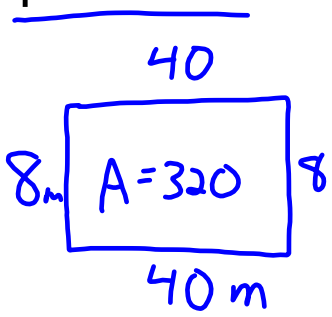
Warm-Up

Given the area of a rectangle is 320 m^2, find the perimeter if one side is 40 m.



$A = bh$

$\frac{320}{40} = \frac{40h}{40}$

$P = 96$ m

For the next unit test Mr. Lindahl is planning on rewarding two students for their performance. He plans on buying pizza for the student with the highest score and the student who shows the biggest improvement from their last unit test. Mr. Lindahl will be ordering from his favorite restaurant Pythagoreas' Pizza Pi (P^3). P^3 offers two different lunch specials. The first is a pizza with a 16 inch diameter and sells for $20. The other is an individual sized 8 inch pizza which sells for $10. With Mr. Lindahl's $20, which deal is the best for the students: One 16-inch pizza or Two 8-inch pizzas?"

Deal #1 - One 16-inch diameter pizza for $20.

Deal #2 - Two 8-inch diameter pizzas for $10 each.

Discuss the following question in your group:

Which deal would give more pizza? Why?

Learning Targets:

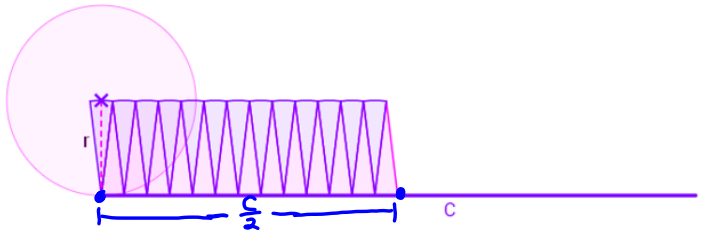
a. I can derive the formula for the area of a circle. Today
b. I can apply the area of a sector formula to solve problems. Mon.
c. I can apply the area formulas of a circle and a regular polygon to solve problems. Wed.

Recall the circumference formula for a circle:

$$C = 2\pi r$$

Use the dynamic exploration on page 419 of your e-book to complete Investigation #1 in your handout.

Investigation #1: Deriving the Area of a Circle



1. After the circle's circumference is unfolded and the pieces are fit together, what shape does the figure start to resemble?

   Parallelogram

2. How would you find the area of this shape?

   $A = bh$

3. What are the dimensions of the shape in terms of r (the radius of the circle)?

   $b = \frac{C}{2} = \frac{2\pi r}{2} = \pi r$

   $h = r$

4. Based on this information, make a conjecture about the area formula for a circle.

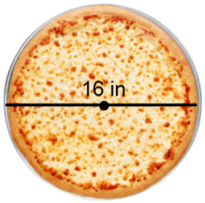
   $A = bh = \pi r \cdot r = \pi r^2$

Formulas for Circles:

Circumference: C = $2\pi r$ **Area:** A = πr^2

Based on what you now know about area, answer example #1.

