LessonTitle: **Developing Circle Formulas**	**Alg 8.7**
Utah State Core Standard and Indicators Algebra Content Standard 4 Process Standards 3-5	
Summary In this lesson, students derive the formulas for finding the perimeter and area of a circle. Then they practice using these formulas.	
Enduring Understanding Geometry enables us to describe, analyze, and understand our physical world.	**Essential Questions** How can we prove the formula for the area of a circle $A = \pi r^2$?
Skill Focus • Develop formulas to find area of circles. • Derive the Pi relationship found in circle circumference and area.	**Vocabulary Focus**
Assessment	
Materials: Graph paper, Small beans, Geometer's Sketchpad, or Patty Paper	
Launch	
Explore	
Summarize	
Apply	

Directions:

1) Collect cans or round lids for students to measure. Number the cans or lids so students can circulate the cans to measure. An alternate activity is found in Patty Paper Geometry, the circle area formula, page 205 or 208.

Alg 8.7 Developing Circle Formulas

1) Circle Circumference. Use string and a ruler to measure the circumference of the cans or round lids given to you by your teacher.

Record your findings below.

Circle #	Diameter	Circumference	Ratio c/d	Ratio c/d as decimal
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
Average Ratio				

After recording your information, one member of your group should give your decimal ratios to the teacher in order to find the average ratio of all the class ratios.

Average ratio _____.

What is the relationship of a diameter to a circumference of any circle?

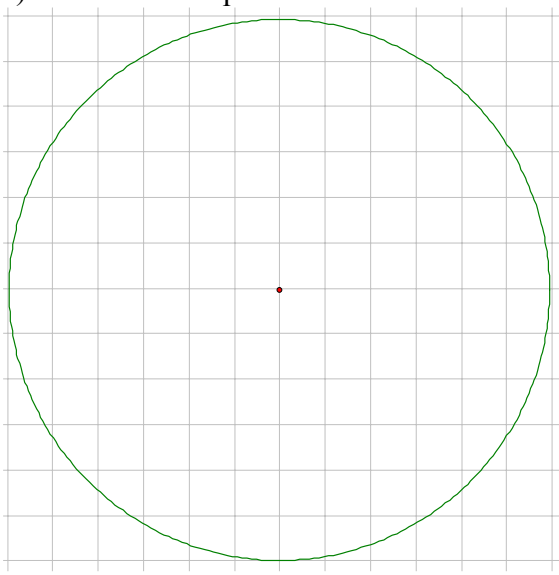
Using this information, create a formula for finding circumference of a circle. Explain your formula below.

Compare your formula to the formula given in your book.

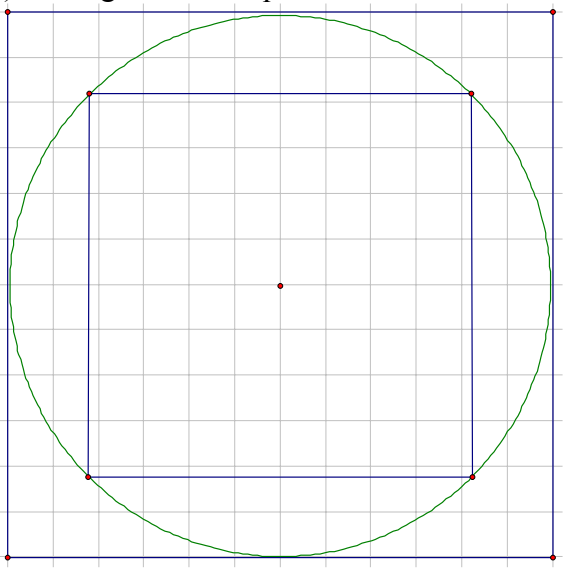
2) Circle Area

Circle area. Use the following five methods to estimate the area of a 12 centimeter diameter circle. Show all work and thinking for each method.

