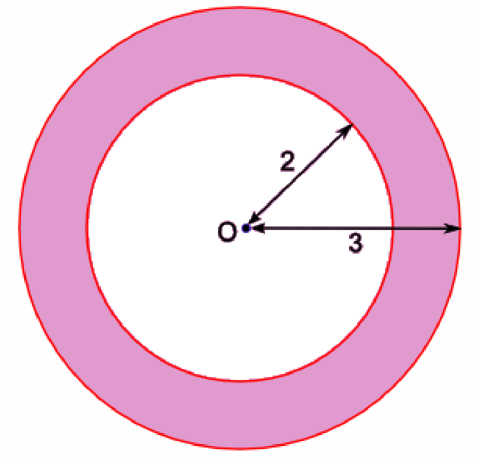
WARM-UP:

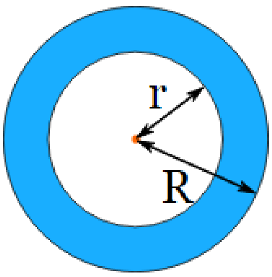


The diagram shows two circles with center O.

The radius of the outer circle is 3 units and the radius of the inner circle is 2 units.

What is the area of the shaded ring?

$9\pi - 4\pi = \boxed{5\pi\ u^2}$

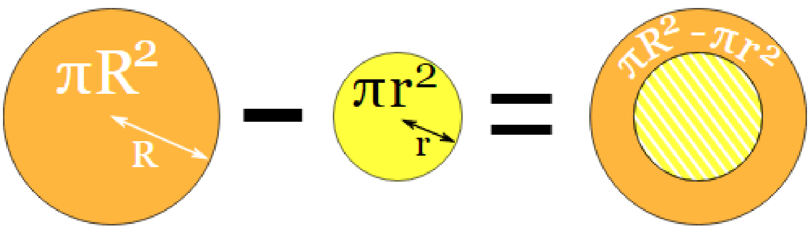


An annulus is a flat shape like a ring.

Its edges are two circles that have the same center.

Area

Because it is **a circle with a circular hole**, you can calculate the area by subtracting the area of the "hole" from the big circle's area:

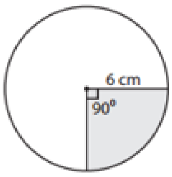
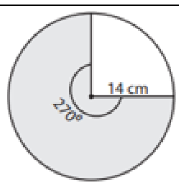
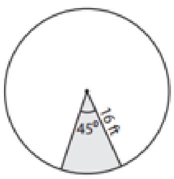


Area $= \pi R^2 - \pi r^2$

$= \pi(R^2 - r^2)$

Investigation

Step 1: For each shaded region, find what fraction of the circle each sector is.
Step 2: Find the area of each full circle.
Step 3: Combine the results in Steps 1 and 2 to find the area of each sector.

Circle	Fraction of Circle	Area of Circle (in terms of π)	Area of Sector (in terms of π)
	$\frac{90}{360} = \frac{1}{4}$	$\pi \cdot 6^2$ $= 36\pi\ cm^2$	$A = \frac{1}{4} \cdot 36\pi$ $= \boxed{9\pi\ cm^2}$
	$\frac{270}{360} = \frac{3}{4}$	$\pi \cdot 14^2$ $= 196\pi\ cm^2$	$\frac{3}{4} \cdot 196\pi$ $= \boxed{147\pi\ cm^2}$
	$\frac{45}{360} = \frac{1}{8}$	$\pi \cdot 16^2$ $= 256\pi$	$\frac{1}{8} \cdot 256\pi = \boxed{32\pi\ ft^2}$

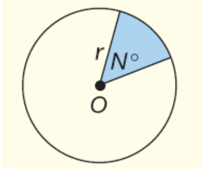
$$\frac{\text{central angle}}{360} = \frac{\text{area sector}}{\text{area circle}}$$

$$\frac{45}{360} = \frac{A}{256\pi}$$

N = measure of central angle

Area Formula for a Sector:

Area: $A = \frac{N}{360}\pi r^2$ or $\frac{N}{360} = \frac{A}{\pi r^2}$



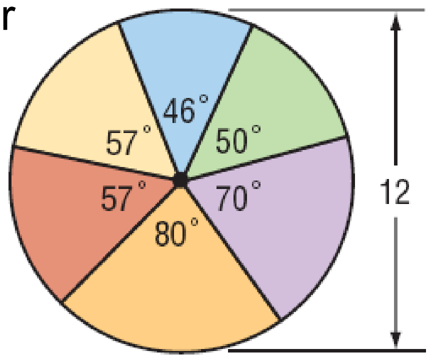
1. Suppose the slices of pizza below have the same price. Which piece of pizza is the better deal? Why?

$\frac{1}{6} \cdot 49\pi = 8.1\overline{6}\pi$ $\frac{1}{3} \cdot 25\pi = 8.\overline{3}\pi$

≈ 25.7 ≈ 26.2

Examples for your notebook:

Find the area of the green sector

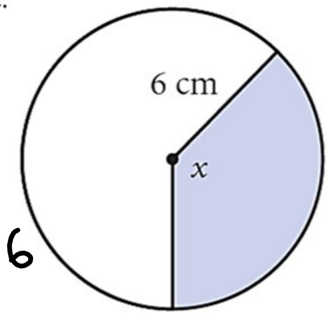


$A = \pi \cdot 6^2 = 36\pi$

$A_{green} = \frac{50}{360} \cdot 36\pi$

$= \boxed{5\pi \text{ units}^2}$

EXAMPLE C The shaded area is 14π cm² and the radius is 6 cm. Find x.



$$A = \frac{N}{360} \cdot \pi r^2$$

$$14\cancel{\pi} = \frac{x}{360} \cdot \cancel{\pi} \cdot 36$$

$$14 = \frac{36x}{360} \longrightarrow 5040 = 36x$$

$$140 = x$$

$$14 = \frac{x}{10}$$

$$140 = x$$

$$\boxed{140°}$$

Example: a steel pipe has an outside diameter (OD) of 100mm and an inside diameter (ID) of 80mm, what is the area of the cross section?

Area of outside: $\pi \cdot 50^2 = 2500\pi \text{ mm}^2$

Area of inside: $\pi \cdot 40^2 = 1600\pi \text{ mm}^2$

Total Area: $2500\pi - 1600\pi = \boxed{900\pi \text{ mm}^2}$

Practice:

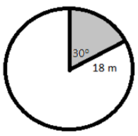
Finish worksheet

Textbook pp. 426-427:

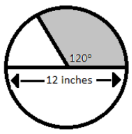
1-3; 6-12; 14-15

2. Find the area of each of the sectors below.

a.



b.



3. A lawn sprinkler moves in a circular direction and rotates 80° before it rotates back to its starting position. If the sprinkler projects water out 20 feet, how many square feet of lawn are being watered by the sprinkler? Round your answer to the nearest square foot.

4. A sector has a radius of 6 yd and an area of 9π yd^2. Find the central angle of the sector.