

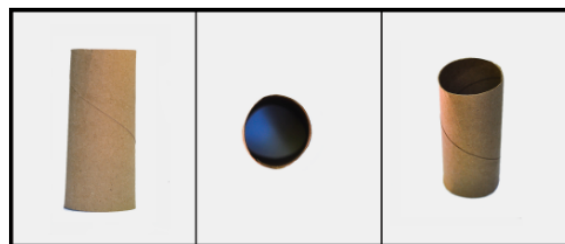
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Unit 3 at a Glance

Circumference of a Circle	Lessons 1, 2, 3 , 4, 5 (optional)
Area of a Circle	Lessons 6, 7 , 8, 9
Let's Put it to Work	Lessons 10, 11(optional)

Warm-up 3.1: Which Is Greater?

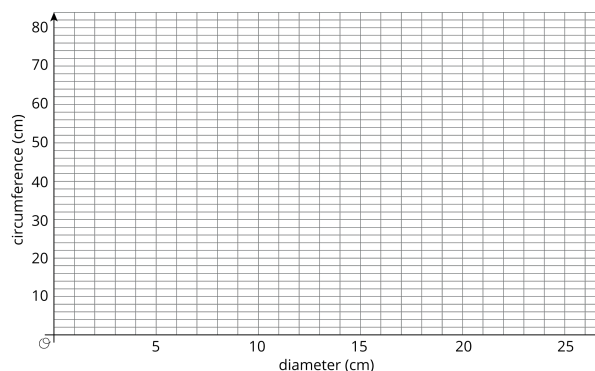
Clare wonders if the height of the toilet paper tube or the distance around the tube is greater. What information would she need in order to solve the problem? How could she find this out?



Activity 3.2: Measuring Circumference and Diameter

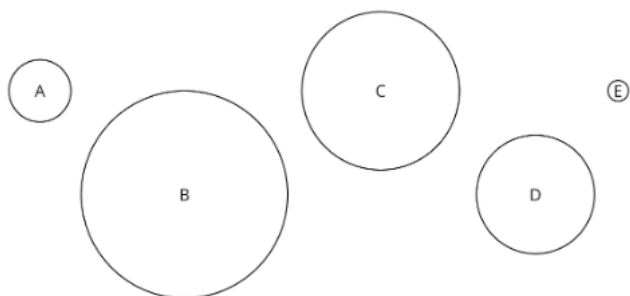
1. Explore the applet to find the diameter and the circumference of three circular objects to the nearest tenth of a unit. Record your measurements in the table.
2. Plot the diameter and circumference values from the table on the coordinate plane. What do you notice?
3. Plot the points from two other groups on the same coordinate plane. Do you see the same pattern that you noticed earlier?

object or group	diameter (cm)	circumference (cm)



Activity 3.3: Calculating Circumference and Diameter

Here are five circles. One measurement for each circle is given in the table.



	diameter (cm)	circumference (cm)
circle A	3	
circle B	10	
circle C		24
circle D		18
circle E	1	

Use the constant of proportionality estimated in the previous activity to complete the table.

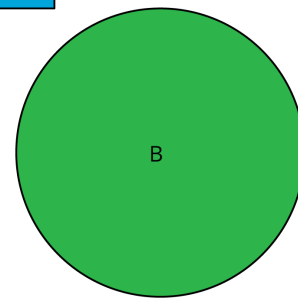
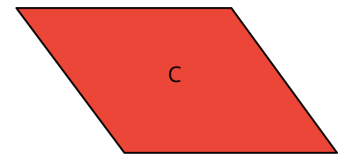
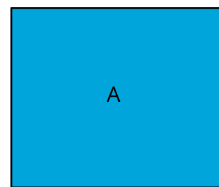
Cool-down 3.4: Identifying Circumference and Diameter

Select **all** the pairs that could be reasonable approximations for the diameter and circumference of a circle. Explain your reasoning.

1. 5 meters and 22 meters.
2. 19 inches and 60 inches.
3. 33 centimeters and 80 centimeters.

