

Academic Standard for Mathematics

7.5.4 Use formulas for finding the perimeter and area of basic two-dimensional shapes and the surface area and volume of basic three-dimensional shapes, including rectangles, parallelograms*, trapezoids*, triangles, circles, right prisms*, and cylinders.

Lesson Objective

By the end of the lesson, students will be able to:

- Identify the use and number value of pi.
- Identify the diameter and radius of a circle, as well as demonstrate how to convert between the two.
- Identify the circumference of a circle.
- Apply pi to find the circumference of a circle.

Standards for Mathematical Practices

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Common Core Literacy Standards:

Reading/Writing for Technical Subjects:

Reading:

Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

Writing:

Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow

Type of Mathematical Knowledge Objective is seeking to measure

- Declarative
- Procedural
- Conceptual

Mathematic Conceptual Categories

- Number and Quantity
- Algebra
- Functions
- Modeling
- Geometry
- Statistics and Probability

for multiple avenues of exploration.

Supporting Diverse Learners

Student Assets: Students respond well to hands-on experiences and visual activities. Students benefit from working in pairs or small groups (social learners).

Anticipated Challenges: Students may struggle at first with processes requiring multiple steps. Students may also need more one-on-one guidance before being able to work independently.

Considerations for IEP and/or ILP:

"Gear Up": More advanced students will be given a ruler to make measurements, which will occasionally require them to use multiple steps of adding segments together while measuring the string.

"Gear Down": Students that may be struggling will be given a meter stick or a yard stick, so they will be focusing on measuring the circumference and diameter without struggling to add together multiple segments.

IEP: John (a student with a learning disability) will be allowed to use a calculator to compute quotients.

There are three students in the class with ILPs. All three are native Spanish speakers. One is a level 2, one is a level 3, and one is a level 5. The level 5 student and level 2 student will be paired together during the activity. The level 2 and 3 students seem to be visual learners, while the level 5 student really benefits from social interactions. They may speak in Spanish, if needed to clarify what they are doing. The level 2 and level 3 students will be allowed to use a Spanish/English dictionary, as well as be allowed to use either an iPad or computer to look at terms on an online English/Spanish mathematics dictionary (Manura). Much of the instruction will include visuals that will be helpful to these students, and those visuals will be left on the board during the student activity. Also, doing hands-on work to learn the number 'pi' will be beneficial to these students (Hill & Flynn, 2006).

Language Objectives: (Hill and Flynn Chapter 2)

The level 2 student will be able identify the circumference and diameter of a circle by pointing to a picture of a circle or a circular object, and tracing finger either around the edge of the circle or across the middle (for the appropriate term).

The level 3 student will be able to verbally identify the circumference and diameter of a circle. For example, they can tell somebody else "Point to the outside of a circle and go around the edge. That is the circumference." or "Move your finger across the middle of the circle to show the diameter."

The level 5 student will be able to use the words circumference and diameter in conversation with another person, using the words for more than just stating their definitions.

Checklist Overview: Use the checklist below to select your method(s) and your support strategies for this lesson. In the agenda section that follows, be sure to name the strategies in the appropriate section.

Rationale for Method(s): Why are you approaching the lesson this way? Students will gain a deeper understanding of the number pi and how it is related to circumference and diameter of a circle doing this hands-on activity than they would if they were to just read about it in a book, or even if they listened to a lecture explaining it.

Method(s) for Instruction

- Class/Group Discussion
- Cooperative Learning
- Small Group
- Guided Practice
- Lecture or Direct Instruction
- Question/Answer
- Learning Stations

- Teacher Modeling/Demo.
- Journal writing
- Role Play
- Hands-on
- Inquiry Learning
- Game
- Simulation/Role Playing
- Independent Learning
- Other

Use of Technology

- Cell Phone
- PollEverywhere.com
- CPS Clickers
- Elmo Document Camera
- Software
- Student Computers
- Teacher Computer w/LCD
- Video Clips/DVD
- Website
- Web 2.0 tool
- Other : Have students enter their quotients onto an Excel sheet that is loaded onto Google Docs (listed on Web 2.0 tool) and shared with the whole class. This will enable students to enter data onto the same sheet while using multiple computers. Once all of the data has been entered, the excel sheet can be pulled up in front of the whole class in order to calculate the average.

