

Big Ideas Math Overview

Authors

No other authorship team in the industry provides the balance of classroom experience and mathematical expertise that the *Big Ideas Math* program authors bring to the table. Dr. Ron Larson and Dr. Laurie Boswell began writing together in 1992. Since that time, they have authored over three dozen textbooks. In their collaboration, Ron is primarily responsible for the Student Edition while Laurie is primarily responsible for the Teaching Edition.



Ron Larson, Ph.D., is well known as the lead author of a comprehensive program for mathematics that spans middle school, high school, 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 programs and has become a popular national speaker.



A Research Based Program

The *Big Ideas Math* program is a research-based curriculum providing a rigorous, focused, and coherent curriculum for middle school and 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.

- Achieve, ACT, and The College Board
- Adding It Up: Helping Children Learn Mathematics
- National Research Council ©2001
- Common Core State Standards

- National Governors Association Center for Best Practices and the Council of Chief State School Officers ©2010
- Curriculum Focal Points
- National Council of Teachers of Mathematics (NCTM) ©2006
- Principles and Standards for School Mathematics
- National Council of Teachers of Mathematics (NCTM) ©2000
- Project Based Learning
- The Buck Institute
- Rigor / Relevance Framework™
- International Center for Leadership in Education
- Universal Design for Learning Guidelines
- CAST ©2011

A Balanced Approach to Instruction

The *Big Ideas Math* program follows a balanced instructional approach. The program balances conceptual understanding with procedural fluency, as research shows that students benefit from equal exposure to discovery learning and scaffolded instruction.


Each section in the program begins with a discovery *Activity* that encourages conceptual understanding. These provide students with the opportunity to explore, question, explain, and persevere as they seek to answer *Essential Questions* that encourage abstract thought.

Essential Question How do you know which operation to choose when solving a real-life problem?

1 ACTIVITY: Choosing an Operation

Work with a partner. The double bar graph shows the history of a citywide cleanup day.

City Cleanup Day



Year	Trash (pounds)	Recyclables (pounds)
2010	2130	183
2011	3975	555
2012	4970	732
2013	6390	1095

- Copy each question below.
- Underline a key word or phrase that helps you know which operation to use to answer the question. State the operation. Why do you think the key word or phrase indicates the operation you chose?
- Write an expression you can use to answer the question.

1.1 Lesson

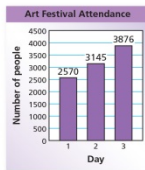


Recall the four basic operations: addition, subtraction, multiplication, and division.

Operation	Words	Algebra
Addition	the <i>sum</i> of	$a + b$
Subtraction	the <i>difference</i> of	$a - b$
Multiplication	the <i>product</i> of	$a \times b$ $a \cdot b$
Division	the <i>quotient</i> of	$a \div b$ $\frac{a}{b}$ $b \overline{)a}$

EXAMPLE 1 Adding and Subtracting Whole Numbers

The bar graph shows the attendance at a three-day art festival.



a. What is the total attendance for the art festival?

You want to find the total attendance for the three days. In this case, the phrase *total attendance* indicates you need to find the sum of the daily attendances.

Line up the numbers by their place values, then add.

There are 9591 people.

$$\begin{array}{r} 111 \\ 2570 \\ 3145 \\ + 3876 \\ \hline 9591 \end{array}$$

b. What is the increase in attendance from Day 1 to Day 2?

You want to find how many more people attended on Day 2 than on Day 1. In this case, the phrase *how many more* indicates you need to find the difference of the attendances on Day 2 and Day 1.

Line up the numbers by their place values, then subtract.

The increase in attendance from Day 1 to Day 2 is 575 people.

$$\begin{array}{r} 10 \\ 3145 \\ - 2570 \\ \hline 575 \end{array}$$

EXAMPLE 2 Multiplying Whole Numbers

A school lunch contains 12 chicken nuggets. Ninety-five students buy the lunch. What is the total number of chicken nuggets served?

You want to find the total number of chicken nuggets in 95 groups of 12 chicken nuggets. The phrase *95 groups of 12* indicates you need to find the product of 95 and 12.

$$\begin{array}{r} 12 \\ \times 95 \\ \hline 60 \\ 1080 \\ \hline 1140 \end{array}$$

Multiply 12 by the ones digit, 5.
Multiply 12 by the tens digit, 9.
Add.

There were 1140 chicken nuggets served.

