Big Ideas Math: Modeling Real Life ©2019 Grades 6-8
Publisher's Response to EdReports Review

Overview

Big Ideas Math: Modeling Real Life for grades K-8 is a high-quality, rigorous math program built on the most current and widely accepted educational research. The data-driven program is effective in ensuring positive student outcomes in mathematics. This newly released math series is building a highly successful user base across a broad range of demographics and school settings.

Gateway 1: Focus and Coherence

On this objective portion of the EdReports review, our high scores reflect that *Big Ideas Math: Modeling Real Life* is a standards-aligned program that fully covers the required content, the major work focus, and the progressions for each grade level. See more about program focus and coherence here.

Gateway 2: Rigor and Mathematical Practices

EdReports' review of this gateway is not consistent across grades, revealing that there is a level of subjectivity to evaluating heavily embedded practices and rigor elements. *Big Ideas Math's* single authorship provides a cohesive structure and scaffolding for rigor and mathematical practices across grade levels.

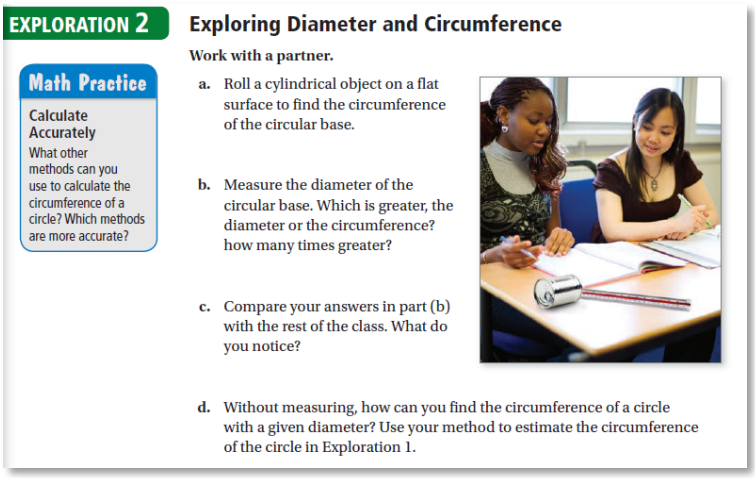
Rigor

A truly rigorous program offers a balance of the three aspects of rigor: conceptual understanding (discovering why), procedural fluency (learning how), and application (knowing when to apply).

Conceptual Understanding

In Gateway 2, the program was reviewed against a narrow expectation of how conceptual understanding should be developed in a curriculum. Big Ideas Learning highly values conceptual development, placing it at the forefront of every section with a discovery exploration.

In these explorations, students explore, question, explain, and persevere as they seek to answer questions that encourage concrete to abstract thought. The explorations provide rich opportunities for students to develop deep conceptual understanding of topics across a grade level. Each exploration was thoughtfully written to get students thinking conceptually, and while on the surface an exploration may appear quite simple, it is here that students often discover foundational concepts that are central to the learning target of the section.



EXPLORATION 2 **Exploring Diameter and Circumference**

Work with a partner.

Math Practice

Calculate Accurately

What other methods can you use to calculate the circumference of a circle? Which methods are more accurate?

a. Roll a cylindrical object on a flat surface to find the circumference of the circular base.

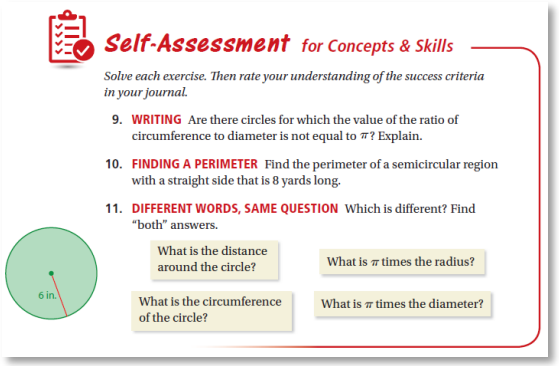
b. Measure the diameter of the circular base. Which is greater, the diameter or the circumference? how many times greater?

c. Compare your answers in part (b) with the rest of the class. What do you notice?

d. Without measuring, how can you find the circumference of a circle with a given diameter? Use your method to estimate the circumference of the circle in Exploration 1.

Grade 7 Circles and Circumference: Using a cylindrical object and a ruler, students discover the relationship between the circumference and the diameter of a circle.

As concepts are solidified in the lesson, every section provides opportunities for students to independently demonstrate conceptual understanding in the in-class Self-Assessment exercises and in the homework Practice exercises. Every lesson and homework set intentionally includes conceptual questions to reinforce the learning.