a) Estimate the square centimeters



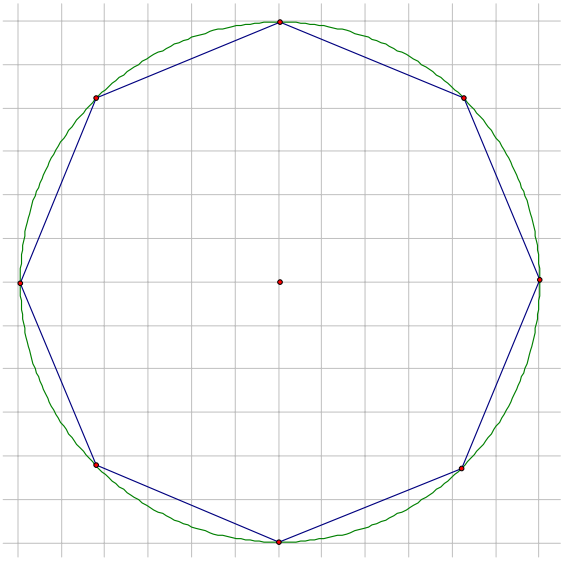
b) Average the two squares below.



Estimated area = _____ Estimated area = _____

c) Estimate the area of the inscribed octagon. Estimated Area _____

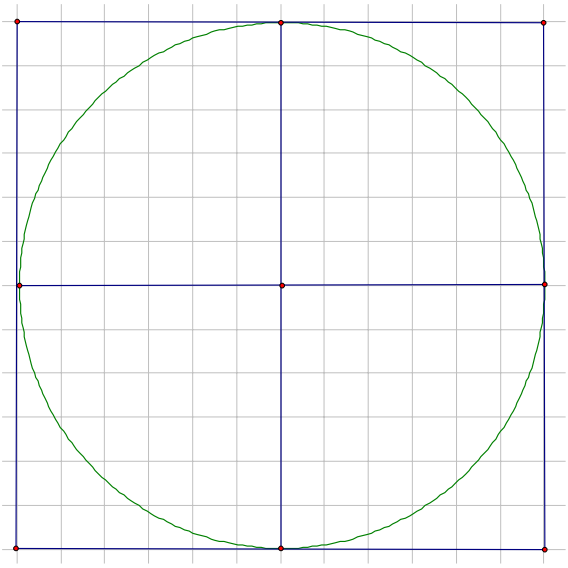
Show all estimation work below.

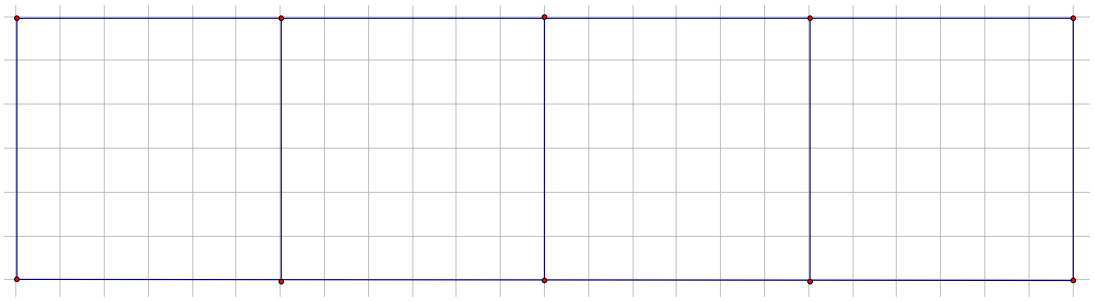


d) Think of the four smaller squares on the circle below as radius squares. Why can we call them radius squares?_____

Place beans on the circle below. Then transfer the beans to the rectangle below.

Estimate the area of the circle. Show all estimation work below.





