BIG IDEAS MATHere

Ron Larson & Laurie Boswell









Ron Larson & Laurie Boswell

Modeling Real Life







Authors and Research

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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 Larson, Ph.D.

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.



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.



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



Online Resources



Common Core

Edition also

available

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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.

Explorations help students reach a deeper Learning Targets and Success Criteria encourage level of conceptual understanding. students to self-assess and evaluate their learning. Multiplying Integers arming Target. Find products of integen Success Criteria: • I can explain the rules for multiplying integer I can find products of integets with the same sign
 I can find products of integets with different signs EXPLORATION 1 **Understanding Products Involving Negative Integers** Work with a partner. a. The number line and integer counters model the product 3 • 2. + + + How can you find 3 . (-2)? Explain. + + + +2 -2 -2 -1 0 1 2 2 4 5 6 7 b. Use the tables to find -3 + 2 and -3 + (-2). Explain your reasoning 2 • 2 = 4 -3 • 3 = -9 1 • 2 = 2 $-3 \cdot 2 = -6$ 0 • 2 = 0 -3 · 1 = -3 -1 - 2 = -3 • 0 = -2 - 2 = -3 . -1 = -3 · 2 = -3 -2 = c. INDUCTIVE REASONING Complete the table. Then write general rules for multiplying (i) two integers with the same sign and (ii) two integers with different signs. Product Product: Positive Type of Product Expression or Negative Integers with the same sign 3.2 3.(-2) Math Practice -3.2 Construct -3 + (-2) Arguments 6+3 Construct an argument that yo 2.(-5) can use to convince a friend of the rules. -6.5 you wrote in Exploration 1(c). -5.(-3) Copyright © Big Ideas Learning, LLC. All rights reserved Section 2.1 Multiplying integers 49

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.

EXAMPLE 2	Evaluating Exp	ressions —	
	a. Find (-2) ² .		•
	$(-2)^2 = (-$	2)+(-2)	Write (- 2) ² as repeated multiple
The expression of the	=4		Multiply
number in parentheses.	b Date of		
the expression - 7.	6. Find =2*.	-	White 32 or executed as products
however, indicates to tes	-2-=-(2.	-2)	where 2 - as repeated multiple.20
Bre obligation a	=-4		Notephy 2 and 2.
	c. Find -2 . 17 . (-5).	
0	-2 • 17 • (-	$(5) = -2 \cdot (-5) \cdot 17$	Commutative Roperty of Multipl
Remember 12		= 10 + 17	Multiply -2 and -5.
utue order of		= 170	Multiply 10 and 17.
operations when evaluating an	d. Find -6(-3+	1) + 6.	
expression.	-6(-3+4)	+6 = -6(1) + 6	Perform operation in parenthese
		= -6+6	Multiplication Property of 1
		= 0	Additive leverse Property
	Ten It	21277)	
	ITY IT Evaluate th	e expression.	
• 🔙	Self-Asses	sment for	Concepts & Skills —
-	Solve each exercise. B in your journal.	ien nate your underst	anding of the success criteria
	 WRITING What is (a) positive an 	can you conclude ab d (b) negative?	out two lategers whose produc
	EVALUATING AN EXP	ESSION Evaluate t	be expression.
	11. 4(-0)	125(-7)	13. 12 - 21 + (-2)
	C REASONING Tel	I whether the states	nent is true or faite. Explain
	 MASONING Tell your reasoning. 14. The product of d 	I whether the states	nent is <i>true</i> or <i>faise</i> . Explain
	 BEASONING Televour reasoning. 14. The product of d 15. The product of d 	l whether the states nee positive integer nee negative integer	nent is <i>true</i> or <i>false</i> . Explain s is positive. s is positive.