Study Skills	Reading Strategy	Writing Strategy	Vocabulary Strategy
<ul style="list-style-type: none"> <input type="checkbox"/> Two column notes <input type="checkbox"/> Guided note taking <input type="checkbox"/> Opinion-proof chart <input type="checkbox"/> Problem-solution chart <input type="checkbox"/> Venn diagram <input type="checkbox"/> Cause and effect frames <input type="checkbox"/> MVP Most Valuable Point <input type="checkbox"/> Creating metaphors <input type="checkbox"/> Other 	<ul style="list-style-type: none"> <input type="checkbox"/> EQW Experience/Questions/still wondering <input type="checkbox"/> KWL (word problem chart) <input type="checkbox"/> Five-Step Problem solving <input type="checkbox"/> Reciprocal teaching <input type="checkbox"/> Graphic Organizer <input type="checkbox"/> Anticipation/Prediction guides <input type="checkbox"/> Word Problem Roulette <input type="checkbox"/> Problematic Situation <input type="checkbox"/> Read-talk-write <input type="checkbox"/> Directed reading thinking activity <input type="checkbox"/> Other 	<ul style="list-style-type: none"> <input type="checkbox"/> Learning Logs <input type="checkbox"/> Question/Answer Relationship <input type="checkbox"/> Question the Author <input type="checkbox"/> RAFT <input type="checkbox"/> Writing to Learn <input type="checkbox"/> Social-academic language translations <input type="checkbox"/> Graphic organizers <input type="checkbox"/> Outlining <input type="checkbox"/> Other: 	<ul style="list-style-type: none"> <input type="checkbox"/> Frayer model <input type="checkbox"/> List-group-label <input type="checkbox"/> Semantic feature analysis <input type="checkbox"/> Word Sorts <input type="checkbox"/> Number Cubes <input type="checkbox"/> Cue Cards <input type="checkbox"/> Vocabulary self-awareness activity <input type="checkbox"/> Creating metaphors <input type="checkbox"/> Concept Definition Maps <input checked="" type="checkbox"/> Other Hands on discovery

Strategies Rationale: Why are you selecting these support strategies? What will these help you and your students accomplish?

Students will need a little instruction to understand exactly what they are supposed to do during the activity, but this lesson should allow students to do some hands-on work that will enable them to discover the use and value of the number pi. This type of lesson will be beneficial to many different students because it builds vocabulary in a meaningful way. Students will have a better understanding of the terms circumference, diameter, radius, and pi because they will be physically using them/discovering them instead of just reading the definitions out of a book (Echevarria, Vogt & Short, 2004). The beginning of this lesson also helps to tie students back to some information that has been covered previously in this class (perimeter of other shapes). By starting out with reviewing perimeter, I am helping students to make the connection between perimeter and circumference of a circle.

Agenda

Anticipatory Set: How will you support students in accessing prior knowledge, personal, real world, and/or

cultural connections?

Students will come in the class and do a warm-up problem on the board. The question will ask students what is perimeter? Students will have the choice to either write a sentence or two to describe perimeter, or students may draw a picture/diagram to explain it. I will then ask for a couple of volunteers to share their answers with the class.

During: What support strategies will you use to scaffold students learning so they meet or exceed targeted objective?

Explain what circumference of a circle is with a drawing on board in front of the class, relate it to finding perimeter of a shape. Also, use a drawing on the board to show what the diameter of a circle is. I will start by drawing the circle in black, then tracing the edge with a different color to show that the distance around the outside is called the circumference. I will then use a different color to draw a line across the center of the circle to demonstrate what the diameter is. Show students how to measure circumference by lining the outside of the circular object (like a plate or bowl) with a string, marking where the string meets its end again on the object, then lying the string out and measuring the length that reached around the object. Next, show students how to measure across the center of the circle to find the diameter. Finally, I will show how to take the measurement from the circumference and divide it by the measurement of the diameter. Then, I will send pairs of students (previously made by me) to a certain spot in the room (also previously determined) that has multiple circular items (bowls, plates, cups, lids, jars, etc) of different sizes and either ruler/yardstick/measuring tape. I will have students measure the circumference and diameter of each object and have them compute the quotient of the circumference divided by the diameter and enter their answers into an Excel sheet that is shared with the class on Google Docs. Once the data has been entered, the Excel sheet will be pulled up in front of the entire class and the average of the data entered will be computed. (Once students enter data, go and put work area back the way they found it, then return to seats) Hopefully, it should be somewhere around 3.14. I will then explain that 3.14 is actually the number 'pi' that is used to compute the circumference and area of a circle. I will then explain that the circumference of a circle can be found by multiplying the diameter by pi. I will also explain that half of the diameter is known as the 'radius'. I will accompany this explanation by drawing a picture of a circle on the board, and using a different color to show the radius. I will then explain that the area of a circle can be found by multiplying the radius squared by pi. I will do a couple examples of finding the circumference and area of a circle in front of the class.

