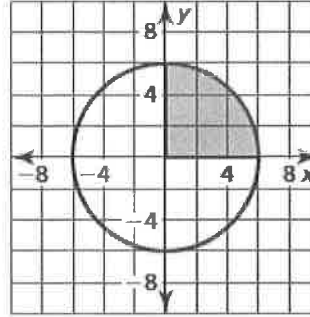


$$r = 6$$

$$A = \pi (6)^2$$

$$A = 36\pi$$

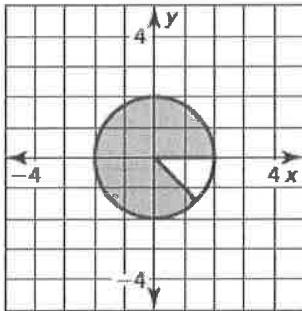
b. one-fourth of a circle



$$A = 36\pi \left(\frac{1}{4}\right)$$

$$A = 9\pi$$

c. seven-eighths of a circle



$$r = 2$$

$$A = \pi (2)^2$$

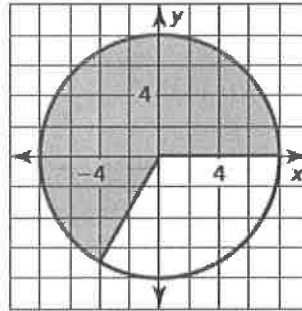
$$= 4\pi$$

$$4\pi \left(\frac{7}{8}\right)$$

$$\frac{28}{8}\pi$$

$$\frac{7}{2}\pi \text{ or } \frac{7\pi}{2}$$

d. two-thirds of a circle



$$r = 8$$

$$A = \pi (8)^2$$

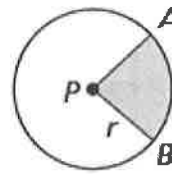
$$= 64\pi$$

$$64\pi \left(\frac{2}{3}\right)$$

$$\frac{128\pi}{3}$$

Area of a Sector

The ratio of the area of a sector of a circle to the area of the whole circle (πr^2) is equal to the ratio of the measure of the intercepted arc to 360° .



$$\frac{\text{Area of sector } APB}{\pi r^2} = \frac{m\widehat{AB}}{360^\circ}, \text{ or}$$

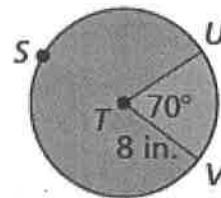
$$\text{Area of sector } APB = \frac{m\widehat{AB}}{360^\circ} \cdot \pi r^2$$

$$\frac{\text{sector area}}{\text{circle area}} = \frac{\text{measure of arc}}{360}$$

Find the indicated measure.

1. area of sector UTV.

* $\angle UTV$ is central angle



$$\frac{X}{\pi(8)^2} = \frac{70}{360}$$

$$360X = 64\pi(70)$$

$$\frac{360X}{360} = \frac{64\pi(70)}{360}$$

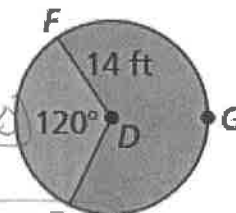
$$X = 39.1 \text{ in}^2$$

2. area of red sector (sector FDE)

$$\frac{X}{\pi(14)^2} = \frac{120}{360}$$

$$360X = 196\pi(120)$$

$$\frac{360X}{360} = \frac{196\pi(120)}{360}$$



$$X = 205.3 \text{ ft}^2$$

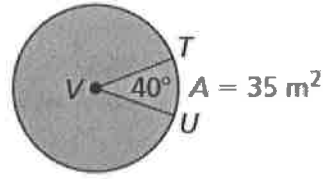
3. area of blue sector

$$\frac{X}{\pi(14)^2} = \frac{240}{360}$$

$$\frac{360X}{360} = \frac{196\pi(240)}{360}$$

$$X = 410.5 \text{ ft}^2$$

Find the area of $\odot V$.



$$\frac{35}{X} = \frac{40}{360}$$

$$\frac{40X}{40} = \frac{12,600}{40}$$

$$X = 315 \text{ m}^2$$

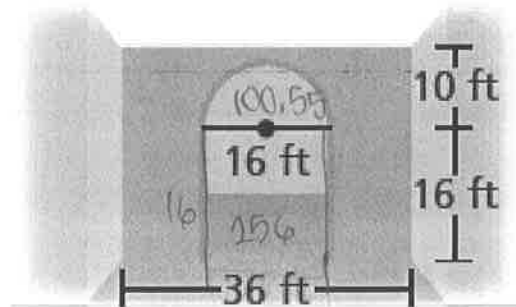
A rectangular wall has an entrance cut into it. You want to paint the wall. To the nearest square foot, what is the area of the region you need to paint?

$$36(26) = 936$$

$$16(16) = 256$$

$$\begin{aligned} r = 8 \quad A &= \pi r^2 \\ &= \pi (8)^2 \\ &= 64\pi \\ &= 201.1 \end{aligned}$$

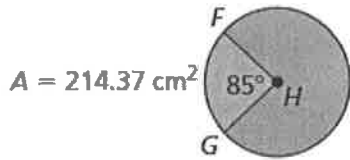
$$\frac{201.1}{2} = 100.55$$



$$936 - (256 + 100.55)$$

$$579.45$$

$$579 \text{ ft}^2$$

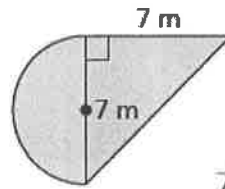
1. Find the area of $\odot H$.

$$\frac{214.37}{x} = \frac{85}{360}$$

$$\frac{85x}{85} = \frac{77,173.2}{85}$$

$$x = 907.92 \text{ cm}^2$$

2. Find the exact area of the figure.



$$\begin{aligned} A_{\Delta} &= \frac{1}{2}bh \\ &= \frac{1}{2}(7)(7) \\ &= \frac{49}{2} \end{aligned}$$

$$\begin{aligned} A_{\circ} &= \frac{1}{2}\pi r^2 \\ &= \frac{1}{2}\pi\left(\frac{7}{2}\right)^2 \\ &= \frac{49\pi}{8} \end{aligned}$$

$$\frac{49}{2} + \frac{49\pi}{8} \text{ m}^2$$

Homework

pg. 606 # 4-22 evens, 23-29,
31,32,40