BIG IDEAS MATH®

Ron Larson & Laurie Boswell









Ron Larson & Laurie Boswell

Modeling Real Life







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Authors and Research

Big Ideas Learning[®] is pleased to introduce a new, research-based K-8 series,

Big Ideas Math®: Modeling Real Life. Written by renowned authors Dr. Ron Larson and Dr. Laurie Boswell, this series uses an exploratory approach to engage students' inquiring minds through rich explorations and in-class problem solving. With one voice from Grade K through Grade 8, and into high school, students make connections through cohesive progressions and consistent, dependable instruction.

The pedagogical approach used in this program follows the best practices outlined in the most prominent and widely accepted educational research including John Hattie's *Visible Learning*, NCTM's *Principles to Actions*, Jo Boaler's *Mathematical Mindsets*, Wiggins and McTighe's *Understanding by Design*, and others.

We created Big Ideas Math because we recognized the need for a truly balanced approach to learning, using discovery learning and scaffolded instruction.

—Ron La<mark>rso</mark>n, Ph.D.



Ron Larson, Ph.D., is well known as the lead author of a comprehensive program for mathematics that spans school mathematics and college courses. He holds the distinction of Professor Emeritus from Penn State Erie, The Behrend College, where he taught

for nearly 40 years. He received his Ph.D. in mathematics from the University of Colorado. Dr. Larson's numerous professional activities keep him actively involved in the mathematics education community and allow him to fully understand the needs of students, teachers, supervisors, and administrators.

Students go deeper in their learning when they are motivated to dig in. My passion is to provide effective ways for teachers to begin each lesson. —Laurie Boswell, Ed.D.



Laurie Boswell, Ed.D., is the former Head of School at Riverside School in Lyndonville, Vermont. In addition to textbook authoring, she provides mathematics consulting and embedded coaching sessions. Dr. Boswell received her Ed.D. from the University of Vermont in 2010.

She is a recipient of the Presidential Award for Excellence in Mathematics Teaching and is a Tandy Technology Scholar. Laurie has taught math to students at all levels, elementary through college. In addition, Laurie has served on the NCTM Board of Directors and as a Regional Director for NCSM. Along with Ron, Laurie has co-authored numerous math programs and has become a popular national speaker.



Big Ideas Math: Modeling Real Life fits the needs of today's middle school math classrooms!

- Uses learning targets and success criteria for student self-assessment
- Supports deep conceptual understanding to facilitate meaningful application for success in higher-level math courses
- Helps teachers recognize the impact they have on students
- Allows students to grow as independent learners and experience the delight of mathematics



Grades 6–8



Advanced Middle School Courses



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Instructional Design

The *Big Ideas Math: Modeling Real Life* program uses a Universal Design for Learning to create an engaging and innovative program that uses hands-on activities and scaffolded instruction. The instructional design guides students through concepts from surface-level to deep-level learning and allows them to transfer these skills to new concepts in a complete and comprehensive way. This allows for balanced lessons with built-in differentiation, as well as RTI support, that appeals to students and teachers alike. Learning targets and success criteria help to focus student learning and make learning visible to teachers and students.





With a strong emphasis on problem solving in the classroom, students can transfer their mathematical knowledge to new concepts and apply their understanding to real-life situations. Through in-class practice and activities, students become more comfortable with the problem-solving process to become strategic mathematical thinkers.





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The **Big Ideas Math: Modeling Real Life** Teaching Edition is a comprehensive resource that guides teachers throughout instruction.





The table identifies each standard as "Preparing," "Learning," "Complete," and "Extending" for each lesson. The **Progressions** highlight the program coherence from grade to grade. Teachers can see what was covered in the previous grade and how it builds to the content they are teaching. They can also see further connections and applications in the next grade.

In the Progressions Through the Chapter, the standards are called out for every section along with guidance on where students should be tracking on their conceptual development.



