

Math: Grade 7, Lesson 17, Area of Circles

Lesson Focus: Find the area of a circle

Practice Focus: Students will focus on practicing finding the area of a circle in order to solve real world problems.

Objective: Find the area of a circle given the radius. Find the area of a circle given the diameter. Find the area of a circle given the circumference.

Key Vocabulary: circumference, diameter, radius, area

TN Standards: 7.G.B.3

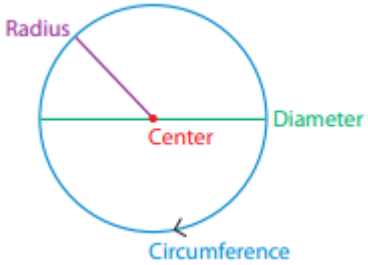
Teacher Materials:

- Paper or white board
- Pen/pencil/marker
- Problems written out to save time
- Student Practice Packet

Student Materials:

- Paper and a pencil, and a surface to write on
- Calculator (optional)

Teacher Do	Student Do
<p><u>Opening</u> (1 min)</p> <p>Hello! Welcome to Tennessee's At Home Learning Series for math! Today's lesson is for all our 7th graders out there, though all children are welcome to tune in. This lesson is the seventeenth in our series.</p> <p>My name is ____ and I'm a ____ grade teacher in Tennessee schools! I'm so excited to be your teacher for this lesson! Welcome to my virtual classroom!</p> <p>If you didn't see our previous lesson, you can find it on the TN Department of Education's website at www.tn.gov/education. You can still tune in to today's lesson if you haven't see any of our others. But, it might be more fun if you first go back and watch our other lessons since we'll be talking about things we learned previously.</p> <p>Today we will be learning about using the area of a circle to solve problems in mathematics! Before we get started, to participate fully in our lesson today, you will need:</p> <ul style="list-style-type: none"> • Paper and a pencil, and a surface to write on • Calculator (You can use your cell phone calculator!) • Ok, let's begin! 	<p>Students get materials ready for the lesson.</p>
<p><u>Intro</u> (3 minutes)</p> <p>In the previous lesson we discussed circumference. Recall that we defined circumference as the distance around a</p>	

<p>circle. [Have the following illustration drawn and point out the circumference, diameter and radius as you discuss them.]</p>  <p>Recall that the circumference is the distance around the circle, the diameter is the distance across the circle through the center, and the radius is the distance from the center of the circle to the circle. Also, the radius is half of the diameter. We have two formulas that we can use to find the circumference. $C = \pi d$ and $C = 2\pi r$, where C is circumference, d is the diameter and r is the radius.</p> <p>Today we are going to discuss the area of a circle. Do you remember finding area of other shapes? What is area? [Pause]</p> <p>We talk about area of two-dimensional shapes. The area is the measure of the space that the shape occupies, or it is the measure of the surface of the shape. Today we will focus on finding the area of a circle.</p> <p>The formula for the area of a circle is $A = \pi r^2$. Remember that r^2 means to multiply the radius by itself. Let's look at a problem!</p>	<p>Student recalls the parts of a circle and the formula for finding the circumference.</p> <p>Student recalls the finding the area of different shapes.</p>
<p><u>Teacher Model</u> (14 minutes)</p> <p>Objective 1: Students find the area of a circle given the radius. Rob is painting a large picture of the Moon on his wall. The picture has a radius of 4 feet. He knows that a pint of paint will cover about 50 square feet. Rob wants to determine if a pint of paint will be enough for the job.</p> <p>What do we know? [Pause] We know that a picture of the Moon is a circle. We know the radius of the circle is 4 feet. We know a pint of paint covers 50 square feet. What is measured in "square feet"? [Pause] Yes! Area! We need to find the area of the picture to determine if 50 square</p>	<p>Objective #1: The student will find the area of a circle given the radius. This is a basic understanding of area and radius. This basic understanding is essential to understanding the more complex problems to follow.</p> <p>Student thinks about the given information in the problem.</p>