Study Tip

In Example 2, you can use estimation to check the reasonableness of your answer.
 $12 \times 95 \approx 12 \times 100 = 1200$
Because $1200 \approx 1140$, the answer is reasonable.

Each *Activity* is followed by a scaffolded *Lesson*. These lessons give students the opportunity to develop procedural fluency and to use clear, precise mathematical language. These lessons also give teachers opportunities to use class discussion, flexible grouping, and other delivery methods in their classrooms.

Real-life applications are utilized throughout the program. These applications are opportunities for students to connect classroom lessons to realistic scenarios, and assist teachers with turning mathematical learning into an engaging and meaningful way to see and explore the real world.

EXAMPLE 4 Real-Life Application



A 301-foot-high swing at an amusement park can take 64 people on each ride. A total of 8983 people ride the swing today. All the rides are full except for the last ride. How many rides are given? How many people are on the last ride?

To find the number of rides given, you need to find the number of groups of 64 people in 8983 people. The phrase *groups of 64 people in 8983 people* indicates you need to find the quotient of 8983 and 64.

Divide the place-value positions from left to right.

$$\begin{array}{r} 140 \text{ R}23 \\ 64 \overline{)8983} \\ \underline{- 64} \\ 258 \\ \underline{- 256} \\ 23 \\ \underline{- 0} \\ 23 \end{array}$$

There is one group of 64 in 89.

There are four groups of 64 in 258.

There are no groups of 64 in 23.


The remainder is 23.

The quotient is $140 \frac{23}{64}$. This indicates 140 groups of 64, with 23 remaining.

So, 141 rides are given, with 23 people on the last ride.

Do not stop here. You must write a 0 in the ones place of the quotient.

What You Learned Before



● **Identifying Prime and Composite Numbers**

Example 1 Determine whether 26 is prime or composite.
Because the factors of 26 are 1, 2, 13, and 26, it is composite.

Example 2 Determine whether 37 is prime or composite.
Because the only factors of 37 are 1 and 37, it is prime.

Try It Yourself
Determine whether the number is prime or composite.

1. 5	2. 14	3. 17
4. 23	5. 28	6. 33
7. 43	8. 57	9. 64

● **Adding and Subtracting Mixed Numbers with Like Denominators**

Example 3 Find $2\frac{3}{5} + 4\frac{1}{5}$.

$$2\frac{3}{5} + 4\frac{1}{5} = \frac{2 \cdot 5 + 3}{5} + \frac{4 \cdot 5 + 1}{5}$$

Rewrite the mixed numbers as improper fractions.

$$= \frac{13}{5} + \frac{21}{5}$$

Simplify.

$$= \frac{13 + 21}{5}$$

Add the numerators.

$$= \frac{34}{5}, \text{ or } 6\frac{4}{5}$$

Simplify.

Try It Yourself
Add or subtract.

10. $4\frac{1}{9} + 2\frac{7}{9}$	11. $6\frac{1}{11} + 3\frac{6}{11}$	12. $3\frac{7}{8} + 4\frac{3}{8}$
13. $5\frac{8}{13} - 1\frac{2}{13}$	14. $7\frac{1}{4} - 3\frac{3}{4}$	15. $4\frac{1}{6} - 2\frac{5}{6}$

Chapter openers focused on *What You Learned Before* promote the development of the habits of mind mathematically proficient students demonstrate.

The Mathematical Practices are woven into every chapter, including a full page dedicated to mastering one of the Mathematical Practices. In addition, *On Your Own* problems allow students to practice and sharpen their skills as they work toward mathematical understanding.

● **Now You're Ready**
Exercises 24–26

● **On Your Own**

Find the value of the expression. Use estimation to check your answer.

8. $\frac{6096}{30}$	9. $45,691 \div 28$	10. $3215 \div 430$
11. WHAT IF? In Example 4, 9038 people ride the swing. What is the least number of rides possible?		

