

**Teacher's Manual**

# Instruction Coach Mathematics

**Dear Educator,**

*Instruction Coach* has been built to meet the new, higher standards for mathematics and contains the rigor that your students will need. We believe you will find it to be an excellent resource for comprehensive instruction, practice, and assessment.








***The Triumph Learning Team***

**Instruction Coach, Mathematics, First Edition, Grade 3, Teacher's Manual** 523NATE ISBN-13: 978-1-62928-397-5  
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Problem Solving



Fluency Lesson



Performance Task

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# Instructional Overview

Welcome to *Instruction Coach*! This program is based on the philosophy that mathematical skills are built on concepts. Math, more than any other school subject, builds from concept to concept, one on top of another, over several years. When students understand concepts and how they connect to skills, they are better equipped to solve the problems that they encounter in the real world.

## Implementation

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*Instruction Coach* is your instructional anchor. You probably have other instructional materials in your class—they may be books and workbooks, computers, smart boards, pads, math manipulatives, or a basal textbook. You know when and how to apply the appropriate mix of instruction for your students as the content demands. In the end, these are your students, who are in your class and your school. You know your class best. You have the wisdom and knowledge to use *Instruction Coach* in the best way possible for your students.

### Basal Implementation

*Instruction Coach* offers complete instruction for your grade. You can use it as your main instructional vehicle throughout the school year. *Instruction Coach* is a complete package—from instructional lessons to robust lesson practice to chapter reviews and performance tasks.

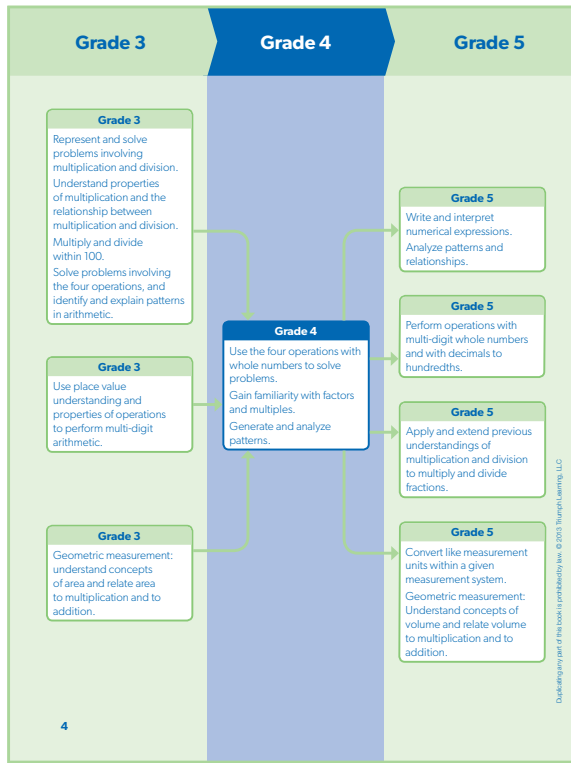
### Supplemental Implementation

If you use a basal textbook, then *Instruction Coach* becomes an excellent partner in helping to strengthen and advance your mathematics instruction. *Instruction Coach* and your basal can work together hand in hand; whether for lesson review, lesson practice, chapter review, or working through a performance task, *Instruction Coach* is ready to help your students.

The flexibility of *Instruction Coach* allows it to fit into many stages of instruction. For example, you may want to use *Instruction Coach* on a twice-weekly basis to add depth, understanding, and practice to the basal experience. Alternatively, you may choose to use *Instruction Coach* at the end of a chapter of instruction if you judge that your students need additional practice in that concept and skill. You can then choose several or all lessons from the chapter to reinforce and review concepts and skills included in that chapter. Or, you may want to assign specific lessons from *Instruction Coach* to groups of students or to individuals.

