

Lesson Plan Title

Calculating the Area of Circles

Goals

Students will understand where the area of a circle formula comes from and to use it accordingly.

Objectives

Students will be able to explain in writing one of the two methods shown in the video of how the area is $2\pi r^2$ with 100% accuracy. It is not expected that students have to go into much detail, but there must be enough to show a grasp on the concept.

Students should know that pi is irrational and never ends (100% accuracy).

Students will be able to solve problems that solve for area or radius with 80% accuracy.

Students will acknowledge that taking a plane section of a torus (donut) vertically will be a circle (100%).

Discipline and Topic

This lesson will be taken place after a lesson on circumference. Also, the concept of pi is crucial, hence the audio pieces on pi. Having students understand circumference, pi, and the area of a circle is the foundation for later topics which include finding surface area and volumes of three dimensional shapes (cylinder, cone).

Target Population

This lesson is for a regular 7th grade class.

Curriculum Alignment (State and Common Core)

State Standards:

7.G.1 Calculate the radius or diameter, given the circumference or area of a circle

Common Core Standards:

Geometry:

3) Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

4) Know the formulas for the area and circumference of a circle and use them to solve problems;

give informal derivation of the relationship between the circumference and area of a circle.

Lesson Description

Provide a detailed description of the lesson and timing. What occurs first, second, third, etc.? What do you do or ask as a teacher? What do you expect students to do? What homework will you assign?

Introduction (5-10 min):

Students will work on a warm-up problem dealing with circumference. We will go over the problem as a class and answer any questions.

Middle (20-30 min):

1) Students will listen to the video with the screen hidden for *5 Facts About Pi (That You May Not Know!)* to learn some interesting facts about pi and also review already learned facts about pi. This will help focus students and grab their attention with an interesting piece of audio that is interesting and relatable. The video will only be viewed from 0:15- 1:05.

2) We will go over the formula for area of a circle and practice a few problems as a class, and then individually to be gone over after.

3) Students will then listen to with the screen hidden on *Math Animations: The Story of Pi*. We will pause after each method shown for where the area came from. (1:20 and 1:53) and discuss these methods as a class.

- *Why do these methods work?*

- *Where does the circumference formula come into play?*

- *Can you think of any other methods?*

4) We will discuss a problem similar to question that is like the last question in the homework and quiz together as a class. We will discuss why the plane section is a circle and what radiuses they see within the torus.

Closure (5-10 min):

Any questions will be addressed. The following questions may be asked if time allows:

- *What is the formula for finding the area of a circle?*

- *What are the two ways we learned about that show where this formula derived?*

- *What other problems may we run into where finding the area of a plane section of a torus could be useful? (Ex: Finding tire sizes, ring sizes, baby teething rings, etc.)*

Supplemental Materials/Links

Math Animations: The Story of Pi. Retrieved from:

<http://www.youtube.com/watch?v=2fCTnF75AL0>

5 Facts About Pi (That You May Not Know!) Retrieved from:
<http://www.youtube.com/watch?v=Rvk5nDMTbf8>

Graphic Image of the Torus. Retrieved from:
<http://www.daividdarling.info/encyclopedia/T/torus.html>

Assessment of Students

Students will complete the homework and a quiz will be given the next day, after any questions on the homework are discussed. This rubric will be used to assess the homework which would have similar questions to the quiz.

Objective (points possible)	3	2	1	0
Explain one of the two methods for area of a circle (2)		Method is clearly stated and explained well enough to show understanding.	Method is stated, yet poorly explained.	Methods are not explained. Little to no effort shown.
Solving for the area (3)	All problems have work shown; only 1-2 problems have the wrong answer due to minor mistakes.	Work is shown for the problems, yet there are errors throughout causing some of the answers to be wrong.	Only right answers are shown and no work OR Some effort is shown and only a few of the problems are correct.	Little to no work shown. Most to all of the problems have wrong answers.
Knowing that pi is irrational and never ends (2)		Both question are right.	Only pi is irrational is stated OR that it never ends.	Questions are either not answered, or both parts are wrong.
Knows that the section of the torus is a circle and answers question (3).	Pictures clearly labeled, work shown, and shows correct answers.	Has pictures labeled and work shown, yet has wrong answer due to one minor mistake.	Either has the circles labeled correctly and solved wrong, OR work is shown with correct answer, with no picture.	Does not state it is a circle, and question is unanswered or wrong.

Name _____

Area of a Circle Homework

Solve problems 1-4. **Label** your answer, use **3.14 for pi** and round each answer to the **nearest tenth**.

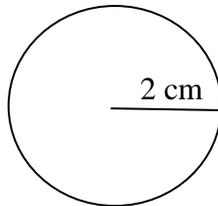
1) Find the area of a circle when the radius is 4 cm.

$$50.2 \text{ cm}^2$$

2) Find the area of a circle when the radius is 3.2 in.