Laurie's Notes



Learning Target

Success Criteria Write and interpret ratios using appropriate notation and language.
 Recognize multiplicative

given ratio. Warm Up Cumulative, vocabulary, and prerequisite skills practice opportunities are available in the *Resources by Chapter* or at *BigldeasMath.com*.

ELL Support

Exploration 1

Exploration 2 a. ves

T-107

a-c. See Additional Answers.

b. Add 3 parts of iced tea for every

1 part of lemonade added

ELL Support Clarify the meaning of the word relationship. Explain that the mother of Sam's mother is Sam's grandmother. The word grandmother describes Sam's relationship to his mother's mother. If necessary, draw a family tree on the board to clarify and describe other relationships within a family. Explain that ratios describe relationships between quantifies, which are relationships. In a mathematical relationships. In a mathematical context, a table is stype of chart, not a type of furniture.

Understand the concepts of ratios and equivalent ratios.

relationships in ratios. • Describe how to determine

whether ratios are equivalent • Name ratios equivalent to a

Chapter 3 Overview

number line.

Students need time to think and discuss with their peers in a supportive learning environment. Be sure to model the expectation that all students engage in their learning, that errors lead to learning, and explanations help students to assess their understanding of the concepts.

A major focus of this course is the study of ratios and rates. In studying these A major nocus of this course is the study of halos and rates. In studying these topics, it is natural to make connections to whole-number multiplication and division. In this chapter, students have the opportunity to review and become more confident with these operations.

This chapter begins with introductory skills associated with writing and representing ratios. Fractional notation is purposely avoided. Instead, the number $\frac{a}{b}$ is referred to as the value of the ratio a: b. Once the concept of a ratio has been introduced, equivalent ratios can be used to solve a wide variety

of problems. Students used tape diagrams in prior grades to show the relationship between numbers. For example, 12 can be decomposed into the two numbers 5 and 8. When the visual model is drawn to scale, it is called a tape diagram and can be used to find equivalent ratios. Another visual model that can be used is a double

Students will also use the structure of a ratio table to find equivalent ratios Valuents win also use the source and a national value to mine equivalent ratios, which in turm are used to solve real-life applications. In the third lesson, various operations are used to create ratio tables. Students will come to understand that in most cases a ratio table is the result of extending pairs of rows (or columns) of a multiplication table.

Once students have a good understanding of ratios, and can solve a variety of ratio problems using a tape diagram or a ratio table, rates are introduced. Students begin by graphing ratios in the first guadrant and recognizing that there is a constant rate at which the line is increasing. The connection to slope will be made in subsequent grades.

Rates, unit rates, and converting measures comp applications of rates, such as miles per hour and students. Converting rates, or simply converting unit, integrates prior computational skills and rat

Suggested Pacing 1 Day Chapter Opener Section 1 3 Days Section 2 3 Days Section 3 3 Days Section 4 3 Days Section 5 3 Davs Section 6 3 Days **Connecting Concepts** 1 Dav Chapter Review 1 Day **Chapter Test** 1 Day 22 Days Total Chapter 3

Year-to-Date

Laurie's Chapter Overview at the beginning of each chapter sets the stage for the content. The overview lays out the conceptual progression for that chapter and how it is developed and instructed in each lesson.

The information offers an efficient way to plan for the chapter and solidify math background.

Laurie's Notes provide effective tips for using models and making connections to previously learned concepts, as well as real-world applications.

Chapter Success Criteria Write and interpret ratios. Name ratios equivalent to a given ratio.
Solve a problem using ratios. Convert units of me ıre usina ratio reasoning.