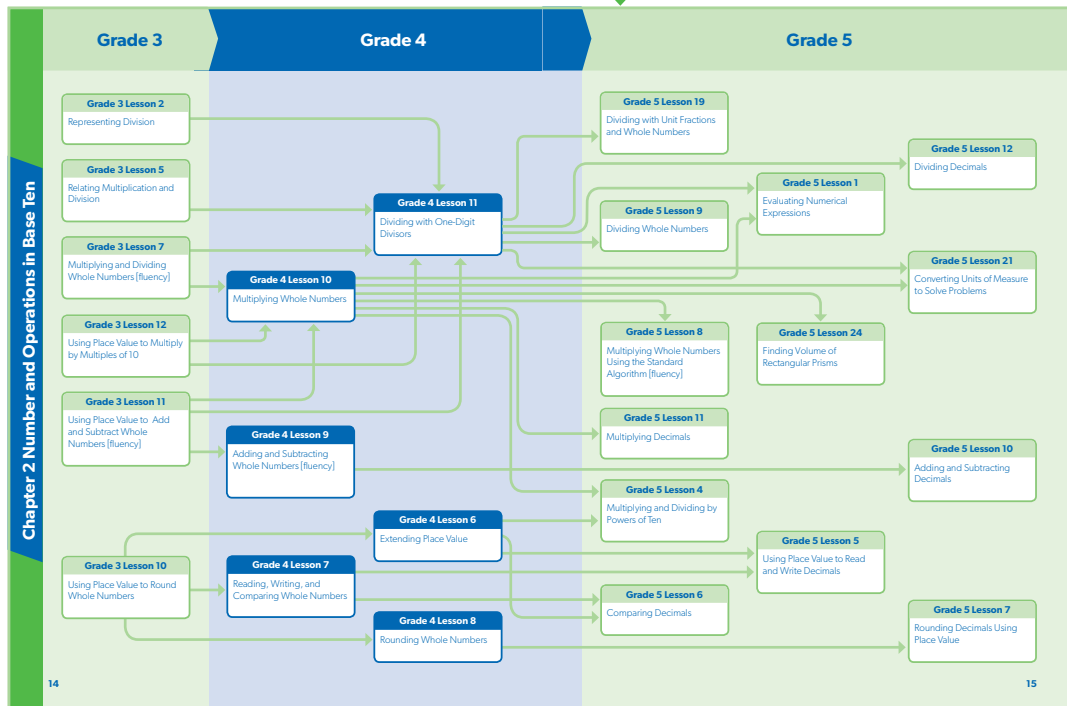
## Progressions

The content covered in this program is organized by chapter. The content across grades 3–5 connects back to math taught earlier in kindergarten and grades 1 and 2. For grades 6–8, although most of the names change, the connections back to earlier grades are strong and dependent. *Instruction Coach* helps you make critical connections between topics within a single grade level and across grade levels.



**Progressions** in the Student Edition give students a clear visual roadmap of how new content builds upon content from previous grade levels and connects to future content.

**Lesson Progressions** in the Teacher’s Manual help you focus on key connections. Each Chapter opens with a Lesson Progression Map that offers a visual progression of lesson content across grades, including both pre- and post-requisite lessons for each chapter. Focusing instruction on these connections will help strengthen the continuum of mathematical concepts and skills.



# Lessons

The lessons flow in a logical fashion, building on prior knowledge from the forerunner chapter or from a chapter whose content links to the chapter at hand. Lessons will often take several days to complete. Use the features—DISCUSS, TRY, CHECK, and MODEL—in the lessons to stimulate discussions, to allow groups of students to interact and answer questions, and to connect with other parts of the math curriculum. The lesson practice allows many options, from work in class to homework.

There are three types of lessons in this program:

**Concept Lessons** begin with an underlying concept that connects directly to the skill or skills taught in that lesson.

**Skill Lessons** start directly with a skill and work through many variants of its application. All skills are developed through Examples.

### LESSON 7 Reading, Writing, and Comparing Whole Numbers

**UNDERSTAND** You use place value to write numbers. A place-value chart separates numbers into periods. Write the number name for 780,412.

- Place 780,412 in a place-value chart.
 