Continuous Preparation

- Every chapter of the *Big Ideas Math* program utilizes question types frequently found on standardized tests, including the PARCC and Smarter Balanced assessments. The balanced approach to instruction helps students develop the habits of mind required to be successful on high-stakes assessments.
- The *Exercises* available throughout the *Big Ideas Math* program provide students with opportunities to use multiple approaches to solve problems.
- The *Dynamic Assessment System* allows teachers to assign assessments directly related to the *Big Ideas Math* program to just some students or to an entire classroom.
- The *Activities* that begin every section require students to use higher-level thinking to work through each problem and to explain their reasoning in the solution.
- A *Cumulative Assessment* is included in every chapter. The questions in each assessment were carefully chosen to represent problem types and reasoning patterns frequently found on standardized tests.
- The *Quizzes* and *Tests* allow students to extend concepts learned in each lesson.
- The *Online Self-grading Practice* allows students to receive immediate feedback on their progress.
- The *Performance Tasks* allow students to apply their knowledge of multiple content standards and work through realistic scenarios.
- The *Alternative Assessments* provide teachers with the opportunity to assess students on the same content in a variety of ways.


Personalized Learning with Complete Teacher Support

The *Big Ideas Math* program offers teachers and students a number of tools to personalize and enrich their classroom experience. Teachers can use *Laurie's Notes*, the *Dynamic Classroom*, and the *Answer Presentation Tool* on a daily basis. Students can use the online *Lesson Tutorial Videos* which are valuable for students who miss a class, need a second explanation, or just need some help with a homework assignment. *Big Ideas Math* completely supports the 3-Tier Response to Intervention Model, so the program can be customized for every level of learner.

- **Teaching Edition with Laurie's Notes**
The *Big Ideas Math* Teaching Edition is unique in its organization. Throughout the book, master educator Laurie Boswell shares insights on Learning Progressions and Mathematical Practices.

Laurie includes connections to previous learning, support for the Mathematical Practices, and closure opportunities for the entire Student Edition. The Teaching Edition also provides Differentiated Instruction, Response to Intervention, and English Language Learner support.

Laurie's Notes



Introduction

Applying Mathematical Practices

- **Make Sense of Problems and Construct Viable Arguments:** From the first day, you want to establish a norm in your classroom that each student will discuss mathematical problems with a partner and learn to form arguments based upon stated assumptions, definitions, and previously established results. Students need time to think, discuss, and evaluate their reasoning. Assure students that this will be the case in math this year.

Motivate

- Share some recycling facts with students in the form of, did you know...
 - An average American uses 465 trees worth of paper during his or her lifetime.
 - Each person creates about 4.7 pounds of waste every single day.
 - Paper plus cardboard combined make up 73% of the materials in landfills.
 - Over 25 billion styrofoam cups are thrown away in the United States each year.
 - Approximately 350,000 aluminum cans are made in a minute.
- If there is a recycling program at your school, take time to discuss the importance of the program.

Activity Notes

Activity 1

- As a warm-up, you may want to have students briefly describe the amount of debris collected in the city for the last four years to make sure students understand how to read the double bar graph.
- In this activity, students need to read carefully, looking for words that suggest an operation to be performed.
- **Common Error:** The word "times" does not immediately imply that multiplication is to be done. In part (c), "times" is used, and it is a division problem. You could point out that in part (d), the problem could be rephrased as "two times the amount of trash..." to help students see the difference.
- As you circulate, do an informal assessment of whole number operations. Are there students unsure about the process?
- Ask volunteers to share their work at the board.
- **Extension:** Discuss recycling efforts in your town.


What Your Students Will Learn

- Determine which operation to perform in real-life applications.
- Divide multi-digit numbers fluently.

Previous Learning

Students need to be familiar with basic computation facts involving whole numbers.

Technology for the Teacher

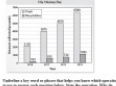


Lesson Plans
Complete Materials List

1.1 Record and Practice Journal

Essential Question: How do you know which operation to choose when solving a problem?

Learning Objectives: Students will be able to...



1. Read the bar graph and answer the questions below. Write your answers in your journal.

2. Write an equation to solve each problem.

3. Write an equation to solve each problem.

4. How much waste was collected in the city last year?
 $2,100 + 400 = 2,500$ pounds
 $17,400$ pounds

5. How much waste was collected in the city last year?
 $1,000 + 1,000 = 2,000$ pounds
 $1,000 + 1,000 = 2,000$ pounds

- **Editable Online Resources**
Complete and editable *Lesson Plans* and *Pacing Guides* are available online for every lesson in the program to provide teachers with planning support.

Grade 6 Chapter Opener for Chapter 1: Numerical Expressions and Factors

Opener Objective: To review previously learned skills necessary for the upcoming chapter. Vocabulary: prime number, composite number, mixed number, improper fraction Pacing: 45 minutes	CC State Standards 4.OA.4, 4.NF.3c
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1. INTRODUCTION (10 minutes)

Cartoons

Group students in pairs or small groups and have them study and discuss the cartoons. Each group should explain what they think the cartoons mean.