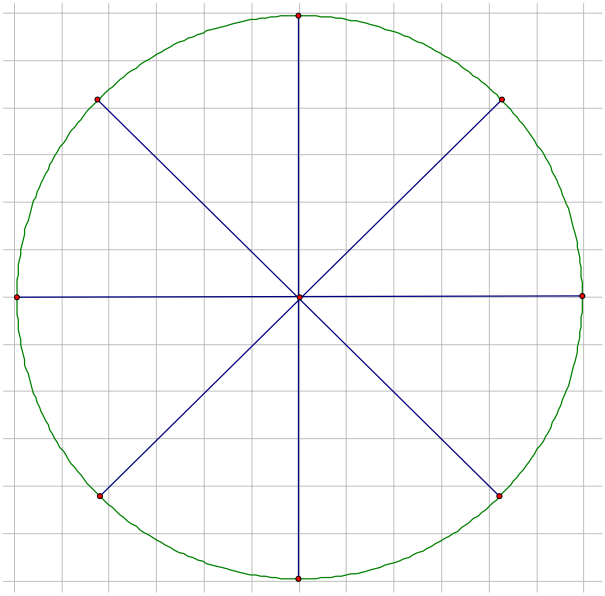
Estimated Circle Area _____

How many radius squares cover the same area as the circle? _____

How can you compare the circle the square?

What is your formula for finding the area of a circle? Explain it.

e) Cut the circle (from the cutting page) into eighths. Then fit and paste the eighths into a long line (turn the pie pieces opposite ways) to create an (almost) parallelogram.



Estimated area _____

Create your "almost" parallelogram here. Estimated area_____

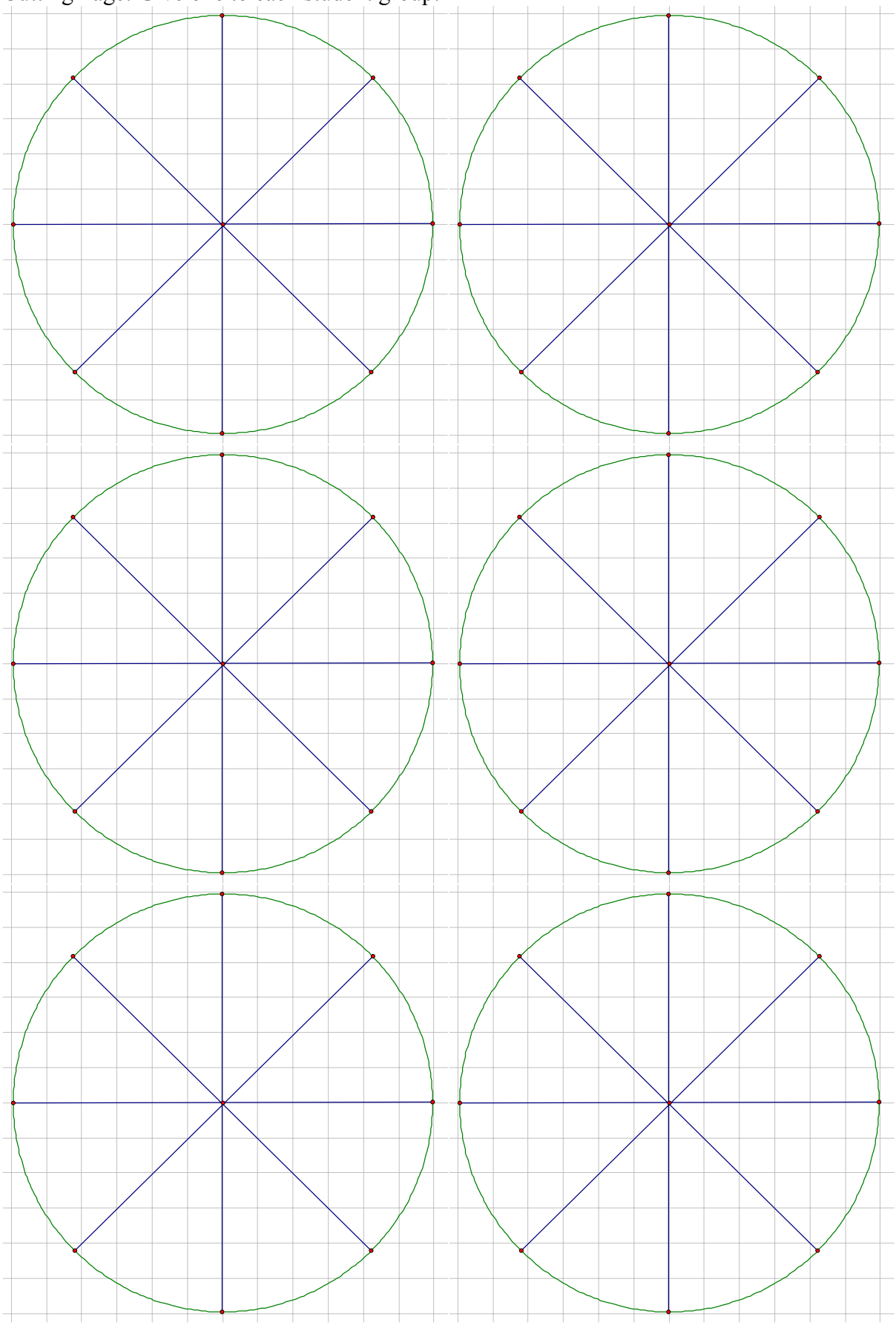
What is the height of the parallelogram? _____ How does this height compare to the radius of the circle?