Thousands			Ones		
Hundreds	Tens	Ones	Hundreds	Tens	Ones
7	8	0	4	1	2
- Start with the thousands period.
 

Thousands			Ones		
Hundreds	Tens	Ones	Hundreds	Tens	Ones
7	8	0	4	1	2

Read the digits in the thousands period.  
seven hundred eighty

Say the name of the period.  
seven hundred eighty thousand

Place a comma after the name of the period.  
seven hundred eighty thousand,
- Continue with the ones period.
 

Thousands			Ones		
Hundreds	Tens	Ones	Hundreds	Tens	Ones
7	8	0	4	1	2

Read the digits in the ones period.  
four hundred twelve

Write four hundred twelve after the comma.  
The number name for 780,412 is seven hundred eighty thousand, four hundred twelve.

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**Connect**  
Write the number 780,412 in expanded form.

- Use a place-value chart to find the value of each digit.  
Write 780,412 in a place-value chart.
 

Thousands			Ones		
Hundreds	Tens	Ones	Hundreds	Tens	Ones
7	8	0	4	1	2
- Write the number of units that correspond to each place value.
 

How many hundred thousands? 7  
How many ten thousands? 8  
How many thousands? 0  
How many hundreds? 4  
How many tens? 1  
How many ones? 2
- Write the value of each digit.
 

7 hundred thousands = 700,000  
8 ten thousands = 80,000  
0 thousands = 0  
4 hundreds = 400  
1 ten = 10  
2 ones = 2
- Write all the values you found, separating them with a plus sign.
 

Zeros are not shown in expanded form, so do not write a number for the thousands.  
The expanded form for 780,412 is  $700,000 + 80,000 + 400 + 10 + 2$ .

**DISCUSS** Explain how to find the expanded form of a number.

Lesson 7: Reading, Writing, and Comparing Whole Numbers 47

### LESSON 9 Adding and Subtracting Whole Numbers

**EXAMPLE A** Add.  $35,748 + 17,026$

- Set up the problem vertically. Line up the digits with the same place values.
 
$$\begin{array}{r} 35,748 \\ +17,026 \\ \hline \end{array}$$
- Add the ones. Regroup 14 ones as 1 ten 4 ones.
 
$$\begin{array}{r} 1 \\ 35,748 \\ +17,026 \\ \hline 4 \end{array}$$
- Add the tens.
 
$$\begin{array}{r} 1 \\ 35,748 \\ +17,026 \\ \hline 74 \end{array}$$
- Add the hundreds.
 
$$\begin{array}{r} 1 \\ 35,748 \\ +17,026 \\ \hline 774 \end{array}$$
- Add the thousands. Regroup. Add the ten thousands.
 
$$\begin{array}{r} 1 \quad 1 \\ 35,748 \\ +17,026 \\ \hline 52,774 \end{array}$$

$35,748 + 17,026 = 52,774$

**DISCUSS** Explain why you regrouped the ones and the thousands in this example.

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**EXAMPLE B** Subtract.  $64,783 - 29,525$

- Set up the problem vertically. Line up the digits with the same place values.
 
$$\begin{array}{r} 64,783 \\ -29,525 \\ \hline \end{array}$$
- You cannot subtract 5 ones from 3 ones. Regroup. Then subtract the ones.
 
$$\begin{array}{r} 713 \\ 64,7\cancel{8}3 \\ -29,525 \\ \hline 8 \end{array}$$
- Subtract the tens.
 
$$\begin{array}{r} 713 \\ 64,7\cancel{8}3 \\ -29,525 \\ \hline 58 \end{array}$$
- Subtract the hundreds.
 
$$\begin{array}{r} 713 \\ 64,7\cancel{8}3 \\ -29,525 \\ \hline 258 \end{array}$$
- You cannot subtract 9 thousands from 4 thousands. Regroup. Subtract the thousands. Then, subtract the ten thousands.
 
$$\begin{array}{r} 514 \quad 713 \\ \cancel{6}4,7\cancel{8}3 \\ -29,525 \\ \hline 35,258 \end{array}$$

$64,783 - 29,525 = 35,258$

**CHECK** Use addition to check your answer.
 
$$\begin{array}{r} 35,258 \\ +29,525 \\ \hline \end{array}$$

Lesson 9: Adding and Subtracting Whole Numbers 59

**Interactive Questions** included at the end of most Examples ask students to DISCUSS a topic, MODEL a situation, TRY to solve a problem on their own, or CHECK their work.

