BIG IDEAS

# MATH®

# Algebra 1

## A Common Core Curriculum

Ron Larson and Laurie Boswell

BIG IDEAS LEARNING®

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# Authors

**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.

Ron Larson

**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.

Laurie Boswell

Dr. Ron Larson and Dr. Laurie Boswell began writing together in 1992. Since that time, they have authored over four dozen textbooks. This successful collaboration allows for one voice from Kindergarten through Algebra 2.

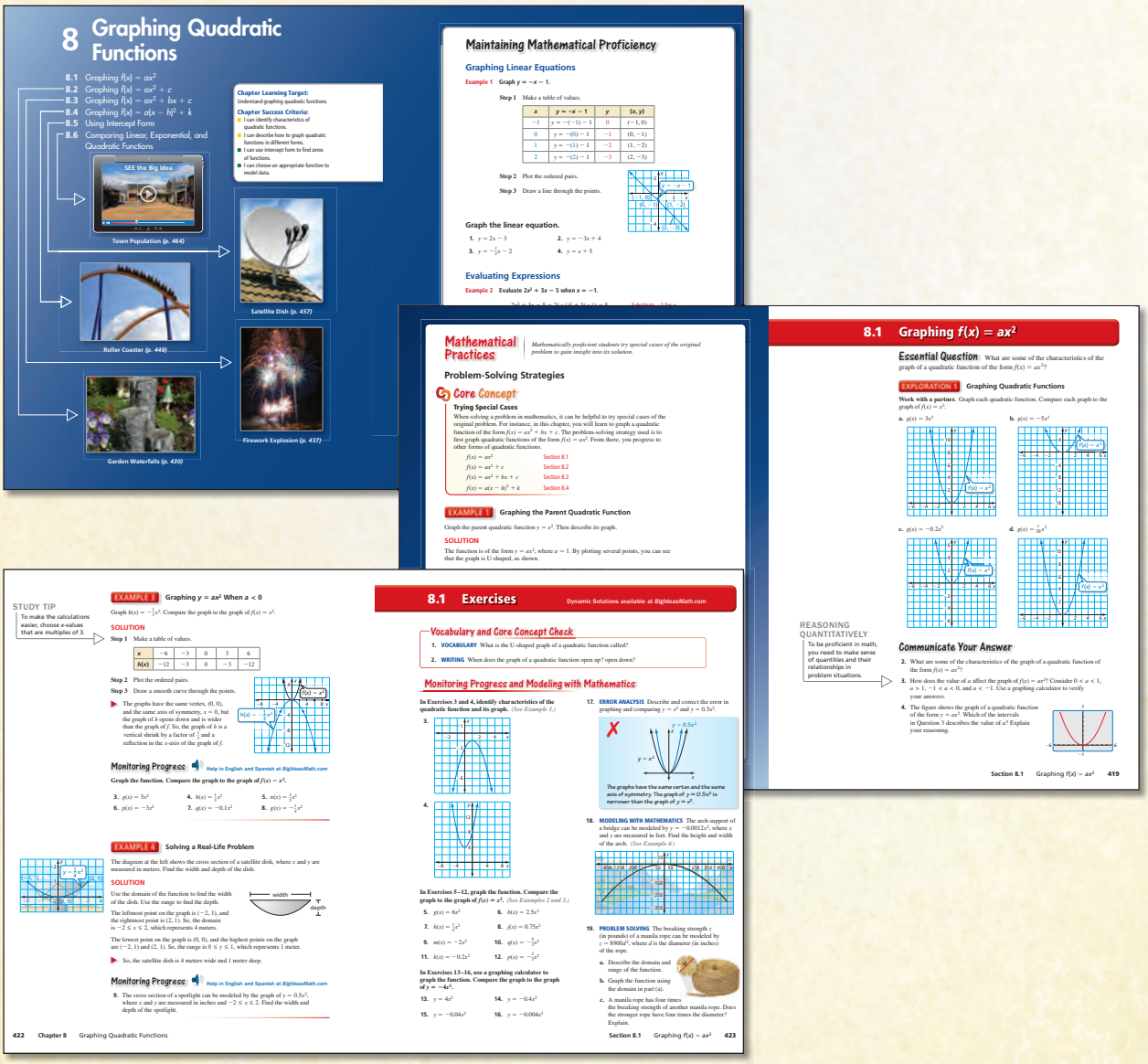
# For the Student

Welcome to *Big Ideas Math Algebra 1*. From start to finish, this program was designed with you, the learner, in mind.