Warm-up 7.1: Estimating Areas

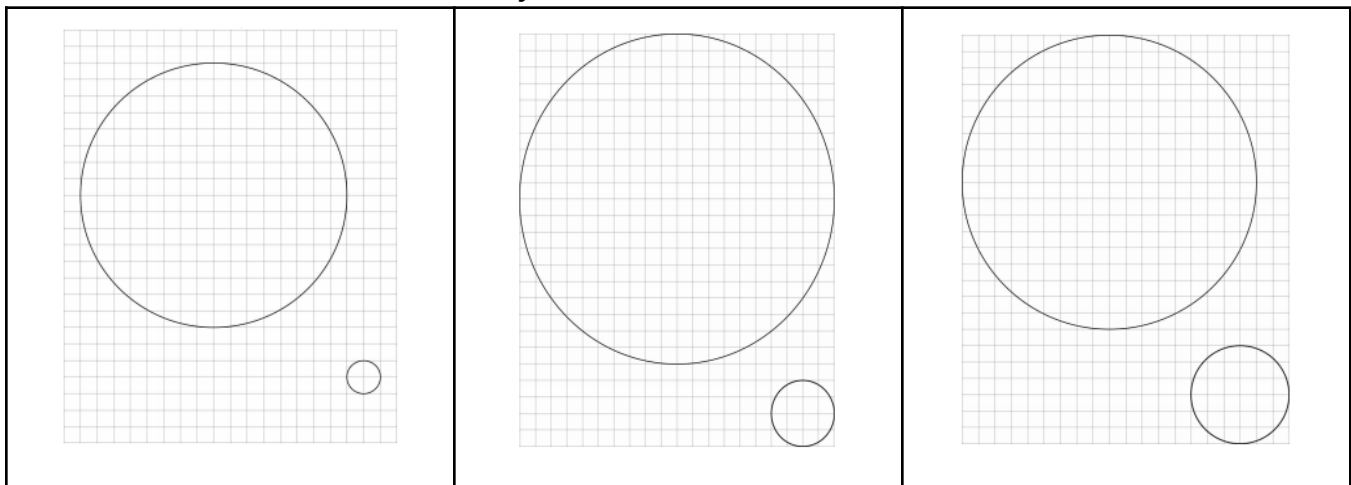
Your teacher will show you some figures.
Decide which figure has the largest area. Be prepared to explain your reasoning.

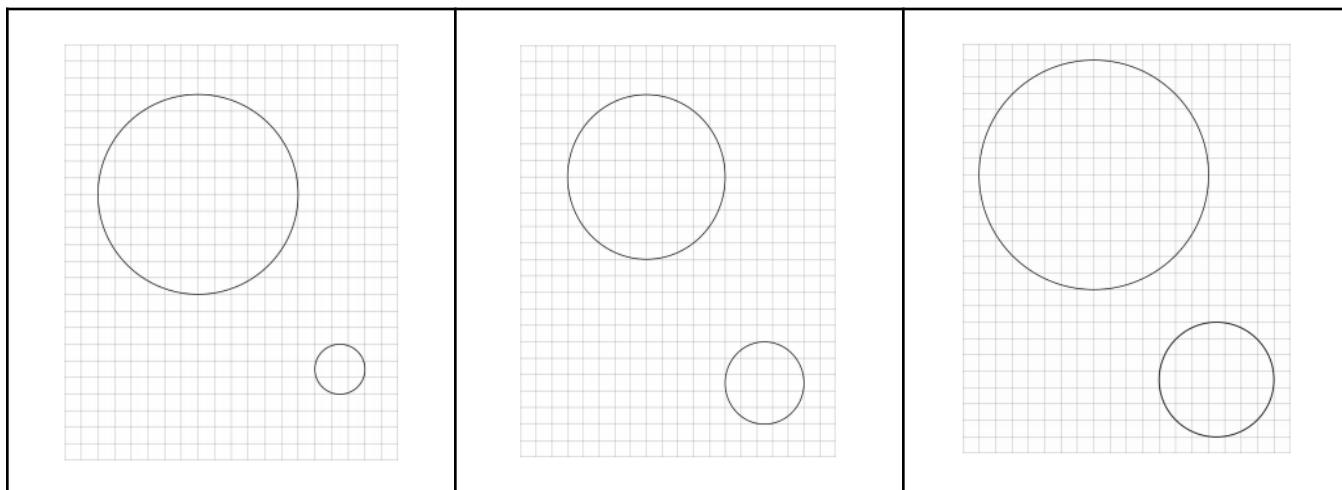


Activity 7.2: Estimating Areas of Circles

Your teacher will give your group two circles of different sizes.

1. For each circle, use the squares on the graph paper to measure the diameter and estimate the **area of the circle**. Record your measurements in the table.

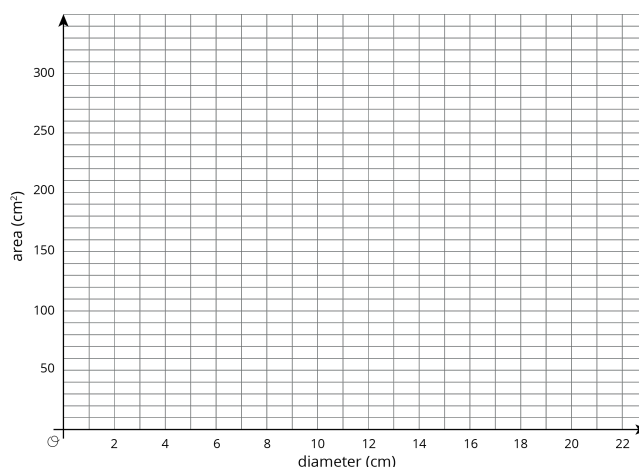




2. Plot the values from the table on the class coordinate plane. Then plot the class's data points on your coordinate plane.

diameter (cm)	estimated area (cm ²)

3. In a previous lesson, you graphed the relationship between the diameter and circumference of a circle. How is this graph the same? How is it different?