**Problem-Solving Lessons** apply skills to real-world problem situations. Students will use a four-step problem-solving process to approach mathematical problems.

**READ** to understand the problem and what is being asked.

**Make a PLAN.** Identify the steps necessary to solve the problem.

**Carry out the steps to SOLVE** the problem.

**CHECK** that the answer is correct.

**LESSON 3 Problem Solving: Multi-Step Problems**

**The Music Store**

**READ**  
A music store has 438 rock CDs and 82 country CDs for sale. Last week, the store sold 106 CDs. How many CDs are left in the store?

**PLAN**  
Step 1: Write an equation to represent the number of CDs in all.  
Let  $x$  = the total number of CDs  
 $438 + 82 = x$   
Step 2: Use the answer from Step 1 to write the equation to represent the number of CDs that are left in the store.  
Let  $y$  = the number of CDs left  
 $(\text{total number of CDs}) - 106 = y$

**SOLVE**  
Step 1: **Add.**  
$$\begin{array}{r} 438 \\ + 82 \\ \hline \end{array}$$
  
← addend  
← addend  
← sum  
Step 2: **Subtract.**  
$$\begin{array}{r} 520 \\ - 106 \\ \hline \end{array}$$
  
← minuend  
← subtrahend  
← difference

**CHECK**  
You can check the answer to a subtraction problem using addition.  
$$\begin{array}{r} 414 \\ + 106 \\ \hline \end{array}$$
  
The sum matches the minuend, so the answer is correct.  
The difference,  $y$ , is \_\_\_\_\_.  
→ There are \_\_\_\_\_ CDs left in the store.

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**Additional Features**

**Practice**

For questions 1–3, will the first digit of the quotient be in the hundreds place, tens place, or ones place?

1.  $2\overline{)428}$       2.  $5\overline{)275}$       3.  $3\overline{)285}$

**Complete each sentence.**  
13.  $124 \times 8 = 992$  is the opposite  
14.  $418 \times 2 = 836$  is the opposite

**Use the diagram to complete the**  
15.  $60 \div \square = \square$

**Choose the best answer.**  
17. Which is the same as  $218 \div 5 = 43 \text{ R}3$ ?  
A.  $43 \times 3 + 5 = 218$   
B.  $43 \times 5 + 3 = 218$   
C.  $43 \times 5 = 218$   
D.  $43 \times 3 = 218$

**Solve.**  
19. There are 1,536 dancers at an audition. The dancers will be divided into groups of 6 in the first round. How many groups of dancers will there be?  
21. **CREATE** Write a real-world problem using  $144 \div 4 = \square$ .

**Fill in the numbers in the boxes to complete the division.**  
4. 
$$\begin{array}{r} \square \square \square \\ 4 \overline{) 1620} \\ - 4 \phantom{0} \\ \hline \square 2 \\ - 20 \\ \hline \square 0 \\ - \phantom{0} \\ \hline \square 0 \end{array}$$
  
5. 
$$\begin{array}{r} \square \square \square \\ 6 \overline{) 7242} \\ - \phantom{0} \\ \hline \square 2 \\ - \phantom{0} \\ \hline \square 42 \\ - \phantom{0} \\ \hline \square 0 \end{array}$$
  
6. 
$$\begin{array}{r} \square \square \square \text{ R} \square \\ 7 \overline{) 3278} \\ - \phantom{0} \\ \hline \square \square \square \\ - \phantom{0} \\ \hline \square \square \square \\ - \phantom{0} \\ \hline \square \square \square \\ - \phantom{0} \\ \hline \square \square \square \end{array}$$

**REMEMBER** Divide, multiply, and subtract in each step.

**Divide. Check your answers.**  
7.  $3\overline{)738}$       8.  $8\overline{)992}$       9.  $5\overline{)895}$   
10.  $3\overline{)273}$       11.  $5\overline{)854}$       12.  $4\overline{)202}$

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Lesson 11: Dividing with One-Digit Divisors 79

**Practice** appears in each lesson. Each lesson concludes with two pages of practice. The practice items build in difficulty and offer a variety of question types. **Hint** and **Remember** features are included when appropriate.