Deal #1



$r = 8$

Cost: $20

Deal #2

$r = 4$

Cost: $10 each

1. What is a better deal, one 16-inch diameter pizza for $20 or two 8-inch diameter pizzas for $10 each? Why?

16 inch

$A = \pi \cdot 8^2$

Exact $A = \pi \cdot 64 = 64\pi \text{ in}^2$

Approximate $A = 201.1 \text{ in}^2$

Two 8 inch

$A = \pi \cdot 4^2$

$A = 16\pi \text{ in}^2$

$A \approx 50.3 \text{ in}^2$

Two pizzas

$A = 50.3 \cdot 2$

$A = 100.6 \text{ in}^2$

2. If the area of a circle is 196π ft^2, find the circumference of the circle.

$A = \pi r^2$

$\frac{196\pi}{\pi} = \frac{\pi r^2}{\pi}$

$196 = r^2$

$r = \sqrt{196}$

$r = 14$

$C = 2\pi \cdot 14$

$C = 28\pi \text{ ft}$ or 88.0 ft

3. If the circumference of a circle is 196π ft, find the area of the circle.

$C = 2\pi r$

$\frac{196\pi}{2\pi} = \frac{2\pi r}{2\pi}$

$98 = r$

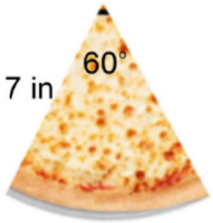
$A = \pi \cdot 98^2$

$A = 9604\pi \text{ ft}^2$

or

$A \approx 30171.9 \text{ ft}^2$

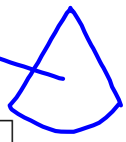
When calling to order the pizza, Mr. Lindahl decides to order himself a piece of pizza. P^3 offers two slices of pizza, one with a 60 degree central angle and radius of 7 inches and the other with a 120 degree central angle and a 5 inch radius. If these pieces of pizza are the same price, which piece do you think is the better deal? Explain your answer.

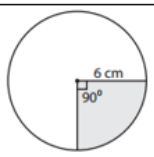
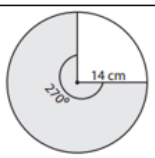


Sector: The part of a circle enclosed by two radii of a circle and their intercepted arc.

Investigation #2
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.

Sector



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

Area Formula for a Sector

$$\text{Area: } A = \frac{\text{central angle}}{360} \cdot \pi r^2$$

Example:

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

2nd slice is better deal.

$8.33\pi \approx 26.1 \text{ in}^2$

$A = \frac{60}{360} \cdot \pi \cdot 7^2 \approx 25.7 \text{ in}^2$

$A = \frac{120}{360} \cdot \pi \cdot 5^2$

$\approx 26.2 \text{ in}^2$

Assignment:

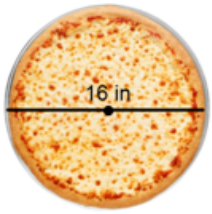
Finish 8.3 Circles and Sectors Homework (1-8)

Complete the Review Packet

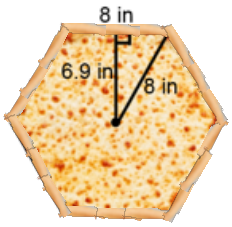
Warm-Up

You call a pizza shop to order a 16 inch pizza, but the owner of the shop recognizes you, and knows of your love of geometry. He decided to create a pizza in the shape of a regular hexagon which costs the same as 16 inch diameter pizza. The hexagonal shaped pizza has a radius of 8 inches and side length is also 8 inches. Should you order the hexagonal pizza? Explain why you would or would not.

Deal #1



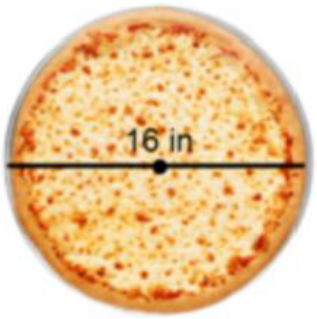
New Deal

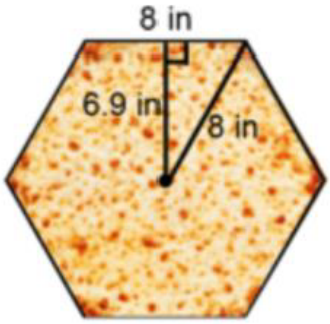


Get out your 8.3/8.4 "Area of Circles, Sectors, and Regular Polygons" Packets

Regular Polygon: a polygon that is equiangular (all angles are equal in measure) and equilateral (all sides have the same length).