Chapter Learning Target

Understand ratios

50 Days

Laurie's Notes

Preparing to Teach

 Students are familiar with comparing measurable attributes using language such as *longer than*, *less than*, *heavier than*, and so on. A ratio is a comparison of two quantities, and there is language and notation associated with ratios

Check out the Dynamic Classr

eMath con

• Represent the value of the ratio a: b as the number $\frac{a}{b}$. Meaning, the quantity a is $\frac{a}{b}$ times b (also the quantity b is $\frac{b}{a}$ times a). For example, the ratio 1:3 $a_{\rm b}$ is $a_{\rm c}^{\rm torse or space we quanty of <math display="inline">a_{\rm c}^{\rm torse}$ and $a_{\rm c}^{\rm torse}$ and $b_{\rm c}^{\rm torse}$ and $b_{\rm c}^{\rm torse}$ and $b_{\rm c}^{\rm torse}$ and $b_{\rm c}^{\rm torse}$ and unnecessarily complicated, however, when interpreting ratios and using ratios to solve problems, this is the type of reasoning students often have to use.

Motivate

- Ask for two volunteers. Hand 3 blocks to Student A and 1 to Student B. Ask the other students to describe the relationship between the numbers
 of blocks. Student A has 2 more blocks (additive relationship) or 3 times a

- or blocks, situetint Kinas Zindre blocks (aduative reasonism) of 3 almes as many blocks fundiplicative relationship). Hand each student I more block. "Describe the relationship now." The additive relationship is still the same but the multiplicative relationship changed. Continue to add 1 block and ask about the relationships. You want students to
- realize that the relationship is never 3 to 1 again. You will revisit this scenario in the Closure.

Exploration 1

- State the learning target and success criteria for this section, and then relate these to the Motivate activity.
 Although the language and notation of ratios will likely be revealed in the
- Motivate, remind students that they should always read introductory text and
- directions. The definition of a ratio is provided before Exploration 1
- directions. The definition of a ratio is provided before Exploration 1. Model with Mathematics: Remaind Students that here y can use a table to organize the possible numbers of girls and boys in the science class. Part (b) is not asking students to compare actual numbers, just relative quantities. Can students make a valid statement? **? Construct Viable Arguments and Critique the Reasoning of Others:** When discussing part (b), focus on student reasoning. Solicit several comments. Ask other students if they agree with explanations offered. "Student B, do you agree with what Student A said? Why?"

Exploration 2

- Expect students to read the problem and work with a partner or group. You are listening to conversations, not teaching the problem.
 Common Misconception: Students may believe that if you add or subtract the
- same quantity to each number in a ratio, it is still the same relationship. Same quantity to each number in a ratio, it is suit to same reaconsity. Students may not have the language of **equivalent ratios**, yet it seems logical to double or triple the recipe. Record student answers so that you may reference these answers when discussing equivalent ratios.

Laurie's Notes appear at the chapter and lesson level for embedded professional development, implementation support, questioning strategies, and differentiation tips page-by-page every step of the way.

Laurie's Notes offer guidance for building proficiency of the mathematical processes and proficiencies.



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Embedded Differentiation

The Teaching Edition, along with the program's print and digital resources, offers support for all levels of learners.

The comprehensive guidance for scaffolding instruction in the Teaching Edition was thoughtfully written with both students and teachers in mind.

Throughout every Lesson, Laurie's Notes provide point-of-use differentiation for emerging, proficient, and advanced learners. The modification suggestions relate directly to the specific content of the exercises.

ELL Support Teaching Strategy boxes Laurie's Notes Teaching Strategy The ELL support boxes are located throughout the highlight teaching Teaching Edition. These are quick, point-of-use notes to methods, such as using example to discuss the value of t en staff said that for every 5 stu sents do not. The ratio of student manipulatives, to help help teachers differentiate instruction for ELL students. reach all learners. EXAMPLE 2 Some of the ELL notes even have differentiated levels students use 1 red tile and 2 blue tiles inds. Looking at the tiles, students car For example, if the ratio of appl to blueberries is 1 : 3, you can u of support to provide the most effective suggestions for red and 3 bl these students. Try It e the ratio of bluebe FLL Sur xtra Example 2 **ELL Support** Explain that a sanctuary is a place where animals are helped and protected. They can live freely there, without harm from hunters. Have ELLs work in pairs to visually model the ratio by drawing squares to represent adult Key Idea elephants and circles to represent baby elephants Beginner: Draw 5 squares and 1 circle. They will then state the value of the ratio as 5. Intermediate: State the value of the ratio and verbally explain that the $as \frac{a}{b} = \frac{a \times a}{b \times a}$ number of adult elephants is 5 times the number of baby elephants. Advanced: State the value of the ratio and provide a written explanation that the number of adult elephants is 5 times the number of baby elephants. T-109