**Chapter Reviews** consist of three pages of questions that cover all concepts and skills taught in the chapter. Chapter reviews include multiple-choice questions, short-response questions, and extended-response questions. These reviews serve as excellent practice tests for the chapter assessments.

**APPLES, ORANGES, AND MELONS**

Debbie bought some apples, some oranges, and some melons. She put all of the apples in one bag, all of the oranges in another bag, and all of the melons in a third bag. The weights of all three bags are the same.

Each apple weighs 4 ounces.  
Each orange weighs 3 more ounces than an apple.  
Each melon weighs twice as much as an orange.

How many apples, oranges, and melons did Debbie buy?  
How much does each filled bag weigh?

\_\_\_\_\_ apples    \_\_\_\_\_ oranges    \_\_\_\_\_ melons  
\_\_\_\_\_ ounces    \_\_\_\_\_ ounces    \_\_\_\_\_ ounces

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**Fluency Practice** appears at the end of the Teacher's Manual. Each Teacher's Manual of *Instruction Coach* includes practice pages specifically designed to align to fluencies. Instructions on when and how to administer the fluency practice pages are included in the lesson plans within this manual. See Appendix A.

**Chapter 1 Review**

Use the arrays to write the factor pairs.

1. 15  

 \_\_\_\_\_

2. 19  

 \_\_\_\_\_

3. 6  

 \_\_\_\_\_

Fill in the missing numbers in each pattern.

4. The rule is  $-10$ .  
 100, \_\_\_\_\_

5. The rule is  $+5$ .  
 1, \_\_\_\_\_

6. The rule is  $+2$ .  
 202, \_\_\_\_\_

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**Performance Tasks** appear at the end of each Chapter. They complement instruction with non-routine application of chapter skills. Performance tasks require students to perform a range of activities, from drawing and building to writing; in a few cases, a task may even take students several days to complete and often asks students to work together to arrive at solutions.

Name \_\_\_\_\_ Date \_\_\_\_\_

**Multiplication: Factors to 9**

1. $\begin{array}{r} 2 \\ \times 7 \\ \hline \end{array}$	2. $\begin{array}{r} 9 \\ \times 6 \\ \hline \end{array}$	3. $\begin{array}{r} 8 \\ \times 1 \\ \hline \end{array}$	4. $\begin{array}{r} 6 \\ \times 5 \\ \hline \end{array}$	5. $\begin{array}{r} 5 \\ \times 5 \\ \hline \end{array}$	6. $\begin{array}{r} 4 \\ \times 6 \\ \hline \end{array}$
7. $\begin{array}{r} 5 \\ \times 8 \\ \hline \end{array}$	8. $\begin{array}{r} 7 \\ \times 4 \\ \hline \end{array}$	9. $\begin{array}{r} 9 \\ \times 3 \\ \hline \end{array}$	10. $\begin{array}{r} 8 \\ \times 8 \\ \hline \end{array}$	11. $\begin{array}{r} 7 \\ \times 6 \\ \hline \end{array}$	12. $\begin{array}{r} 6 \\ \times 8 \\ \hline \end{array}$
13. $\begin{array}{r} 5 \\ \times 4 \\ \hline \end{array}$	14. $\begin{array}{r} 4 \\ \times 9 \\ \hline \end{array}$	15. $\begin{array}{r} 9 \\ \times 9 \\ \hline \end{array}$	16. $\begin{array}{r} 6 \\ \times 3 \\ \hline \end{array}$	17. $\begin{array}{r} 2 \\ \times 9 \\ \hline \end{array}$	18. $\begin{array}{r} 0 \\ \times 9 \\ \hline \end{array}$
19. $\begin{array}{r} 8 \\ \times 4 \\ \hline \end{array}$	20. $\begin{array}{r} 1 \\ \times 7 \\ \hline \end{array}$	21. $\begin{array}{r} 9 \\ \times 5 \\ \hline \end{array}$	22. $\begin{array}{r} 7 \\ \times 3 \\ \hline \end{array}$	23. $\begin{array}{r} 7 \\ \times 9 \\ \hline \end{array}$	24. $\begin{array}{r} 3 \\ \times 3 \\ \hline \end{array}$