Self-Assessment *for Concepts & Skills*

Solve each exercise. Then rate your understanding of the success criteria in your journal.

9. **WRITING** Are there circles for which the value of the ratio of circumference to diameter is not equal to π? Explain.

10. **FINDING A PERIMETER** Find the perimeter of a semicircular region with a straight side that is 8 yards long.

11. **DIFFERENT WORDS, SAME QUESTION** Which is different? Find "both" answers.

6 in.

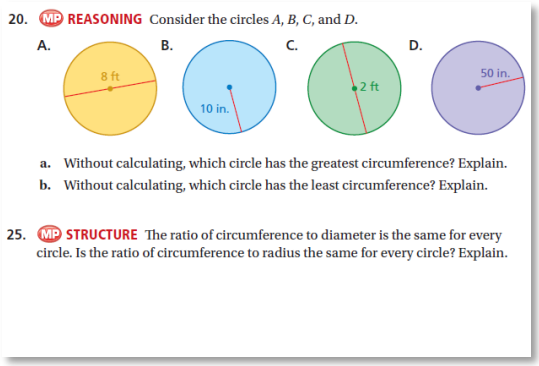
What is the distance around the circle?

What is π times the radius?

What is the circumference of the circle?

What is π times the diameter?

Grade 7 Circles and Circumference: The Self-Assessment for Concepts & Skills includes conceptual exercises (#9 and # 11) to gauge student understanding.



20. MP **REASONING** Consider the circles *A*, *B*, *C*, and *D*.

A. 8 ft B. 10 in. C. 2 ft D. 50 in.

a. Without calculating, which circle has the greatest circumference? Explain.

b. Without calculating, which circle has the least circumference? Explain.

25. MP **STRUCTURE** The ratio of circumference to diameter is the same for every circle. Is the ratio of circumference to radius the same for every circle? Explain.

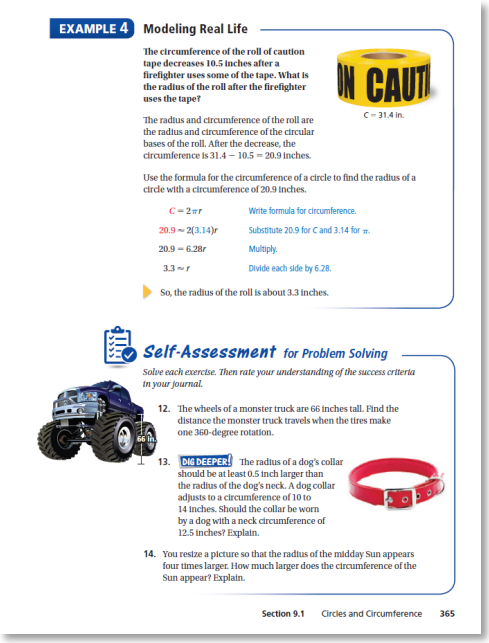
The homework for this same lesson includes exercises to reinforce students' conceptual understanding.

Procedural Fluency

Every exploration is followed by a lesson where students are presented with precise definitions, examples, and self-assessment opportunities. Here students begin to shift their conceptual understanding into procedural fluency.

Application

Big Ideas Math exposes students to real-life application examples within every lesson and then follows with additional application problems for in-class problem solving practice. The homework contains a variety of application problems to strengthen and deepen students' problem-solving skills.



EXAMPLE 4 Modeling Real Life

The circumference of the roll of caution tape decreases 10.5 inches after a firefighter uses some of the tape. What is the radius of the roll after the firefighter uses the tape?

$C = 31.4$ in.

The radius and circumference of the roll are the radius and circumference of the circular bases of the roll. After the decrease, the circumference is $31.4 - 10.5 = 20.9$ inches.

Use the formula for the circumference of a circle to find the radius of a circle with a circumference of 20.9 inches.

$C = 2\pi r$ Write formula for circumference.

$20.9 \approx 2(3.14)r$ Substitute 20.9 for C and 3.14 for π.

$20.9 \approx 6.28r$ Multiply.

$3.3 \approx r$ Divide each side by 6.28.

So, the radius of the roll is about 3.3 inches.

Self-Assessment for Problem Solving

Solve each exercise. Then rate your understanding of the success criteria in your journal.