As you work through the chapters in your Algebra 1 course, you will be encouraged to think and to make conjectures while you persevere through challenging problems and exercises. You will make errors—and that is ok! Learning and understanding occur when you make errors and push through mental roadblocks to comprehend and solve new and challenging problems.

In this program, you will also be required to explain your thinking and your analysis of diverse problems and exercises. Being actively involved in learning will help you develop mathematical reasoning and use it to solve math problems and work through other everyday challenges.

We wish you the best of luck as you explore Algebra 1. We are excited to be a part of your preparation for the challenges you will face in the remainder of your high school career and beyond.



# Big Ideas Math High School Research

*Big Ideas Math Algebra 1*, *Geometry*, and *Algebra 2* is a research-based program providing a rigorous, focused, and coherent curriculum for high school students. Ron Larson and Laurie Boswell utilized their expertise as well as the body of knowledge collected by additional expert mathematicians and researchers to develop each course.

The pedagogical approach to this program follows the best practices outlined in the most prominent and widely-accepted educational research and standards, including:

Achieve, ACT, and The College Board

*Adding It Up: Helping Children Learn Mathematics,*
National Research Council ©2001

Common Core State Standards for Mathematics,
National Governors Association Center for Best Practices and the Council of Chief State School Officers ©2010

Curriculum Focal Points and the *Principles and Standards for School Mathematics* ©2000,
National Council of Teachers of Mathematics (NCTM)

Project Based Learning,
The Buck Institute

Rigor/Relevance Framework™,
International Center for Leadership in Education

*Universal Design for Learning Guidelines,*
CAST ©2011

*Unlocking Formative Assessment: Practical Strategies for Enhancing Students' Learning in the Primary and Intermediate Classroom,*
Shirley Clarke, Helen Timperley, and John Hattie ©2004

*Evaluating the Quality of Learning: The SOLO Taxonomy*,
John B. Biggs and Kevin F. Collis ©1982

*Formative Assessment in the Secondary Classroom,*
Shirley Clarke ©2005

*Improving Student Achievement: A Practical Guide to Assessment for Learning,*
Toni Glasson ©2009

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# Common Core State Standards for Mathematical Practice

**Make sense of problems and persevere in solving them.**

- *Essential Questions* help students focus on core concepts as they analyze and work through each *Exploration*.
- Section opening *Explorations* allow students to struggle with new mathematical concepts and explain their reasoning in the *Communicate Your Answer* questions.

**Reason abstractly and quantitatively.**

- *Reasoning*, *Critical Thinking*, *Abstract Reasoning*, and *Problem Solving* exercises challenge students to apply their acquired knowledge and reasoning skills to solve each problem.
- *Thought Provoking* exercises test the reasoning skills of students as they analyze and interpret perplexing scenarios.

**Construct viable arguments and critique the reasoning of others.**

- Students must justify their responses to each *Essential Question* in the *Communicate Your Answer* questions at the end of each *Exploration* set.
- Students are asked to construct arguments and critique the reasoning of others in specialized exercises, including *Making an Argument*, *How Do You See It?*, *Drawing Conclusions*, *Reasoning*, *Error Analysis*, *Problem Solving*, and *Writing*.

**Model with mathematics.**

- Real-life scenarios are utilized in *Explorations*, *Examples*, *Exercises*, and *Assessments* so students have opportunities to apply the mathematical concepts they have learned to realistic situations.
- *Modeling with Mathematics* exercises allow students to interpret a problem in the context of a real-life situation, often utilizing tables, graphs, visual representations, and formulas.

**Use appropriate tools strategically.**

- Students are provided opportunities for selecting and utilizing the appropriate mathematical tool in *Using Tools* exercises. Students work with graphing calculators, dynamic geometry software, models, and more.
- A variety of tool papers and manipulatives are available for students to use in problems as strategically appropriate.