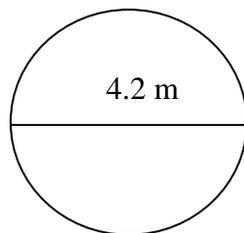
$$32.2 \text{ in}^2$$

3) Find the area



$$12.6 \text{ cm}^2$$

4) Find the area



$$(\text{radius} = 2.1 \text{ m})$$

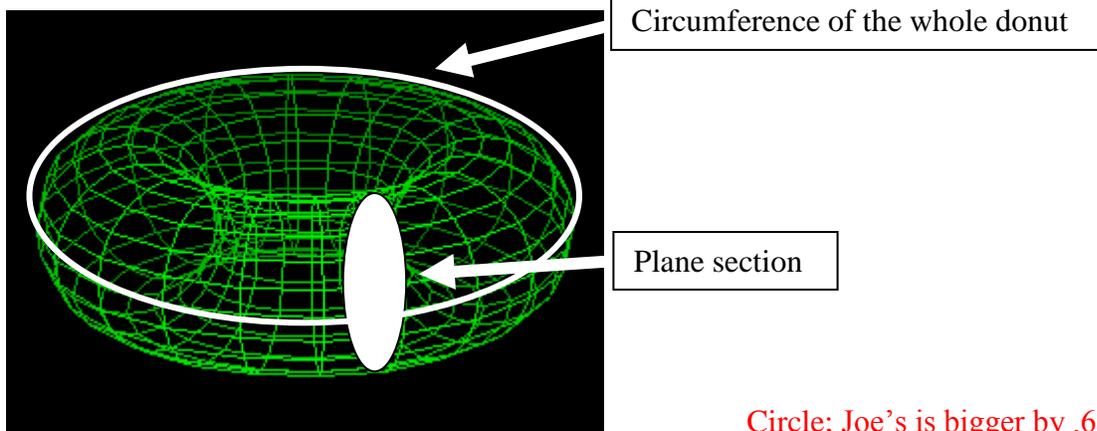
$$\text{Area} = 13.8 \text{ m}^2$$

5) Explain one of the two methods explained in class to show how the area of a circle formula makes sense. You may draw pictures to help your explanation.

6) True or **False**: Pi is a rational number

7) **True** or False: Pi is a number that never ends and goes on forever

8) Take a plane section from the following figure. Let this figure (torus) represent a donut. Joe's section of his donut has a **radius** of 2.5 cm. Jill's section has an **area** of 19 cm^2 . What shape is the plane section? Whose donut is bigger and by how much?



Circle; Joe's is bigger by $.625 \text{ cm}^2$

Name _____

Area of a Circle Quiz

Solve problems 1-4. Each question is 2 points. 1 point for work shown and 1 point for the correct **labeled** answer. Use **3.14** for **pi** and round each answer to the **nearest tenth**.

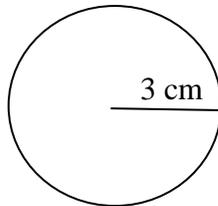
1) Find the area of a circle when the radius is 6 cm.

113.0 cm²

2) Find the area of a circle when the radius is 2.1 in.

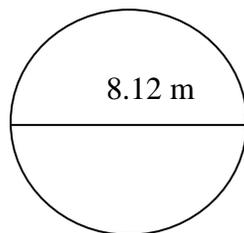
13.8 in²

3) Find the area



28.3 cm²

4) Find the area



(radius = 4.06 m)

Area = 51.8 m²

5) Circle the answers that correspond to pi. More than one may be circled (1pt).

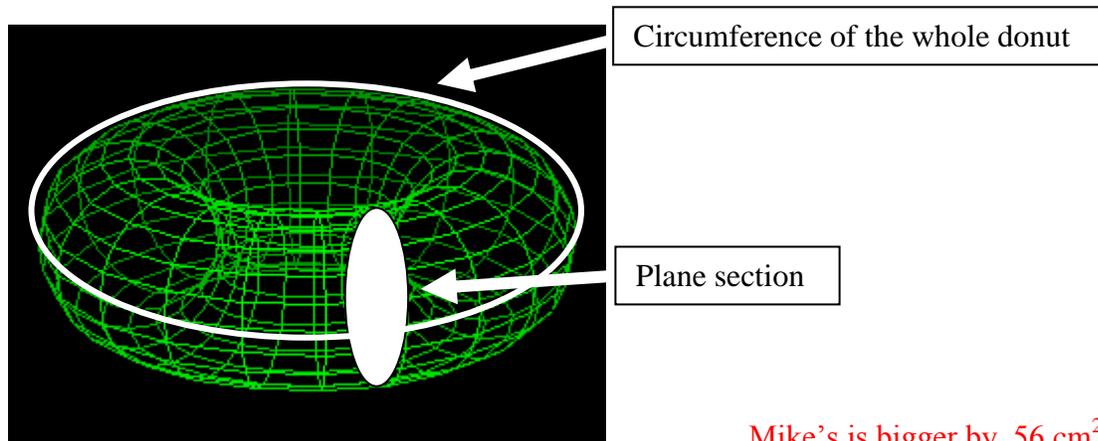
Irrational

Rational

Exactly 3.14

≈ 3.14159...

6) Take a plane section from the following figure. Let this figure (torus) represent a donut. Mike's section of his donut has a radius of 2 cm. Jane's section has an area of 12 cm^2 . Who has the larger donut if the circumference of each whole donut is equal? (2 pts: 1 pt for work, 1 pt for correct answer.)



Evaluation of Lesson

If 80% or more of the students score a 7/10 or better on the homework and if 80% or more of the students score a 9/11 or better on the quiz, I would consider this lesson to be a success.

Rationale for using the medium

I used this medium because I thought it would be the best way to introduce mathematics through audio. Being a math class, it is not easy to incorporate speeches, movies, books read on tape, or other forms of audio; nor would it be effective or necessary. Incorporating these short YouTube videos allows students to refocus and be a part of this new way of introducing mathematical ideas. It even introduced ideas that were new and interesting to me, and would be nice to share with the students as well. Although both of the videos go through the material kind of quickly (especially since most of this information is new), it can be hard for students to keep up. Yet the nice thing is that the teacher can pause the video throughout and talk about each new idea to ensure students understand what the video has to offer.