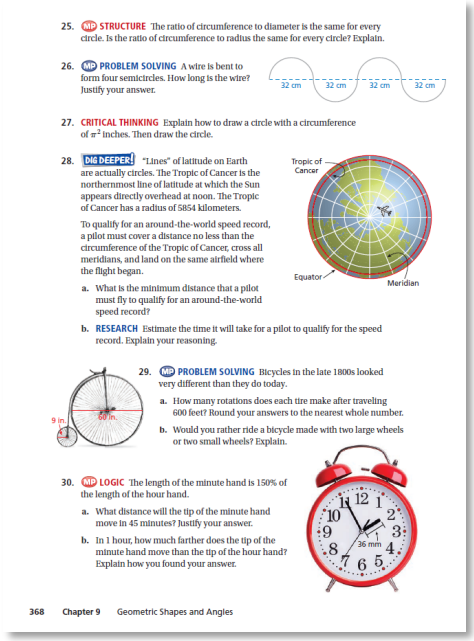
12. The wheels of a monster truck are 66 inches tall. Find the distance the monster truck travels when the tires make one 360-degree rotation.

13. DIG DEEPER! The radius of a dog's collar should be at least 0.5 inch larger than the radius of the dog's neck. A dog collar adjusts to a circumference of 10 to 14 inches. Should the collar be worn by a dog with a neck circumference of 12.5 inches? Explain.

14. You resize a picture so that the radius of the midday Sun appears four times larger. How much larger does the circumference of the Sun appear? Explain.

Section 9.1 Circles and Circumference 365

Grade 7 Circles and Circumference:
The example shows a real-life problem. Immediately following are application problems for students to answer independently, including a Dig Deeper exercise where students solve to answer a bigger question.



25. MP STRUCTURE The ratio of circumference to diameter is the same for every circle. Is the ratio of circumference to radius the same for every circle? Explain.

26. MP PROBLEM SOLVING A wire is bent to form four semicircles. How long is the wire? Justify your answer.

32 cm 32 cm 32 cm 32 cm

27. CRITICAL THINKING Explain how to draw a circle with a circumference of π^2 inches. Then draw the circle.

28. DIG DEEPER! "Lines" of latitude on Earth are actually circles. The Tropic of Cancer is the northernmost line of latitude at which the Sun appears directly overhead at noon. The Tropic of Cancer has a radius of 5854 kilometers.

To qualify for an around-the-world speed record, a pilot must cover a distance no less than the circumference of the Tropic of Cancer, cross all meridians, and land on the same airfield where the flight began.

Tropic of Cancer, Equator, Meridian

a. What is the minimum distance that a pilot must fly to qualify for an around-the-world speed record?

b. RESEARCH Estimate the time it will take for a pilot to qualify for the speed record. Explain your reasoning.

29. MP PROBLEM SOLVING Bicycles in the late 1800s looked very different than they do today.

9 in. 60 in.

a. How many rotations does each tire make after traveling 600 feet? Round your answers to the nearest whole number.

b. Would you rather ride a bicycle made with two large wheels or two small wheels? Explain.

30. MP LOGIC The length of the minute hand is 150% of the length of the hour hand.

36 mm

a. What distance will the tip of the minute hand move in 45 minutes? Justify your answer.

b. In 1 hour, how much farther does the tip of the minute hand move than the tip of the hour hand? Explain how you found your answer.

368 Chapter 9 Geometric Shapes and Angles

The homework for this same lesson includes a variety of application exercises that require higher-order thinking.

Exposing students to problem solving in class allows them to move with confidence to deeper problem solving in the homework. While some proficient or advanced learners may move to independent problem solving easily, emerging learners benefit from examples. In either case, our curriculum provides teachers with a versatile program to use with every student. See more about program rigor here.

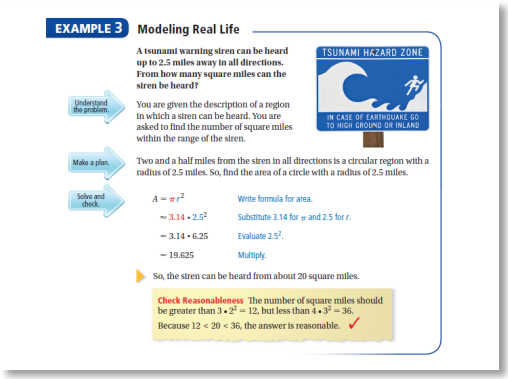
Mathematical Practices

The EdReports review of *Big Ideas Math* discounts explicit teaching instruction as a proven teaching strategy. EdReports' focus maximizes the effect of the materials on students' learning and minimizes the effect of the teacher; Big Ideas Learning believes the opposite.