**Attend to precision.**

- *Vocabulary and Core Concept Check* exercises require students to use clear, precise mathematical language in their solutions and explanations.
- The many opportunities for cooperative learning in this program, including working with partners for each *Exploration*, support precise, explicit mathematical communication.

**Look for and make use of structure.**

- *Using Structure* exercises provide students with the opportunity to explore patterns and structure in mathematics.
- Students analyze structure in problems through *Justifying Steps* and *Analyzing Equations* exercises.

**Look for and express regularity in repeated reasoning.**

- Students are continually encouraged to evaluate the reasonableness of their solutions and their steps in the problem-solving process.
- Stepped-out *Examples* encourage students to maintain oversight of their problem-solving process and pay attention to the relevant details in each step.

# Common Core State Standards for Mathematical Content for Algebra 1

## Chapter Coverage for Standards


### Conceptual Category Number and Quantity

- The Real Number System
- Quantities


### Conceptual Category Algebra

- Seeing Structure in Expressions
- Arithmetic with Polynomials and Rational Expressions
- Creating Equations
- Reasoning with Equations and Inequalities


### Conceptual Category Functions

- Interpreting Functions
- Building Functions
- Linear, Quadratic, and Exponential Models


### Conceptual Category Statistics and Probability

- Interpreting Categorical and Quantitative Data

# 1 Solving Linear Equations



**See the Big Idea**
Learn how boat navigators use dead reckoning to calculate their distance covered in a single direction.

# Solving Linear Inequalities 2




**See the Big Idea**
Determine how designers decide on the number of electrical circuits needed in a house.

# 3 Graphing Linear Functions



**See the Big Idea**
Discover why unlike almost any other natural phenomenon, light travels at a constant speed.

# 4 Writing Linear Functions



**See the Big Idea**
Explore wind power and discover where the future of wind power will take us.

# 5 Solving Systems of Linear Equations



**See the Big Idea**
Learn how fisheries manage their complex ecosystems.

# 6 Exponential Functions and Sequences



**See the Big Idea**
Explore the variety of recursive sequences in language, art, music, nature, and games.

# 7 Polynomial Equations and Factoring



**See the Big Idea**

Explore whether seagulls and crows use the optimal height while dropping hard-shelled food to crack it open.

# 8 Graphing Quadratic Functions



**See the Big Idea**
Investigate the link between population growth and the classic exponential pay doubling application.

# 9 Solving Quadratic Equations



**See the Big Idea**
Explore the Parthenon and investigate how the use of the golden rectangle has evolved since its discovery.

# 10 Radical Functions and Equations



**See the Big Idea**
Explore how a tsunami's speed changes with depth and explore other factors in determining tsunami danger zones.

# 11 Data Analysis and Displays



**See the Big Idea**
Foray into the fashion differences between men and women.

# How to Use Your Math Book

Get ready for each chapter by **Maintaining Mathematical Proficiency** and reviewing the **Mathematical Practices**. Begin each section by working through the EXPLORATIONS to **Communicate Your Answer** to the **Essential Question**. Each **Lesson** will explain **What You Will Learn** through EXAMPLES, **Core Concepts**, and **Core Vocabulary**.

Answer the **Monitoring Progress** questions as you work through each lesson. Look for STUDY TIPS, COMMON ERRORS, and suggestions for looking at a problem ANOTHER WAY throughout the lessons. We will also provide you with guidance for accurate mathematical READING and concept details you should REMEMBER.

Sharpen your newly acquired skills with **Exercises** at the end of every section. Halfway through each chapter you will be asked **What Did You Learn?** and you can use the Mid-Chapter **Quiz** to check your progress. You can also use the **Chapter Review** and **Chapter Test** to review and assess yourself after you have completed a chapter.

Apply what you learned in each chapter to a **Performance Task** and build your confidence for taking standardized tests with each chapter's **Cumulative Assessment**.

For extra practice in any chapter, use your *Online Resources*, *Skills Review Handbook*, or your *Student Journal*.