<p>feet will be enough. Sometimes it helps to draw a picture of the problem. [Draw a circle. Label the radius. Shade in the circle lightly to show the area.]</p> <p>The formula for the area of a circle is $A = \pi r^2$. We can substitute 4 for the radius.</p> $A = \pi 4^2$ $A = \pi(16)$ <p>Let's use 3.14 as an approximation for π.</p> $A = (3.14)(16)$ $A = 50.24$ <p>The area of the picture is about 50.24 square feet. Will Rob have enough paint if he buys a pint? [Pause] No, he will need to buy more than a pint since a pint only covers 50 square feet.</p> <p>Let's think about another problem.</p> <p>Objective 2: Students find the area of a circle given the diameter.</p> <p>A circular clock face has a diameter of 6 inches. What is the area of the clock face? What do we know? [Pause] We know the clock face is a circle. We know the diameter is 6 inches. We need to know the area. First, let's draw a picture of the situation. [Draw a circle. Label the diameter. Shade in the circle lightly to show the area.]</p> <p>We know the formula for the area of a circle is $A = \pi r^2$. We also know that the diameter is twice the radius, or the radius is half of the diameter. The radius of the clock face is half of 6 or 3 inches. [Label the radius on the picture.]</p> $A = \pi r^2$ $A = \pi(3)^2$ $A = \pi(9)$ <p>Let's use 3.14 as an approximation of π.</p> $A = (3.14)(9)$ $A = 28.26$ <p>The area of the clock face is 28.26 square inches.</p>	<p>Student thinks about how to find the area.</p> <p>Student interprets the answer to the problem.</p> <p>Objective #2: Students find the area of a circle given the diameter. They will use this knowledge to answer real-world problems.</p> <p>Student thinks about what information is given in the problem.</p> <p>Student thinks about how to find the radius if they know the diameter.</p> <p>Student thinks about using the formula to solve the problem.</p>
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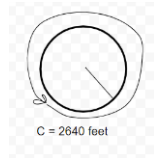
Great! Let's think about how we would find the area of a circle given the circumference.

Objective 3: Students will find the area of a circle given the circumference.

There is a circular walking path in the city park. The path is one-half mile or 2,640 feet around. Rob wants to reseed the grass enclosed within the circular walking path. He needs to determine how many square feet he needs to reseed.

What do we know? [Pause] We know that the path forms a circle. We know the distance around the path (or the circumference) is 2,640 feet. Let's draw a picture.

[Draw a circle. Label the circumference. Shade in the circle lightly to show the area.]



What do we need to know to find the area? [Pause] We need the radius. We are given the circumference. How can we find the radius given the circumference?

Recall the formula for the circumference of a circle is

$$C = 2\pi r$$

We know the circumference is 2,640. We can substitute 2,640 for C.

$$2640 = 2\pi r$$

Now we can solve for the radius, r.

$$\frac{2640}{2\pi} = \frac{2\pi r}{2\pi}$$

$$\frac{1320}{\pi} = r$$

Feel free to use a calculator! I am!

$$\frac{1320}{3.14} = r$$

$$420.38 = r$$

Objective #3: Students will find the area of a circle given the circumference. This will aid students in understanding the relationship between area of a circle and its circumference.

Students think about the problem.

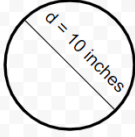
Students think about the given information and the question being asked.

Students think about the relationship between circumference and radius.

Students think about how to substitute this into the formula for area.

Students think about how to simplify this expression.

<p>Now we can substitute this for “r” into our area formula!</p> $A = \pi r^2$ $A = \pi(420.38)^2$ $A = \pi(176719.34)$ <p>Using 3.14 to approximate pi, we get</p> $A = 3.14(176719.34)$ <p>So</p> $A = 554898.73$ <p>What does this mean? [Pause]</p> <p>This means that Rob will need enough seed to cover 554,898.73 square feet of ground. That’s a LOT of seed!</p> <p>Tying the learning together:</p> <p>We have thought about finding the area given the radius, given the diameter and given the circumference. Now let’s practice what we have learned! Are you ready?</p>	<p>Students interpret the answer.</p> <p>Tying the learning together:</p> <p>Students think about what they know about the area of a circle.</p>
<p><u>Guided Practice</u> (10 minutes)</p> <p>[I do]</p> <p>Let’s think about this problem.</p> <p>A DVD has a radius of 6 cm. What is the area of the DVD?</p> <p>What do we know? [Pause]</p> <p>Yes! We know the radius, and we are trying to find the area.</p> <p>We know the area formula.</p> <p>Let’s draw a picture.</p> <p>[As you draw the picture, explain each part.]</p> <div style="text-align: center;"> </div> <p>What is the area formula? [Pause]</p> <p>Yes!</p> $A = \pi r^2$ <p>We can substitute 6 for the radius, r. [Pause]</p> $A = \pi(6)^2$ <p>[Pause]</p> $A = \pi(36)$ <p>We can use 3.14 to approximate pi.</p> $A = (3.14)(36)$	<p>Students think about what they are given.</p> <p>Students draw the diagram.</p> <p>Students recall the formula for the area of a circle.</p>