2. Part 1 (10 minutes)

Identifying Prime and Composite Numbers

Review the examples with the students. Check for understanding. Have students work through the Try It Yourself exercises.

3. Part 2 (20 minutes)

Adding and Subtracting Mixed Numbers with Like Denominators

Review the examples with the students. Check for understanding. Have students work through the Try It Yourself exercises.

4. ASSESS (5 minutes)

Homework Assignment

- Fair Game Review in the Record and Practice Journal

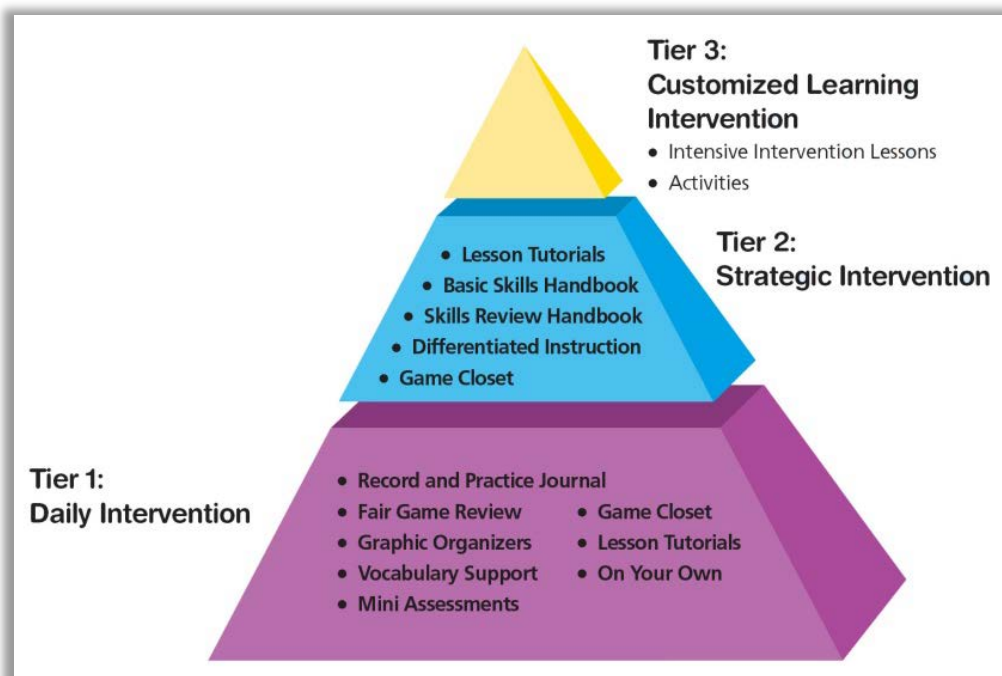
Other Resources

- Record and Practice Journal
- Skills Review Handbook
- Dynamic Classroom
- Lesson Tutorials

Pacing Guide for Chapter 1	
Chapter Opener	1 Day
Section 1	
Activity	1 Day
Lesson	1 Day
Section 2	
Activity	1 Day
Lesson	1 Day
Section 3	
Activity	1 Day
Lesson	1 Day
Study Help / Quiz	1 Day
Section 4	
Activity	1 Day
Lesson	1 Day
Section 5	
Activity	1 Day
Lesson	1 Day
Section 6	
Activity	1 Day
Lesson	1 Day
Extension	1 Day
Chapter Review/ Chapter Tests	2 Days
Total Chapter 1	17 Days
Year-to-Date	18 Days

- **Differentiated Instruction**

Through print and digital resources, the *Big Ideas Math* program completely supports the 3-Tier Response to Intervention model. Using research-based instructional strategies, teachers can reach, challenge, and motivate each student with high-quality instruction targeted to individual needs.



Big Ideas Learning works with educators in every step of the development process. Using mathematical and pedagogical research, the *Big Ideas Math* program focuses on fewer topics at each grade level, providing a narrower and deeper course of study that leads students to mastery of each benchmark as they move from grade to grade. Big Ideas Learning provides students and teachers with all the tools they need to succeed from middle school to high school mathematics.

Ron Larson's textbooks are known for their readability, accuracy, and real-life applications. They are used by over five-million students each year. He has been deeply committed to providing innovative and coherent print and online materials to the education community for nearly 40 years.