We believe in the teacher's role in instructing, cultivating, and measuring the math practices within daily instruction. The teacher creates a productive and conducive environment in which students are supported in exploration and discussion with their peers. The teaching edition notes opportunities for teachers to encourage expert mathematical thinking in students during

group work or in-class discussions. Fostering that thinking in class encourages these mindsets in students as they work independently.

The authors thoughtfully considered how students can develop mathematical proficiency throughout the program. The student and teaching editions regularly identify and encourage the mathematical practices throughout the curriculum.



EXAMPLE 3 Modeling Real Life

A tsunami warning siren can be heard up to 2.5 miles away in all directions. From how many square miles can the siren be heard?

TSUNAMI HAZARD ZONE

IN CASE OF EARTHQUAKE GO TO HIGH GROUND OR INLAND

Understand the problem.

You are given the description of a region in which a siren can be heard. You are asked to find the number of square miles within the range of the siren.

Make a plan.

Two and a half miles from the siren in all directions is a circular region with a radius of 2.5 miles. So, find the area of a circle with a radius of 2.5 miles.

Solve and check.

$A = \pi r^2$ Write formula for area.

$\approx 3.14 \cdot 2.5^2$ Substitute 3.14 for π and 2.5 for r.

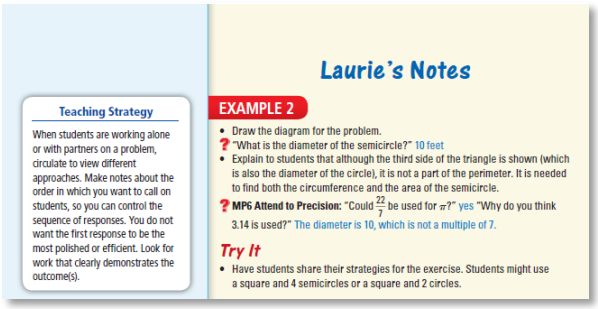
$= 3.14 \cdot 6.25$ Evaluate 2.5^2.

$= 19.625$ Multiply.

So, the siren can be heard from about 20 square miles.

Check Reasonableness The number of square miles should be greater than $3 \cdot 2^2 = 12$, but less than $4 \cdot 3^2 = 36$. Because $12 < 20 < 36$, the answer is reasonable. ✓

This Grade 7 example shows students how to think through a real-life application using the Problem-Solving Plan. Examples like this help students make sense of problems and persevere in solving them.



Laurie's Notes

Teaching Strategy

When students are working alone or with partners on a problem, circulate to view different approaches. Make notes about the order in which you want to call on students, so you can control the sequence of responses. You do not want the first response to be the most polished or efficient. Look for work that clearly demonstrates the outcome(s).

EXAMPLE 2

- Draw the diagram for the problem.
- ? "What is the diameter of the semicircle?" 10 feet
- Explain to students that although the third side of the triangle is shown (which is also the diameter of the circle), it is not a part of the perimeter. It is needed to find both the circumference and the area of the semicircle.
- ? **MP6 Attend to Precision:** "Could $\frac{22}{7}$ be used for π?" yes "Why do you think 3.14 is used?" The diameter is 10, which is not a multiple of 7.

Try It

- Have students share their strategies for the exercise. Students might use a square and 4 semicircles or a square and 2 circles.

Laurie's Notes regularly encourage teachers to lead discussions with their students to reinforce the mathematical practices. This page from the Grade 7 Teaching Edition encourages students to think about the value used for pi, helping them attend to precision.

To strengthen the connection between the textbook labels and the eight Standards for Mathematical Practice, we have placed a correlation document online at *BigIdeasMath.com*. It can also be found here.

Gateway 3: Usability

Usability is one of the hallmarks of the program that, regretfully, was not even reviewed. Student learning is our highest goal and our student materials are widely known for being clear and understandable. Similarly, the teacher materials are known for their depth and usability. Every component of the versatile teacher package was specifically targeted to help teachers in a practical way as they plan, teach, and assess for student learning. See more about program usability here.

Conclusion

Big Ideas Math: Modeling Real Life was developed from the latest research with students and teachers in mind. This rigorous program strives for positive math outcomes to prepare today's students for the jobs of tomorrow. We invite you to go here to explore the program further.

Big Ideas Learning acknowledges the perceived value of third-party reviews as one of the criteria educational leaders use in their evaluation process. We appreciate the reviewer comments and consider all feedback in future program development. Please send any EdReports evaluation inquiries regarding *Big Ideas Math* to BIMqueries@BigIdeasMath.com.