Print and Digital Resources to meet the needs of all Learners

The new middle school series offers options and resources to curate a unique instructional experience. There are a variety of opportunities for reteaching, extra practice, enrichment, and extension in the Teaching Edition, online, and in printed resources.

of a rei the blu 1:2.Sl of the g Mini-A In a pet sh 1. cats to 2. fish : ' Determin 3. 4:7 a 4. 12:4	e 48 Students may need trangle. They may see that rectangle's dimensions row students why the rati reen rectangle is 1 : 4. sssessment op, there are 12 dogs, 9 to dogs 9 to 12 or 9 : 12 Section	reminded how to find the perimeter and area to the gener cetangly dimension are twice and then assume that all of the ratios will be of the area of the blue rectangle to the area att, and 17 fish. Write the ratio.	 21 21 21 4. ²/₂ The ratio of the first quantity to the second quantity is 4 . ³/₂ The ratio of the second quantity to the second quantity to the second quantity to the second quantity is a second second to the second quantity is a second second to the second quantity is a second sec
5. A car movir		Surface Level	Deep Level
Sectic	Resource: • Extra • Retea • Puzzl Student Ju • Self • Pract Differentia Tutorial Vi Skills Revi Skills Train	s by Chapter Practice ach e Time Durnal Assessment ice ting the Lesson deos ew Handbook ner	Resources by Chapter • Enrichment and Extension Graphic Organizers Dynamic Assessment System • Section Practice
Resourc • Extr • Retu • Puz Student	es by Chapter a Practice sach Le Time Journal -Assessment tice	Resources by Chapter • Enrichment and Extension Graphic Organizers Dynamic Assessment System • Section Practice	21. spen works of



The Math Tools provide an array of virtual manipulatives for modeling lessons or for students to work out solutions while practicing in their Dynamic Student Edition.

The Section Resources in the Teaching Edition highlight resources for supporting all students in their transfer from surface- to deep-level understanding.

School to Home Connections

The Resources by Chapter include Family Letters in English, Spanish, and other languages to support practice and homework exercises.





Extra Examples also include Lesson Tutorial Videos with English and Spanish audio to support students inside and outside the classroom.



The middle school program offers a variety of opportunities for both formative and summative assessment. Options include:

Self-Assessments

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- Prerequisite Skills Practice
- Pre-Course and Post-Course Test
- Quizzes
- Chapter Tests
- Alternative Assessments
- STEAM Performance Tasks
- Quarterly Benchmark Tests
- Online Assessments (see Technology page)

Student ownership and accountability for learning is a vital component of fluency with both the content and practice standards.

Every Chapter offers a Chapter Self-Assessment for



Self-Assessment opportunities appear throughout instruction for Concepts & Skills and Problem Solving.



The **Chapter Tests** and **Quizzes** are opportunities for students to demonstrate understanding. The problems include questions that extend concepts.



The **STEAM Performance Task** activity provides students the opportunity to demonstrate their understanding of the chapter learning targets. It aligns with the Performance Task Preview from the beginning of the chapter and the Performance Task reference on the Connecting Concepts page.