Cool-down 7.4: Areas of Two Circles

- Circle A has a diameter of approximately 20 inches and an area of approximately 300 in².
- Circle B has a diameter of approximately 60 inches.

Which of these could be the area of Circle B? Explain your reasoning.

- A. About 100 in²
- B. About 300 in²
- C. About 900 in²
- D. About 2,700 in²

Planning a Lesson

Lesson Title	Exploring the area of a circle
Lesson Narrative and Goals How does the lesson fit into the story of the unit?	Goals: Comprehend the word “pi” and the symbol to refer to the constant of proportionality between the diameter and circumference of a circle. Create and describe (in writing) graphs that show measurements of circles. Generalize that the relationship between diameter and circumference is proportional and that the constant of proportionality is a little more than 3. Students use their knowledge from the previous unit on proportionality to estimate the constant of proportionality.
Cool-down <i>Do the math.</i> What connections are there between the learning goals and the cool-down?	Goal: to be able to see what the student was able to take away from the lesson with the skills they learn. 1. More Chances
Warm-up <i>Do the math for the warm-up and activities.</i> How is this warm-up an invitation to the mathematics?	Goal: knowing which way they have to measure the object. Mathematic tools: to be able to use a ruler, able to know if they are measuring in inches or cm.
- What are the key contextual or mathematical features of the activity that the launch attends to? - What adaptations might you make and why? How does that change the time and purpose of the launch?	

Activities Describe the progression of understanding from one activity to the next. What strategies and representations will students use to show understanding of the learning goal? • What role does the launch play in the activity? • What are the key contextual or mathematical features of the activity that the launch attends to? • What adaptations might you make and why? How does that change the time and purpose of the launch?	
Lesson Synthesis What questions or actions provide students the opportunity to consolidate understanding before the cool-down?	

Planning for Instruction

- Where is there opportunity to *enhance access and challenge* already written into the lesson?
- What can I *highlight or amplify*?
- What questions can I *ask* to build on students' understanding?
- What tools can I *offer* to help students make connections?

Progression of Understanding



Consider:

1. What is being assessed in each item?
2. How do you anticipate students will respond to each item?
3. How do the End-of-Unit Assessment items connect to the progression of understanding?

End-of-Unit Assessment

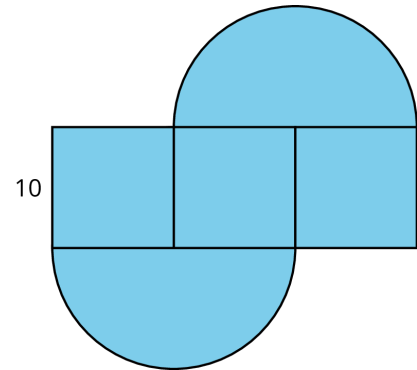
1. Students need to know and use the formula for area of a circle.
2. This item combines circumference and perimeter, also use pi in responses.
3. Students learned that π is the constant of proportionality in the formula for circumference of a circle. It is also featured in the formula for area of a circle.
4. Students justify their reasoning about if a proportional relationship exists between the radius and circumference of a circle.
5. Students distinguish between circumference and area. This is not directly reflected in the big idea, but students can use what they learned about circumference being a linear measure in their response.
6. Students use what they know about perimeter and area.
7. This item combines work students did with proportional relationships in an earlier unit with the current work with circles.

Consider allowing access to a calculator.

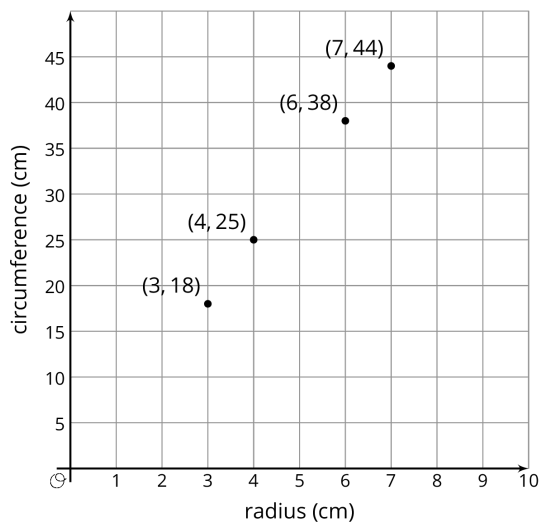
1. A circle has radius 50 cm. Which of these is *closest* to its area?
 - A. 157 cm²
 - B. 314 cm²
 - C. 7,854 cm²
 - D. 15,708 cm²

2. The shape is composed of three squares and two semicircles. Select all the expressions that correctly calculate the perimeter of the shape.