25.  $9 \times 8 = \underline{\quad}$     26.  $8 \times 7 = \underline{\quad}$     27.  $6 \times 6 = \underline{\quad}$

28.  $5 \times 7 = \underline{\quad}$     29.  $0 \times 6 = \underline{\quad}$     30.  $9 \times 1 = \underline{\quad}$

31.  $3 \times 8 = \underline{\quad}$     32.  $9 \times 9 = \underline{\quad}$     33.  $7 \times 7 = \underline{\quad}$

34.  $8 \times 5 = \underline{\quad}$     35.  $1 \times 6 = \underline{\quad}$     36.  $4 \times 7 = \underline{\quad}$

37.  $9 \times 7 = \underline{\quad}$     38.  $8 \times 6 = \underline{\quad}$     39.  $4 \times 4 = \underline{\quad}$

A4

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The *Instruction Coach* Student Edition also includes a glossary and a selection of content-specific math tools.

### Glossary

**acute angle** an angle that has a measure of less than  $90^\circ$  Lesson 32

**acute triangle** a triangle with three acute angles Lesson 33

**add (addition)** to find the total when two or more groups are joined Lesson 3

**addend** a number to be added Lesson 3

**angle** a figure that is formed when two rays meet at one point called a vertex Lessons 29, 32

**area** the number of squares having a side length of 1 unit that can completely cover the inside of a plane figure with no gaps or overlaps Lesson 27

**array** an arrangement of objects in equal rows and columns Lesson 4

**centimeter (cm)** a metric unit for measuring length; 100 centimeters = 1 meter Lesson 24

**circle** a two-dimensional shape with a curved side containing  $360$  one-degree angles Lesson 29

**circle graph** a graph that uses a circle divided into pie-shaped sections to show parts of a whole Lesson 29

**composite number** a whole number that has more than one factor pair Lesson 4

**cup (c)** a customary unit for measuring capacity; 2 cups = 1 pint Lesson 23

**customary system of measurement** the system of units of measure used in the United States Lesson 23

**decimal** a number with one or more digits to the right of the decimal point Lesson 21

**decimal point** a period separating the ones from the tenths in a decimal Lesson 21

**degree ( $^\circ$ )** a unit for measuring angles Lesson 29

**denominator** the bottom number in a fraction, which tells how many equal parts in the whole or group Lesson 12

**difference** the answer in a subtraction problem Lesson 3

**digit** any of the numerals 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9 Lesson 6

**dividend** the number to be divided Lesson 2

**division (divide)** to find the number of equal groups or the number in each group Lesson 2

**divisor** the number by which the dividend is divided Lesson 2

**endpoint** either of two points meeting the end of a line segment Lesson 29

**equation** a number sentence with an equal sign Lesson 1

**equivalent fractions** two or more fractions that name the same value but have different numerators and denominators Lesson 12

**even number** a number that is divisible by 2. Even numbers have 0, 2, 4, 6, or 8 in the ones place. Lesson 5

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### Math Tool: Labeled Fraction Strips