Name	Date
Chapter 3 Performance Task	
Oops! Unit Conversion Mistakes	
Why is accuracy in unit conversions important? In what types of situations can in unit conversions cause problems?	mistakes
 A patient is scheduled to receive 750 milliliters of blood over the course There are 15 drops in 1 milliliter. The nurse is supposed to find the corre drops per minute, of the transfusion so that the patient's circulatory syste over- or under-taxed. The nurse makes the following calculation. 	of 4.5 hours. et rate, in m is not
$\frac{750 \text{ mL}}{4.5 \text{ h}} \times \frac{15 \text{ drops}}{1 \text{ mL}} = 2500 \frac{\text{drops}}{\text{min}}$	
The nurse made one very dangerous mistake. What is it? Find the corre	ect rate.
 In July of 1983, an Air Canada flight took off from Montreal. After one plane ran out of fluel and had to make an emergency landing. Before the aircraft prevoned detormined that has plane needed 22 2010 out is longer for the flight and that there was currently 7602 latters of find in the tank. Additional out of the plane would accel 4917 more lites of the left perform following calculations. Worksh of the in the tank. 7682 L x 172 ^{bb}/₂ = 13 597 km 	hour, the Hight, the ns of fuel They ning the
weight of fuel to be added: 22 300 kp = 13 507 kg = 8703 kg	
Volume of fuel to be added: $\frac{8703 \text{ kg}}{\text{L}} = 4917 \text{ L}$	
What did they do wrong? Find the correct amount (in liters) of fuel to be (1 kg \approx 2.2 lb)	added.

Grade 6 STEAM Performance Task

High-stakes assessments require a deeper level of conceptual understanding. **Explorations** provide students with multiple opportunities to develop their conceptual understanding.



Connecting Concepts prepare students for high-stakes assessments by asking questions that use previously learned skills in new contexts. Students also practice with the Problem-Solving Plan so they are prepared to use it during assessments.





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Big Ideas Math: Modeling Real Life comes with an innovative and dependable technology package that supports and enhances instruction for teachers and students.

Dynamic Student Edition

The Dynamic Student Edition is a complete, interactive version of the Student Edition. Students have access to interactive explorations, digital examples, virtual manipulatives, Lesson Tutorial Videos, and digital exercises from the textbook.

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Dynamic Assessment System

With the Dynamic Assessment System, teachers can create customizable homework and assessments with *Big Ideas Math* question banks or items they create!

Question types include a variety of technology-enhanced items, such as drag and drop, graphing, point plotting, multiple select, multiple choice, and more.

Students complete the assignments online and can receive immediate feedback on their progress. The reports in this system provide the feedback teachers need to drive instruction.



STEAM Videos

STEAM Videos allow students to see mathematics in real life.

They also come with corresponding Performance Tasks to make further connections to the mathematical content. Students learn about DNA, the carbon atom, natural disasters, and more!







Dynamic Classroom

The Dynamic Classroom mimics the students' Dynamic Student Edition, with additional resources and support for teachers. Interactive explorations and examples from the textbook create a 21st-century classroom atmosphere that engages students. Point-of-use Laurie's Notes guide instruction with motivation suggestions, teaching tips, questions to ask the students, closure strategies, and more!





Formative Check

The Formative Check provides teachers with immediate feedback on student progress, making it easy to differentiate and provide support where it is needed the most.

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Formative Che	eck £	2	Class: Grade 6 Class	Warm Up			¥	.00
Hide Students	1	2	Self Reflection					
Kari Baker	~	~	ŝ					
Ani Cho	~	~	Ċ					
Dom Ducillo								
Chris McDonald	~	~	P					\sim
Clay Migo	~	~	ம					~
Harper Otis	×	~						
Ren Porter	~	~	ß					
Miguel Rodriguez	×	×						
Sample Student								
Sara Suffi	×	×						
Sophia West	~	~	ß					is n
								314

Skills Trainer

The Skills Trainer is an online interactive tool for skill practice that comes with detailed reports for teachers to gain insight into each student's proficiency. Students have access to every skill found within the *Modeling Real Life* series, as well as skills from Algebra 1 and Geometry.

The Skills Trainer can be used to engage students in remediation or as the daily warm-up for the lessons!