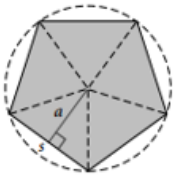
Suppose the following two pizzas cost the same price. Which pizza is the better deal, a circular pizza with a 16 inch diameter or a regular hexagonal pizza where both the radius and side length 8 inches long? Why?





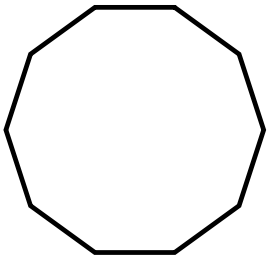
Investigation #2: Deriving the Area of a Regular Polygon

Step 1: Consider a regular pentagon with side length s, divided into congruent isosceles triangles. Each triangle has a base s and a height a. Step 1 What is the area of one isosceles triangle in terms of a and s?

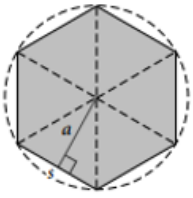


Regular pentagon

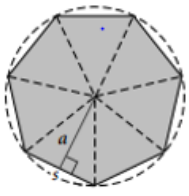
Step 2: What is the area of this pentagon in terms of a and s?



Step 3: Repeat Steps 1 and 2 with other regular polygons and complete the table below.



Regular hexagon



Regular heptagon

Number of sides	5	6	7	8	9	10	n	50
Area of regular polygon								

The distance a appears in the area formula for a regular polygon, and it has a special name—apothem. An apothem of a regular polygon is a perpendicular segment from the center of the polygon's circumscribed circle to a side of the polygon. You may also refer to the length of the segment as the apothem.

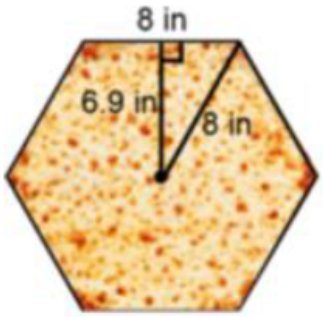
Step 4: What is the perimeter of a regular polygon in terms of n and s? Use your answer to this question and your last entry in the table to fill in this conjecture.

Area Formula for Regular Polygons:

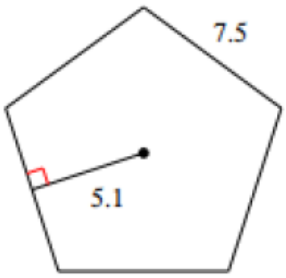
The area of a regular polygon where A is the area, P is the perimeter, a is the apothem, is given by:

A =

1. Use the area formula for a regular polygon to find the area of the pizza below.



2. Find the area of the regular pentagon below.



3. Suppose a regular hexagon has an area of 522 m^2 and a side length of 12 m. Find the length of the apothem of the hexagon.

4. Suppose a regular pentagon has an area of 33 ft^2 and an apothem length of 3 ft. Find the length of each side of the pentagon.

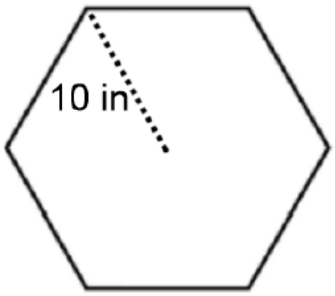
Assignment: 8.3 Area of Regular Polygons Homework

(Just do 1-3)

For extra practice: Workbook p. 60 #'s 1-4 ✓ answers in back

Also be completing your green packet (8.1 a-e, 8.3 a-b, 8.4)

5. Suppose we have the regular hexagon below.



a. Use the interior angle of a regular polygon formula, Each Interior Angle = $\frac{(n-2)180°}{n}$, to find the measure of each interior angle of the regular hexagon.

b. Draw in the apothem of the regular hexagon to form a triangle. What are the angle measurements of the triangle?

c. Use SOHCAHTOA or special right triangles to find the length of the apothem.

d. Use SOHCAHTOA or special right triangles to find the side length

e. Find the area of the regular hexagon above.