ire all I fluency Modeling Real Life examples and practice bring problem solving into the classroom, promoting transfer of concepts and skills into real-life situations. EXAMPLE 3 Modeling Real Life You solve a number puttle on your phone You start with 250 points. You finish the puzzle in 8 minutes 45 seconds and make 3 mixtakes. What is your score? You are given ways to gain points and lose points when completing a puzzle. You are asked to find your score after finishing the puzzle. Use a verbal model to solve the problem. Find the sum of the starting points, mistake penalties and time bories. Starting Number of points Time bonus Score = = 250 + 3(-50) + 75 10 min - 8 min 45 wc = 1 min 15 sec = 75 sec = 250 + (-150) + 75= 100 + 75= 175 # 16 100 150 200 25 So, your score is 175 points. Self-Assessment for Problem Solving Solve each exercise. Then note your understanding of the success criteria its your journal. 16. On a mountain, the temperature decreases by 18°F for each 5000-loot increase in elevation. Al 7000 feet, the temperature is 41°F. What is the temperature at 22,000 feet? Justify your answer Player Coins Time 17. Players in a racing game earn 3 points for each coin they collect Each player loses 5 points for each second that he or she 1 31 0.02.65 finishes after the first-place finisher. The table shows 2 18 0:01:55 the regults of a race. List the players in order from greatest to least number of points. 3 24 0.01:58 4 27 0:02:01 52 Chapter 2 Multiplying and Dividing Rational Numbers Copyright @ Bg destuance, UC All right rearred



Teaching Support

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





Progressions				2			
	Bre	at the	Grade	1			
danks 5		Inde					61
 Canad Analysis Internations Addy addition in speechemics (price) 	 Visionersee Visionersee Visionersee Constants Constants Constants Solice path Transmittee 		a and tak magning t canthered gravitat into it (conver-		- Shoker and pro- shoker and pro- able and able and	Pyrink o v Bur whether whether dis- of-prepar- of-prepar-	Pite distant form
	Desegh	le Ch	igter.				
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tunkerine Bagrens, ir upstiller.							
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The **Progressions** table highlights the program coherence from grade to grade. Teachers will find this useful because they can see what was covered in the previous grade level and how it builds to the content they are teaching in their grade level. In addition, they can see further connections and applications in the next grade level.

The Learning Standards are called out for every chapter along with guidance on where students should be tracking on their conceptual development.



Chapter 3 Overview

In previous courses, students were introduced to algebraic expressions. That introduction included related vocabulary (i.e., term, coefficient, exponent, etc.) and writing and evaluating algebraic expressions. That said, it is common for students to see 1.5x + 0.06(1.5x) as just a bunch of symbols that have little meaning. Students find it difficult to appreciate that an algebraic expression can model a real-life situation, one that can be interpreted and explored with *what if*

In 1.5x + 0.06(1.5x), x can represent the wholesale price of an item. The item is marked up 50%, 1.5x, and there is a 6% sales tax, 0.06(1.5x). The sum of the two terms is the retail price (the price the consumer pays) and the expression can b simplified to show that the consumer pays 59% more than the wholesale price. 1.5x + 0.06(1.5x) = 1(1.5x) + 0.06(1.5x)



What is the retail price if the wholesale price is \$60? If the wholesale price doubles (x =\$120), does the retail price double? If the wholesale price increasy by 10 dollars (x =\$70), does the retail price increase by 10 dollars? Students will work with percents later in this course, but the skills for writing and simplifying algebraic expressions are in the first two lessons of this chapter. Algebra tiles and area models are used to model operations on

The area of the shaded region is

(16 - z - z)5 square units.

The Distributive Property is used to find the prod 5(16 - z) = 90 - 5z. The Distributive Property is as in the real-life situation above represented by (1.5x). The last two lessons of the chapter look at expressions. Students' understanding and recog Property is essential to understanding both of th

Learning Target Understand the concepts a ratios and equivalent ratio Success Criteria · Write and interpret rati

Write and interpretation ratios using appropriate notation and language. Recognize multiplication relationships in ratios. Cosmito hour to determine shafter ratios are equivalent to a ratios are equivalent to a former ratios application to a

juggested Pacing

Chapter Opener

Section 1

Section 2

Section 3

Section 4

Connecting Concents

Chapter Review

Total Chapter 3

Year-to-Date

Chapter Learning Target Understand algebrai

Chapter Success Criteria

Identify parts of an algebraic Write algebraic expressions.
 Solve problems using algebraic

expressions.

