Unit 8:
Geometric Measurement

"Where there is matter, there is geometry."
Johannes Kepler (1571-1630)

Unit Summary

Overview:

The topic of geometric shapes is continued in this unit with the study of different types of polygons and their unique features. Students will study perimeter and area of polygons using hands-on methods. Measurement is a weak topic among middle school students, so it is critical that they understand not only how to find measurements, but also how measurement methods work. When discussing circles, students need to understand the relationship between the diameter, radius, and circumference of a circle. Finding the area of a circle will also be taught in this unit. Finally, the concept of volume will be introduced. Models will be used throughout the unit to give students a tactile way of learning.

Objectives:

Students will

- investigate determining perimeter and area of polygons using hands-on methods;
- investigate the relationship between a circle's diameter and radius and its circumference;
- investigate finding the area of a circle using hands-on methods;
- investigate determining the volume of a solid using hands-on methods.

Name:	Date:

Pi, Each and Every Time Notes

Screen 1

Here's a number introduced to me
by Archimedes and some other guys.
It's an irrational number that never repeats
roughly twenty-two sevenths, it's pi.

Screen 2

'A' *is its perimeter.*
The line through the widest part is diameter.
And circumference divided by
Diameter is always pi.

It's always true every single time
No matter what the circle's size
It's true from sea to shining sea
Three point one four and on to infinity

Screen 3

If your circumference is ninety-four and two tenths feet
With a thirty-foot diameter I will repeat
circumference divided by
Diameter is always pi.

If circumference is sixty-two and eight tenths yards
and diameter is twenty yards, it's not that hard
circumference divided by
Diameter is always pi.

If the circle's really big,
it still holds true,
and if the circle's really small,
it's true then, too.

Name:	Date:

Screen 4

And since that fact is always true
The other side of this fact family must be, too.
To find a circle's diameter,
Divide pi into its perimeter.

And did you know half of the diameter is called a radius*?*
With part of the puzzle, you can figure out the rest
Because you know that pi is always the same number.
It's not that hard to remember.

Screen 5

For any circle that you find
the circumference divided by
its diameter is always pi.
Said another way, diameter times...

...a little more than three,
Equals circumference I guarantee
Introduced to me by Archimedes
Three point one four one five nine, stretching on to infinity.

Name:	Date:

Pi Notes

Screen 1

Whatever the size of the *circle*, three diameters plus a little more will always equal its circumference.

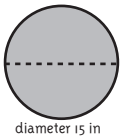
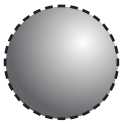
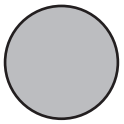
- That "a little more" approximately equals one seventh of the diameter, and
- that "three diameters plus a little more" is known as the irrational number *pi*, which, though endless and never-repeating, is approximately equal to twenty-two sevenths or 3.14.

This knowledge gives us a formula for any circle:

$$\frac{\text{Circumference}}{\text{Diameter}} = \frac{22}{7} \approx 3.14 = \text{pi} = \pi$$

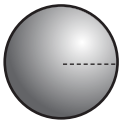
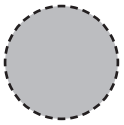
Screen 2

The *radius* of a circle is a straight line from the center to the edge of a circle or sphere. It is equal to one half of the diameter. What are the radii of the circles and spheres to the right?

	Answer
 diameter 15 in	
 circumference 60 in	
 circumference 25 in	

Screen 3

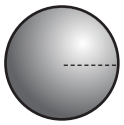
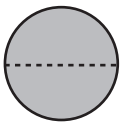
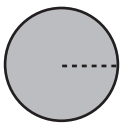
The *diameter* of a circle is a straight line from one side of a circle or sphere to the other that passes through the center. It is equal to twice the radius. What are the diameters of the circles to the right?

	Answer
 radius 3.5 m	
 circumference 17m	
 circumference 7m	

Name:	Date:

Screen 4

The *circumference* of a circle is the length of the outside edge of a circle or round shape. It is the perimeter of a circle. It is equal to pi times the diameter. What are the approximate circumferences of the following circles and spheres?

	Answer
 radius 8ft	
 diameter 25 ft	
 radius 10.5 ft	

Screen 5

The relationship between *radius*, *diameter*, and *circumference* of a *circle*.

Summary

And there you go! Measuring a circle is as easy as understanding that

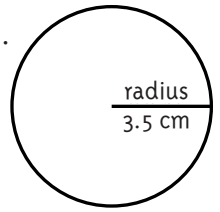
- the length of the diameter is twice the length of the radius and
- the circumference is the length of the diameter times π!

Name:	Date:

Geometric Measurement

Use the pictures to answer exercises 1 – 3 below. You may use a calculator.