- A. $40 + 20\pi$
- B. $80 + 20\pi$
- C. $120 + 20\pi$
- D. $300 + 100\pi$
- E. $10 + 10 + 10\pi + 10 + 10 + 10\pi$



3. Select all of the true statements.
- A. π is the area of a circle of radius 1.
 - B. π is the area of a circle of diameter 1.
 - C. π is the circumference of a circle of radius 1.
 - D. π is the circumference of a circle of diameter 1.
 - E. π is the constant of proportionality relating the diameter of a circle to its circumference.
 - F. π is the constant of proportionality relating the radius of a circle to its area.
4. A class measured the radius and circumference of various circular objects. The results are plotted on the graph.

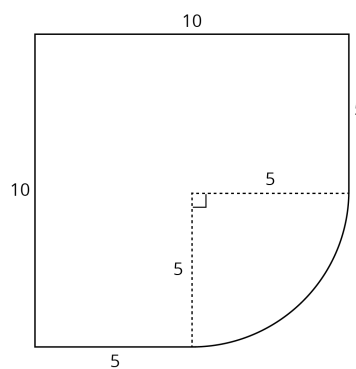


- a. Does there appear to be a proportional relationship between the radius and circumference of a circle? Explain or show your reasoning.

- b. Why might the measured radii and circumferences not be *exactly* proportional?

5. For each quantity, decide whether circumference or area would be needed to calculate it. Explain or show your reasoning.
 - a. The distance around a circular track.
 - b. The total number of equally-sized tiles on a circular floor.
 - c. The amount of oil it takes to cover the bottom of a frying pan.
 - d. The distance your car will go with one turn of the wheels.

6. This figure is made from a part of a square and a part of a circle.



- a. What is the perimeter of this figure, to the nearest unit?
 - b. What is the area of this figure, to the nearest square unit?

7. A groundskeeper needs grass seed to cover a circular field, 290 feet in diameter. A store sells 50-pound bags of grass seed. One pound of grass seed covers about 400 square feet of field.

What is the smallest number of bags the groundskeeper must buy to cover the circular field? Explain or show your reasoning.

Required Materials at a Glance

UNIT 3 Measuring Circles	
four-function calculators	Lesson 1 (except Activity 1) 4.2: Using π Lesson 9 Lesson 11 (optional)
copies of blackline master	1.2: Perimeter of a Square 7.2: Estimating Areas of Circles
rulers marked with centimeters	1.2: Perimeter of a Square
pre-printed strips, cut from copies of the blackline master	2.2: Sorting Round Objects 10.2: Card Sort: Circle Problems
rulers	2.4: Drawing Circles (optional) 5.2: Rolling, Rolling, Rolling (optional)
compasses	2.4: Drawing Circles (optional) 11.3: Invent Your Own Design (optional)
cylindrical household items	3.2: Measuring Circumference and Diameter 5.2: Rolling, Rolling, Rolling (optional) 8.2: Making a Polygon out of a Circle
empty toilet paper roll, measuring tapes	Lesson 3
blank paper	5.2: Rolling, Rolling, Rolling (optional) 8.2: Making a Polygon out of a Circle 11.3: Invent Your Own Design (optional)
receipt tape	5.2: Rolling, Rolling, Rolling (optional)
geometry toolkits	Lesson 6 Lesson 7 Lesson 11 (optional)
glue or glue sticks, markers, scissors	8.2: Making a Polygon out of a Circle

Technology at a Glance

UNIT 3 Measuring Circles	
Circumference of a Circle	Lessons 1, 2, 3, 4 , 5 (optional)
Area of a Circle	Lessons 6, 7, 8 , 9
Let's Put it to Work	Lessons 10, 11 (optional)

Learning Goals

- Recognize the knowledge about measuring circles that students are expected to bring from earlier grades, and the progression of understanding across the unit:
 - Noticing proportional relationships in circle measures
 - using proportional relationships to find unknown dimensions of circles
 - Connecting circumference and area of circles to perimeter and area of polygons
 - Writing and using formulas for circumference and area
- Describe the purpose of activity launches.
- Explain a strategy or two for adapting the launch to support my students based on anticipated student thinking.

My Reflections

Unit Content and Planning	Connect: How do these ideas connect to what you already know?
	Extend: What new ideas did you get that extend or push your thinking in new directions?
	Challenge: What is now a challenge for you to get your mind around? What questions do you now have?
	Next step: What next step will you take back to your classroom?