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BIG IDEAS MATH	CC Alg2-Geo Books	✓ Geometry: CC 2019	✓ k8teacher@test.com	• =		
🎄 Skills Trainer						
Chapter Grade						
к	Absolute Value	Expressions	Fractions, Decimals, Percents	Percents		
1	Finding Absolute Value	Using Order of Operations with Exponents	Comparing Fractions, Decimals, and Percents	Writing a Fraction as a Percent		
2	Interpreting Absolute Value	Modeling Real Life with Order of		Writing Percents as Decimals		
3	Nodeling Real Life with Absolute Value	Writing Expressions as Powers	Geometry	Writing Decimals as Percents		
5		Finding Values of Powers	Finding the Area of a Parallelogram	Finding the Whole		
6	Common Factors and Multiples	Identifying Parts of an Algebraic	Finding the Area of a Triangle			
7	Modeling Real Life with GCF	Expression	Finding the Area of a Trapezoid	Ratios and Rates		
8	Modeling Real Life with LCM	Evaluating Expressions	Finding the Area of a Kite	Writing Ratios		
Algebra 1	Finding the GCF	Writing Algebraic Expressions	Making a Net for a Solid	Using a Tape Diagram to Solve a Ratio Problem		
Geometry	Finding the LCM	Using Properties to Write Equivalent Expressions	Finding the Surface Area of a Rectangular	Using Ratio Tables		
Algebra 2	Coordinate Plane	Simplifying Algebraic Expressions Using	Final Section for Area of a Second	Graphing Values from Ratio Tables		
	Identifying an Optional Pair	the Distributive Property	Pyramid	Finding a Unit Rate		
		Factoring an Algebraic Expression	Finding the Surface Area of a Triangular			



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PRINT RESOURCES

Student Edition

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- **Teaching Edition**
- **Student Journal**

Resources by Chapter

- Family Letter
- Warm-Ups
- Extra Practice
- Reteach
- Enrichment and Extension
- Puzzle Time

Assessment Book

- Prerequisite Skills Practice
- Pre-Course Test
- Quizzes
- Chapter Tests
- Alternative Assessments
- STEAM Performance Tasks
- Course Benchmark Tests
- Post-Course Test

Skills Review Handbook

Rich Math Tasks

TECHNOLOGY RESOURCES

Dynamic Student Edition

Includes access to Student Edition and Student Journal online, as well as:

- Virtual Manipulatives
- Interactive Explorations
- Digital Examples
- Lesson Tutorial Videos

Dynamic Classroom

Includes access to the Teaching Edition, as well as:

- Laurie's Notes
- Virtual Manipulatives
- Interactive Explorations
- Digital Examples
- Extra Examples
- Formative Check
- Mini-Assessments
- Flip-To

Dynamic Teaching Tools

- Answer Presentation Tool
- Skills Trainer
- Digital Flashcards
- STEAM Videos
- Game Library
- Multi-Language Glossary
- Additional Online Resources
 - Lesson Plans
 - Differentiating the Lesson
 - Graphic Organizers
 - Pacing Guides
 - Cross-Curricular Projects
 - Worked-Out Solutions Key
 - Math Tool Paper

Dynamic Assessment System

- Customized Practice and Assessments
- Detailed Reports

Video Support for Teachers

- Pedagogical Approach Videos
- Concepts and Tools Videos

Big Ideas Math: Modeling Real Life offers a program that:

INSPIRES

Elevate student learning with a balanced approach

ENGAGES

Captivate student learning with innovative technology

EMPOWERS

Make learning visible through student accountability

GROWS

Positively impact student performance in mathematics

Learn more at NGL.Cengage.com/Bigldeas

K–12 Programs

Big Ideas Math programs offer a seamless articulation from elementary through high school. With a consistent author voice from level to level, students make connections through cohesive progressions and rich instruction.

Big Ideas Math uses a balanced approach to engage students' inquiring minds and empower them to become mathematical thinkers in their daily lives.



Big Ideas Math: Modeling Real Life for Grades K–5



Big Ideas Math: Modeling Real Life for Grades 6-8







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Visit NGL.Cengage.com/repfinder to locate your sales consultant for pricing or ordering information. Or, call 888-915-3276.

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