

MATH

Can Take You Places

LESSON 7

“Don’t Be A Square”

by Michael Torres

CONCEPT AREA Measurement

GRADE LEVEL 5-6

TIME ALLOTMENT Two 60-minute sessions

LESSON OVERVIEW Students will learn the relationship between the radius and diameter of a circle and the relationship of the diameter and the circumference of a circle. Students will also find the approximate circumference of a circle, given either the diameter or radius.

LESSON ACTIVITIES OVERVIEW After having the teacher read *Sir Cumference and the First Round Table* to the class, the students will measure the diameter of five different circular objects.

LEARNING OBJECTIVES Students will be able to:

- Identify the radius, diameter and circumference of a circle.
- Be able to obtain the diameter, given the radius, and vice versa.
- Find the approximate circumference of a circle, given either the radius or the diameter.
- Find the approximate diameter of a circle, given the radius.
- Measure the diameter and circumference of circular objects.
- Solve a problem situation using prior knowledge.
- Use a chart to organize data.

STANDARDS (TEKS) From the Texas Essential Knowledge and Skills for Math for grades 5-6:

Grade 5
5.4H

Grade 6
6.8A, B; 6.11A, B, D; 6.12A; 6.13A, B

MEDIA COMPONENTS "The World of Math Online." This Web site includes a section with games that students will have fun playing. <http://www.math.com/>

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- MATERIALS**
- *Sir Cumference and the First Round Table* (optional)
 - *Sir Cumference and the Dragon of Pi* (optional)
 - Diagram of Circle (in Student Handouts)

Per group of students:

- Two circular plastic lids (different sizes)
- One circular item (e.g., trash can)
- Ruler with metric units
- Two different colors of string
- One calculator
- Circles (one for each group) cut out of construction paper about eight inches in diameter

**PREP FOR
TEACHERS**

- Students will measure lids as well as other circular items that are in the classroom. Make sure that you have at least one item (that is usually found in the classroom) per group. A circular trash can and some other items have different bases, so either base can be used, or have the group measure both bases [confusing].
- As a reward, order a cookie from the store in the mall for the second day. This is part of the culminating activity. However, it is not mandatory.

Note:

The following concepts will be covered during this lesson: **radius, circumference, diameter, pi, quotient, estimation and ratio**. Students may need to review the concepts prior to beginning the activities.

**INTRODUCTORY
ACTIVITY:
SETTING THE
STAGE**

1. Read the book *Sir Cumference and the First Round Table: A Math Adventure*.
2. Review the vocabulary words for a circle with the students (radius, diameter, circumference, π ; See “Media Component” Web site number three for details).

3. Have the students go back to their stations and trace one of the lids on a clean sheet of paper. They will also label the three parts of a circle discussed in the book (radius, diameter and circumference). One way to find the center of the circle is to fold it in half to create the diameter. Then, fold a second diameter, so that the two diameters intersect. Where the two diameters intersect, mark the center point. Students can then proceed to draw and label the radius and circumference.

**LEARNING
ACTIVITIES**

4. Use Diagram of Circle (in Student Handouts). Ask students if they notice a relationship between any of the three parts of the circle. Most should notice that the radius is half the size of the diameter. To lead students towards this observation, have them record the data as they measure in the chart like the one below. (cont next page)

	Object	Diameter (mm)	Radius (mm)	Circumference (mm)
1.				
2.				
3.				

To make the relationship between diameter and circumference easier to see, have the students graph the two sets of data. Use the diameter as the independent variable and the circumference as the dependent variable.

Have the students measure the diameter of each of the three items. The students should record the diameter of each item to the nearest millimeter and then figure the radius of the circle. Ask: “Is there another relationship besides the one between the radius and the diameter? How can we measure the circumference of the lids or of the trash can?”

Some might suggest using a string and then measuring the string.

Some might be familiar with a measuring tape used by carpenters.

Some might be familiar with a measuring tape used by a seamstress.

Have the students measure the diameter of each of their three items using one of the strings.

Using the other color string, have the students measure the circumference of the three items.

Allow the students to work for a while with the strings to see if they come up with a relationship between the diameter and the circumference of each item.

Give each group one of the construction paper circles and have the students record what they think the relationship between the diameter and the circumference is. Allow each group to report its findings to the class.

CULMINATING ACTIVITY

1. After discussing the findings with the class and getting a consensus as to what the relationship is, read *Sir Cumference and the Dragon of Pi* to the class. (If you purchased a cookie, this would be the time to share it with the class.)

2. Select one of your students to use the calculator to determine the quotient of the four items on page 21. Have another student record the findings on the chalkboard in a table format.

3. Discuss with the students that for now, they will round pi to 3 to get an estimate of the circumference of the items at their stations. (See: “Teacher’s Note” below.)

4. Have the students create a table with four subheadings: “Item Name,” “Diameter,” “Pi,” and “Circumference.” Have the students record the diameter of each item they measured and then figure out the circumference by multiplying (using 3 as the estimate for pi). Remember to have them record the data as they measure.

5. Have the students create another table using the same information, but have the second column be the circumference and the last column be the diameter. Ask: “How

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will this table differ from the last? Are we going to do the same operation?”

6. Teacher’s Note: The ratio of circumference to diameter will not be equal to 3.14; remember π is an approximation because it is an irrational number. Be careful not to lead students into thinking that $\pi = 3.14$. This is not true since 3.14 is a terminating decimal and π , on the other hand, is irrational and never terminates. Make sure that students understand that the definition of π is the ratio of the circumference of a circle to its diameter, $C / D = \pi$. The value 3.14 is only an approximation of π . $\pi \approx 3.14$, *not equal to 3.14*. Please stress this point! When students physically measure items and find the ratio of the circumference to the diameter, they will probably not get the value 3.14; this is because there will always be error in measurement due the precision of the measurement tools. Rather they will get a value of 3.... something. Help students to feel secure knowing that the value of π is a little more than three.

CROSS-CURRICULAR EXTENSIONS

Language Arts

Have students create their own one-page story that deals with mathematics. This can be as short or as long as you want it to be. Some students will be very creative with their ideas. Encourage this creativity as long as it is mathematically sound and they use the proper vocabulary and terminology.

Art

Using a plastic circle about 12 inches in diameter, have the students label the parts of a circle using yarn. Have the Art teacher demonstrate using a Hula hoop.

REAL-WORLD CONNECTIONS

Have an architect visit the class to discuss how he/she uses the relationships found in a circle in his/her planning process.

ASSESSMENT

Informally monitor students’ responses for mathematical understanding.

STUDENT HANDOUTS

Diagram of Circle