What part of the circle forms the base and top of the "almost" parallelogram?

How can you use the circumference formula to help you create an area formula?

Write your thoughts about the formula for the area of a circle.

Cutting Page: Give one to each student group.



Using Formulas Practice

Name_____

Areas:		**Perimeter and Circumference**	**Volume**
Rectangle	= LW	= 2L + 2W	LWH (rectangle prism)
Circle	= π r^2	= π d	4/3 π r^3 (sphere)
Triangle	= 1/2 bh	= a + b + c	
Parallelogram	= [(b + b)/2]h	= a + b + c + d	

1) Wallpaper comes in rolls that are 60 feet long and 2 feet wide. How many rolls of wallpaper will it take to cover 600 square feet?

   Step 1 _____ Step 2 _____

   How much will the wallpaper cost if each roll is $25?_____

2) A rectangular garden has an area of 42 square feet. One of the sides is 6 feet. What is the other side? _____ You want to put a fence around it. How long will the fence need to be? Show your steps.

   Equation _____ Answer _____

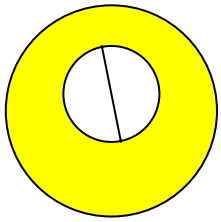
3) a) A circular swimming pool is 32 feet in diameter. For safety reasons the pool needs a fence. How long will the fence need to be?

   Equation_____ Answer_____

   b) What is the area of the yard covered by the pool?

   Equation_____ Answer_____

   c) There will be a 5 foot wide nonskid sidewalk around the pool. How many square feet of this surface will need to be laid? LABEL the drawing. Show your steps



   Step 1 _____

   Step 2 _____

4) The <u>diameter</u> of the earth is about 7926 miles. Find the volume of the earth.

   Equation_____ Answer_____

5) A shipping company needs to know how many toy cars will fit into a box. So they need to know the volume of the box which has is 2 ft by 2.5 ft. by 3 ft.

Equation_____ Answer_____

6) A 12 ft by 16 ft off ice is being sectioned off into triangular areas. From corner to corner of the office is 20 feet. The manager needs a dividing banner to hang from the ceiling of one of the triangles. So he needs to know the perimeter of the triangle.

a) What is the perimeter of the triangular section of this office?

Equation_____ Answer_____

b) The carpet in each section will be a different color. How many square feet of carpet will be needed to cover each triangular section?

Equation_____ Answer_____