Wrap up/Closing:

First, give students a couple of minutes to read the text definition of pi, circumference, radius, and diameter (just to give them another mode of seeing these words being used, especially for students who learn best through reading texts). Have students turn to their neighbor to quickly discuss how the text definitions relate to what we have just done in class. Next, they will be given a few problems to work on independently to check if they can see how the number pi relates to the circumference and diameter of a circle. Before students leave, have them write down a brief explanation of how the number pi relates to a circle (finding area/circumference) and any questions that have come up during today's activities.

Daily Assessment How do you know your students met your lesson objective(s)?

- knowledge
- comprehension
- application
- analysis
- synthesis

Formative:

- Class discussion
- CPS clickers
- Email teacher
- Entrance/Exit slip
- Teacher Observe
- Thumbs up, neutral, or down
- Homework check
- Listened to conversations

Summative:

- Test
- Project
- Report
- Presentation
- Final Exam
- Other

<p>Daily Assessment <i>How do you know your students met your lesson objective(s)?</i></p> <p><input checked="" type="checkbox"/> knowledge <input checked="" type="checkbox"/> comprehension <input checked="" type="checkbox"/> application <input type="checkbox"/> analysis <input type="checkbox"/> synthesis <input type="checkbox"/> evaluation</p> <p>I will walk around the room and listen to student conversations as they work. I will be listening to see if they are correctly identifying the circumference and diameter of each of the circular objects that they are measuring. I will check the problems that they worked on at the end of class to see that each student is correctly using the radius or diameter and pi to calculate the circumference and area of a circle.</p>	<p>Formative:</p> <p><input type="checkbox"/> Class discussion <input type="checkbox"/> CPS clickers <input type="checkbox"/> Email teacher <input type="checkbox"/> Entrance/Exit slip <input checked="" type="checkbox"/> Teacher Observe <input type="checkbox"/> Thumbs up, neutral, or down <input checked="" type="checkbox"/> Homework check <input checked="" type="checkbox"/> Listened to conversations <input type="checkbox"/> Math Journal <input type="checkbox"/> Quiz <input type="checkbox"/> Video quiz <input type="checkbox"/> Voting <input type="checkbox"/> Whiteboard Check <input type="checkbox"/> Other</p>	<p>Summative:</p> <p><input type="checkbox"/> Test <input type="checkbox"/> Project <input type="checkbox"/> Report <input type="checkbox"/> Presentation <input type="checkbox"/> Final Exam <input type="checkbox"/> Other</p>
<p>Additional Teacher Preparation:</p> <p>Copy: Worksheet for end of class with a few problems for students to try on their own</p> <p>Locate: Materials needed for students: strings, rulers, yardsticks, tape measures, circular objects.</p>	<p>Use of Materials</p> <p><input type="checkbox"/> Teacher's Manual pg # <input checked="" type="checkbox"/> Student Text pg # <input type="checkbox"/> Picture Books <input type="checkbox"/> Handouts: <input type="checkbox"/> Manipulative: <input checked="" type="checkbox"/> Related Equipment: Circular objects, string, rulers/yard sticks <input type="checkbox"/> Adapted materials:</p>	
<p>Additional Reference/Sources of Information:</p> <p>None</p>		
<p>Daily Reflection <i>This would be a section at the end for the teacher to note any strengths or weaknesses of the plan. What worked well? What needs to be changed for next year? What are the next steps for the students and how will you get them there?</i></p>		

Works Cited

- Echevarria, J., Vogt, M., & Short, D. J. (2004). *Making content comprehensible for English learners: The SIOP model*. Upper Saddle, NJ: Pearson Education, Inc.
- Hill, J., & Flynn, K. (2006). *Classroom instruction that works with English language learners*. Alexandria, Va: Association for Supervision and Curriculum Development.
- Manura, D. (1999). *Math2.org math tables: English-spanish dictionary*. Retrieved from <http://math2.org/math/spanish/eng-spa.htm>