Interpret algebraic expression

in real-life problems

Chapter Test

1 Day

2 Days

2 Days

2 Davs

2 Days

1 Day

1 Day

1 Day

12 Days

44 Days

given rate. Warm Up

Constative, vecabulary, and preropriate skills practice opportunities are available in the Resources by Chapter or at SigldeasMath.com.

ELL Support

a-c. See Additional Answers.

b. Add 3 parts of lord tex for every

I part of lemonade added.

7.00

T-107

Motivate

Clarify the meaning of the word relationship. Explain that the nother of San's nother is

Exploration 1

- Sam's grandmother. The word grandmother describes Sam's relationship to his mother's Inditionary to the motion's motion. If recentary, draw a family true on the band's to class and describe stheir relationship within a family, Saplain that ratios describe relationships
- retion describe industry by between quarties, which are the amounts of different terms. Tell students that they will be retaring tables to show ratio relationships. In a methomatical scottart, a balleris a type of chart, met a type of furniture.

agree with what Insdant A said? Why?

Exploration 2

Expect students to read the problem and work with a partner or group. You

The table identifies with "Preparing", "Learning", and "Complete" for each lesson.

· - properting · - complex

Descriptions in the second second second



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.



Oteck oct Bre Dynamic Oater

Math Los

Preparing to Teach Deducts are familiar with comparing neararable attributes using language such as langue than, lears than, harvier flam, and so an.
 A ratile is a comparison of two quentilies, and there is language and notates susceited with retion.

Represent the value of the ratio a: b as the number of Meaning, the quantity ain ² Stress Minho the quantity bin ² Stress di For example, the ratio 1:3 maare 1 in ² stress 2 (or 2 in ² Stress 1). This scands like awavent language and unrecessarily complicated, however, when interpreting ratios and using ratios to solve problems, this is the type of recessing students often have to use

 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 members of Voleks. Student A has 2 more blocks (addition relationship) or 7 times to · Hand each student I nere Block. "Describe the relationship new." The

 Centinue to add 1 block and ask about the relationships. You want students to realize that the relationship is namer 2 to 1 again. • You will revisit this scanarie in the Desara.

State the learning target and success criteria for this section, and then relate these to the Motivate activity.

tense or the decement activity. A Schedigh the improvement of ratios will likely be revealed in the Moristan, running students that they should always read introductory test and directions. The decinition of a ratio is provided burner Suplandian I. • Model with Mathematics: School students that they can use a table to Model with Mathematocy: nortical structures that they can sure a status to organice the possible methods in gipts and logs in the society calsus.
 Pert Di is not assing students to compare actual numbers, just relative quantities. Can tuberm make a wolfs statement?
 Construct Walde Arguments and Oritiges the Ressoning of Others: When documents partials. How on student measuring Solicit sourced comments. Ask wher relations If they approve with explanations of intra-f. Thubert E, do you and solicit.

ere latering to conversations, not teaching the problem. Common Misconception: Students may believe that if you add or subtract the same scenthy to each number in a ratio, it is still the same relation Solutions may not have the language of regionaliset creation, yet it assess logical to double or triple the racipe. Record student answers so that you may inforunce these answers when decussing 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 practices and processes.



Differentiation



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.

specific content of the exercises.



ELL Support

Explain that a sanctuary is a place where animals are helped and protected.

elephants and circles to represent buby elephants. Beginner: Draw 5 squares and 1 circle. They will then state the value of the

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

Intermediate: State the value of the ratio and verbally explain that the

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.

The ELL support boxes are located throughout the Teaching Edition. These are quick, point-of-use notes to help teachers differentiate instruction for ELL students.

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.



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 book includes Family Letters that support practice and homework exercises.



also include Videos with English and the classroom.

Some of the ELL notes even have differentiated levels of support to provide the most effective suggestions for these students.

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Laurie's Notes

ELL Support

ratio as 5.



