

Mathematics: Calculating the Area of a Circle

Sunshine State Standard Benchmark MA.B.1.4.1: The student will use concrete and graphic models to derive formulas for finding perimeter, area, surface area, circumference, and volume of two- and three- dimensional shapes, including rectangular solids, cylinders, cones, and pyramids.

Write the objective

Given six diagrams of circles in which either the diameter or radius is specified, students will determine the area of the circles using the formula $\text{Area}=\pi R^2$. Students must show their work and solve at least five of the problems correctly.

Introduce the lesson

Gain student attention– Show two Frisbees' of different sizes. Ask students if they have ever played Frisbee™ and thought about how the size of the Frisbee' might affect how far it will go when thrown? Tell them that a Frisbee™ or disk is really a circle, and the surface is called the area. In this lesson, they will learn how to determine the area of a circle.

Explain the objective– Today they are going to learn how to determine the area of a circle. They will learn how to find the area when they know the radius of the circle and when they know the diameter. Use the Frisbee™ to point out the area, radius, and diameter.

Relate to prior knowledge– Use prompting questions and statements to remind students of the following:

- vocabulary for the parts of a circle: circumference, diameter, radius (Draw and label the parts on the board.)
- the definition and value of π ($\pi = 3.14$ or $22/7$)
- the formula for the circumference of a circle ($\text{Circumference}=\pi D$)

Present the content

Knowledge and skills in lesson– Students already know vocabulary for the parts of a circle and the formula for the circumference of a circle. The lesson content will focus on calculating the area of a circle.

Teacher and student learning activities – Write the formula for the area of a circle on the board and explain it ($\text{Area}=\pi R^2$). Model and describe several examples, step by step, using the formula when the radius is known. Use the Frisbee™ as the first circle.

Draw circle diagrams and write the problem-solving steps on a transparency as you explain the examples. Then, have the students work two problems with you. Ask prompting questions to guide learning at each step in the process.

Repeat the process described above to teach how to determine the area of a circle when the diameter is known, adding in the extra step required (dividing the diameter by 2 to find the radius).

Activity organization and support –

Media selection: Gather two different-sized Frisbees™. Secure an overhead projector and transparencies. Prepare two different worksheets with four circles printed on them for guided and independent practice. Prepare an assessment including six diagrams of circles, three with the diameter specified and three with the radius specified.

Student grouping: The introduction and the content are presented to the whole class. Guided practice is a small group activity.

Provide practice and feedback

Guided practice– Have students work in groups of four to determine the area of four circles printed on paper, where either the radius or the diameter is given. Ask students to follow the problem solving steps demonstrated in the lesson, showing their work on the back of the sheet of paper. After the first problem is solved, have one person in each group present the steps to the solution to the other group members and discuss it with them. After the second problem is solved, have a different group member present the solution. Continue until all four problems are solved and each group member has had a turn presenting the solution. Rotate among groups to coach students where needed and provide feedback on their performance. Next, go over all of the problems together with the class, showing each step in the problem solving process on overhead transparencies. Provide feedback on why responses are right or wrong. If needed, provide additional examples and additional opportunities for practice and feedback.

Independent practice– Assign a homework exercise for independent practice. Give each student four circles printed on paper with different areas than those used in the guided practice activity. Have students determine the area of the four circles, where either the radius or the diameter is given. Ask students to show the steps in their work on the back of the page. Check the homework with the class the next day in the same manner described for guided practice.

Judicious review – Preview the remaining lessons in the unit and determine appropriate places to include a short review of calculating the area of a circle.

Summarize the lesson

Remind students they have learned how to find the area of a circle.

Ask them to state the formula used and tell the extra step that must be taken first if only the diameter is known. Point out that this skill could be applied to finding the area of any circle, for example, the area of the top of a round table, etc. Write an additional circle problem on the board, have students solve it, and discuss responses.

Assess student learning

Give students a worksheet including six diagrams of circles, three with the diameter specified and three with the radius specified. The directions tell students to determine the area of each circle using the formula $Area = \pi R^2$ and show the steps in their work. Students must solve five out of six problems correctly to demonstrate mastery. The solutions must include the steps and the correct answer.

Accommodations

For a student who has difficulty maintaining attention and working with other students in small groups:

Provide practice and feedback

Within the small group, pair the student with a trained peer who can help keep his work on track.

Monitor the group's interactions and provide positive reinforcement to the student for appropriate behaviors.

For a student with poor visual acuity:

Introduce the lesson and Present the content

Make sure the student can see the visual aids for the lesson by making markings on the worksheets dark and legible. If needed, provide a large print handout with formulas and other key points for the student to read at her desk.

For a student who has poor fine motor control and writes very large:

Assess student learning

Provide extra sheets of paper for the student to show the steps in the problem solutions so the solution does not have to fit into small spaces. Let the student use a word processor to complete the assessment.

Modifications (different objectives) for individual students

For a student working on a modified curriculum to learn the parts of a circle:

Objective:

Given six diagrams of circles, in which either the diameter or radius is specified, the student will correctly label the measurement shown on at least five of the diagrams as either the diameter or the radius. The student is not expected to learn to calculate the area of a circle; he or she is learning a prerequisite skill.