<p>[Pause]</p> $A = 113.04$ <p>What does this mean? [Pause] Good! This means the area of the DVD is 113.04 square cm.</p> <p>Great! Let's try another one!</p> <p>[We do] The most popular pizza at Pavone's Pizza is the 10-inch personal pizza with one topping. What is the area of a pizza with a diameter of 10 inches?</p> <p>Write down what you know, and draw the picture. [Pause] Good! We know that the pizza has a diameter of 10 inches. This can be represented by a circle that looks like this:</p>  <p>What are we trying to find? [Pause] Yes! We are trying to find the area. How do we find the area of a circle? [Pause] We use the formula!</p> $A = \pi r^2$ <p>But the formula allows us to find the area of a circle if we know the radius. What is the radius of the pizza and how do you know? [Pause] The radius is half of the diameter, so the radius of the pizza is 5 inches. Now let's find the area. [Pause long enough for the student to simplify.] Let's see if your answer matches mine!</p> $A = \pi r^2$ $A = \pi(5)^2$ $A = \pi(25)$ <p>We will use 3.14 to approximate pi.</p> $A = (3.14)(25)$ $A = 78.50$ <p>Did you get 78.50? [Pause] What does this mean? [Pause] The 10-inch pizza has an area of 78.5 square inches. Great! I think you've got it! One more!</p> <p>[You do]</p>	<p>Students interpret the answer.</p> <p>Students write what they know, and they draw the picture.</p> <p>Students think about what the problem is asking.</p> <p>Students determine the radius given the diameter.</p> <p>Students substitute for the radius and simplify the expression.</p> <p>Students compare their work to the teacher's work.</p> <p>Students interpret the answer.</p>
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<p>A circle has a circumference of 2 inches. What is the area of the circle?</p> <p>You try this one on your own, then we will work it together!</p> <p>You can do it! Persevere!</p> <p>[Pause long enough for students to work the problem.]</p> <p>We know that the circumference is 2 inches. We know that the circumference is two times pi times the radius. We can use this to find the radius.</p> $C = 2\pi r$ $2 = 2\pi r$ <p>Now we can solve the equation for "r".</p> $\frac{2}{2\pi} = \frac{2\pi r}{2\pi}$ $\frac{1}{\pi} = r$ <p>We will use 3.14 to approximate pi.</p> $\frac{1}{3.14} = r$ $0.32 = r$ <p>We know that the formula for the area of a circle is</p> $A = \pi r^2$ <p>We can substitute 1 divided by pi for the r.</p> $A = \pi(0.32)^2$ <p>We can square the 1 over pi.</p> $A = \pi(0.1024)$ <p>We will use 3.14 to approximate pi.</p> $A = (3.14)(0.1024)$ $A = 0.32$ <p>The circle has an area of 0.32 inches.</p> <p>Additional Problems (if needed):</p> <p>The sides of a square field are 12 meters. A sprinkler in the center of the field sprays a circular area with a diameter that corresponds to a side of the field. How much of the field is reached by the sprinkler? Round your answer to the nearest hundredth.</p>	<p>Students think about how to find the area given the circumference.</p> <p>Students recall the circumference formula.</p> <p>Students find the radius given the circumference.</p> <p>Students substitute for the radius in the area formula.</p> <p>Students simplify the expression.</p> <p>Students interpret the answer.</p>
<p><u>Independent Practice</u> (1 minute)</p> <p>Great work! Today, we reviewed finding the area of a circle! You sure did a great job! After the video, you will have some problems to practice on your own. I will show you the independent practice problems now, or you can find them in</p>	

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<p>the student practice for this lesson posted on our website, www.tn.gov/education. [Teacher shows student practice page under document camera or camera zooms in on student practice page.]</p> <p>Good luck and do your best!</p>	
<p><u>Closing</u> (1 min)</p> <p>7th grade, I enjoyed reviewing finding the area of a circle with you! Thank you for inviting me into your home. I look forward to seeing you in our next lesson in Tennessee's At Home Learning Series! Bye!</p>	

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