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		Resources	Sanethrap (0)	eporta Mio
Grade 8		Andgements		
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	2		ЦПЦ	
Desmos Graphing	Desmos Geometry	Algebra Tiles	Box-and-Whisker Plot	

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.

Extra Examples Lesson Tutorial Spanish audio to support students inside and outside



Assessment

The Grades 6–8 program offers a variety of opportunities for both formative and summative assessment. Options include:

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

Self-Assessment

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 students to evaluate their understanding of the Learning Targets and their performance perception related to the Success Criteria.



The **Chapter Tests**, as well as **Mid- and End-of Chapter Quizzes** are opportunities for students to

demonstrate understanding. The problems include questions that extend concepts.



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

to develop their conceptual understanding.





The **STEAM Performance Task** activity provides students the opportunity to demonstrate their understanding of the chapter learning targets. It aligns with what was previewed in the Performance Task Preview.

Name Date
Chapter 3 Performance Task
Oops! Unit Conversion Mistakes
Why is accuracy in unit conversions important? In what types of situations can mistakes in unit conversions cause problems?
 A patient is scheduled to receive 750 millillares of blood recer the course of 4.5 hours. There are 15 despite it i millillare. The neares is supposed to find the corroce ran, in despite per minute, of the transfastion on that the patient's elevationity system is not or on-ar wind second. The manute match the following and studiation.
$\frac{750 \text{ mL}}{4.5 \text{ h}} \times \frac{15 \text{ drops}}{1 \text{ mL}} = 2500 \frac{\text{drops}}{\text{min}}$
The sume made one very dangerous mistake. What is it? Find the correct rate.
 In July of 1903, an Air Canada Eight took off from Montroal. After one hour, the place rate out of fact and had to make an emergency landing. Bolive the Eight, the among Proceeding discontinued that the place resolute 223 to that kilotepares of fact
for the flight and that there was currently 7662 inters of facil in the tank. They determined that the plane would need 4917 more litters of facil by performing the fellowing calculations.
Weight of fuel in the task: 7682 $L\times 1.77~\frac{2b}{L} \approx 13,997~k_{B}$
Weight of fael to be added: 22,300 kg - 13,997 kg = 8700 kg
Volume of fiel to be added: $\frac{8700~kg}{1.77~\frac{B}{L}}$ = 4917 L
What did they do wrong? Find the correct amount (in lines) of fact to be added. (14g = 2.2 fb)

Grade 6 STEAM Performance Task

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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LEARNING

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.



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!

Items include a variety of question types such as multiple choice, technology enhanced, multiple select, and more. Responses are automatically scored except for the newly released essay question type, which allows students to provide explanations of their reasoning.

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!



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This Dates	*		8		Ŧ	Self-Reflection		
Daryl Adams	-	4	×	-	~	0		
David Report	1	1	~	~	1	Q		
wante Campbell	4	×	×	4	×	0		
LineCost	~	4	~	4	4	0		
Mchalls Das	4	1	~	×	×	0		
Augusta Board		+	+					
forest lower	4	4	~	~	×	0		
Kash Parts	4	×	4	×	~	9		
Liste Water	×	v.	4	×	×	\$		
Reasol Wilson	×	4	×	4	4	9		

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.

Students complete the assignments online and can receive immediate feedback on their progress.



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¢		$\begin{aligned} & b(x,b) &= x + b(x) + \left(\frac{1}{2} $	3	Frankt - A track may be dependent of the - A track may be dependent on - A track may be
-14	- 40		0.4	



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.

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E 1 2 3 4 5 8 7 8	Internet Control of Co	Antonia de California (Seconda da california de Californi	Address (Andress) Berning and Address Berning and Address Berning Bern		Parlamente des Para de las destructiones estas en estas destructiones estas en estas destructiones en argunes des destructiones destruct
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The Skills Trainer can be used to engage students in remediation or as the daily warm-up for the lessons!

Components

PRINT RESOURCES

Student Edition

NATIONAL GEOGRAPHIC

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

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

Dynamic Classroom

- 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

- Professional Development 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.



Common Core edition available for Grade K through Algebra 2.

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



Advanced middle school courses available!

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







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