1.



a. Diameter

_____ cm

b. Radius:

_____ cm

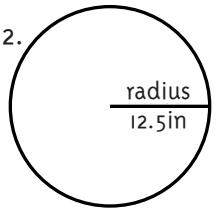
c. Area:

_____ cm^2

d. Circumference:

_____ cm

2.



a. Diameter

_____ in

b. Radius:

_____ in

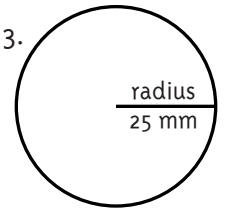
c. Area:

_____ in^2

d. Circumference:

_____ in

3.



a. Diameter

_____ mm

b. Radius:

_____ mm

c. Area:

_____ mm^2

d. Circumference:

_____ mm

Circle the correct answers below.

4. The radius of a circle is 15 millimeters. What is its circumference?

a. 92.4 mm b. 94.2 mm c. 706.5 mm

5. The diameter of a circle is 32.4 cm. What is its area? _____

6. The area of a circle is about 200 in^2. The radius of the circle could be

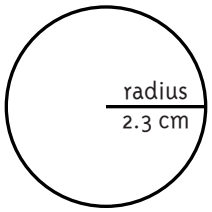
a. 6 in. b. 8 in. c. 64 in.

Name:	Date:

Geometric Measurement

Find the circumference (C) and area (A) of each circle below.

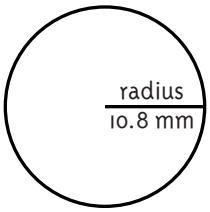
1.



C = _____ cm

A = _____ cm²

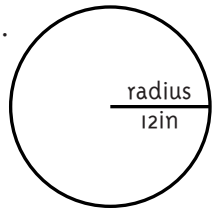
2.



C = _____ mm

A = _____ mm²

3.



C = _____in

A = _____in²

The radius of a small plate is 3 inches. The radius of the large plate is twice as big as the small plate. Circle the correct answer below. Show your calculations.

4. What is the diameter of the large plate?

a. 6 in b. 12 in c. 9 in

5. What is the area of the small plate?

a. 28.26 in² b. 9.42 in² c. 18.84 in²

6. What is the circumference of the large plate?

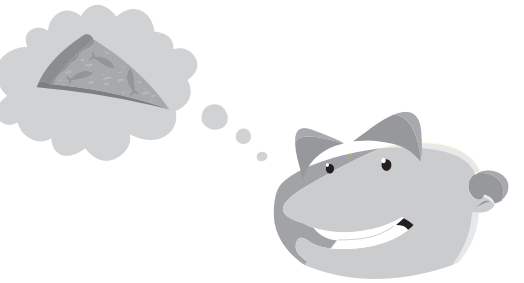
a. 28.26 in b. 18.84 in c. 37.68 in

7. What is the circumference of the small plate?

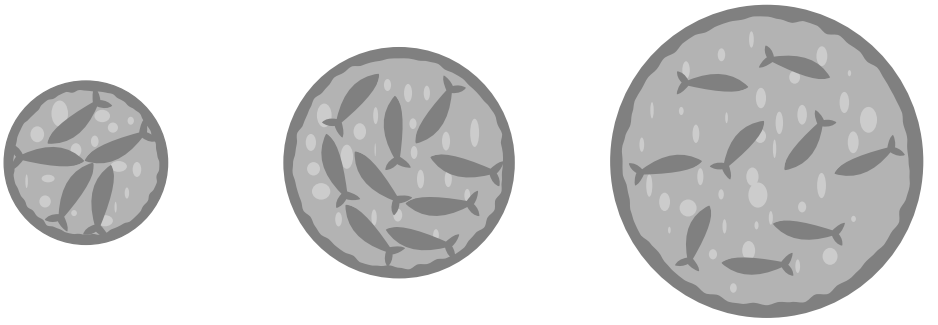
a. 18.84 in b. 37.68 in c. 452.16 in

Name:	Date:

Rocky Rizzo's Pizzeria Specials



Rocky Rizzo's Pizzeria is running a special deal on his world famous pizzas. The menu shows these pizza choices:



Small — 12 inches **Medium — 16 inches** **Large — 22 inches**

Mr. Bighead stops at the pizzeria on his way home from a stimulating game of croquet and wants to get the best deal. Rocky tells him that he can have

- one large pizza for $12.50,
- two medium pizzas for $12.50, or
- three small pizzas for $12.50.

In order to figure out what the best deal would be, Mr. Bighead tries to draw a mental picture of pizza slices in his head, but only gets more confused. His mouth starts to water, as he yearns for a delicious, piping hot slice of anchovy pizza to satisfy his hunger pains.

Problem

What deal will give Mr. Bighead the most pizza for his money?
Explain your answer.

Name:	Date:

Geometric Measurement

1. Use six objects to trace different-sized circles below.
2. Measure the diameter of each using a metric ruler.
3. Find the radius (R), area (A), and circumference (C) of each. Include the units for each.

Diameter: _____ R: _____ C: _____ A: _____	Diameter: _____ R: _____ C: _____ A: _____
Diameter: _____ R: _____ C: _____ A: _____	Diameter: _____ R: _____ C: _____ A: _____
Diameter: _____ R: _____ C: _____ A: _____	Diameter: _____ R: _____ C: _____ A: _____