1

$\frac{1}{2}$     $\frac{1}{2}$

$\frac{1}{3}$     $\frac{1}{3}$     $\frac{1}{3}$

$\frac{1}{4}$     $\frac{1}{4}$     $\frac{1}{4}$     $\frac{1}{4}$

$\frac{1}{5}$     $\frac{1}{5}$     $\frac{1}{5}$     $\frac{1}{5}$     $\frac{1}{5}$

$\frac{1}{6}$     $\frac{1}{6}$     $\frac{1}{6}$     $\frac{1}{6}$     $\frac{1}{6}$     $\frac{1}{6}$

$\frac{1}{8}$     $\frac{1}{8}$     $\frac{1}{8}$     $\frac{1}{8}$     $\frac{1}{8}$     $\frac{1}{8}$     $\frac{1}{8}$     $\frac{1}{8}$

$\frac{1}{10}$     $\frac{1}{10}$     $\frac{1}{10}$     $\frac{1}{10}$     $\frac{1}{10}$     $\frac{1}{10}$     $\frac{1}{10}$     $\frac{1}{10}$     $\frac{1}{10}$     $\frac{1}{10}$

$\frac{1}{12}$     $\frac{1}{12}$     $\frac{1}{12}$     $\frac{1}{12}$     $\frac{1}{12}$     $\frac{1}{12}$     $\frac{1}{12}$     $\frac{1}{12}$     $\frac{1}{12}$     $\frac{1}{12}$     $\frac{1}{12}$     $\frac{1}{12}$

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When students encounter a highlighted term in their book, they will find this term defined in the glossary. When math tools are necessary for a given lesson, you will find this reference in the Materials section of your lesson plan—occasionally, these tools are referenced in the lesson itself.

## Assessments

A combination of great teaching, strong instructional content, and computer activities provides an excellent environment in which your students can achieve success. The assessments that accompany *Instruction Coach* will provide you with data to determine the depth of student understanding. Items on these assessments have been specifically crafted to assess content and skills. Given this information, you can decide how to use *Instruction Coach* with any number of additional resources to teach all your students in the best possible way.

The *Instruction Coach Assessments* include six comprehensive assessments. Additionally, each item in these assessments has been designed at a specific Webb’s Depth of Knowledge Level. The items always range from level 1 through level 3. These assessments are available in a separate booklet and in a digital format. Two types of assessments are included in the program:

### Chapter Assessments

There are five Chapter Assessments, one for each Chapter. Each assessment consists of 20, 25, or 30 items. Students are given the opportunity to demonstrate mathematical proficiency in five open-ended items included at the end of each assessment. Rubrics and sample student work that assist in evaluating student work are also provided in a separate answer key.

### Summative Assessment

At the end of the course, you can administer the summative assessment, designed to assess students’ understanding of the mathematical concepts at their grade level. It includes 50 multiple-choice items that range in difficulty.

# Teacher's Manual

## Lesson Plans

Two pages with guidance are provided for each student lesson.

Clear Learning Objectives for every lesson

Math Vocabulary with definitions

Pre-lesson activities introduce new concepts and skills or focus on prerequisite skills

Full support in working through instruction

### LESSON 4 Understanding Factors and Multiples

**Learning Objectives**

- Students will understand how to find all factor pairs of a given number.
- Students will list multiples of a given number and determine if a given number is prime or composite.

**Vocabulary**

<b>array</b>	an arrangement of objects in equal rows and columns
<b>composite number</b>	a whole number that has more than one factor pair
<b>factor</b>	a number that is multiplied to get a product
<b>multiple</b>	the product of a number and another number
<b>prime number</b>	a whole number that has exactly one factor pair, 1 and itself

**Materials**

- Math Tool: Multiplication Table
- Fluency Practice, page A2

**Before the Lesson**

Distribute copies of *Math Tool: Multiplication Table* or have the students use the Multiplication Table on page 241 in their books. Discuss the relationship between factor pairs and basic multiplication facts. Ask: *What are all of the multiplication facts that have a product of 18?*

**⚡** You might want to use Fluency Practice page A2 to help students review multiplication facts.

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**Understand ↔ Connect**

This page introduces the term *factor*. Visual representations of factor pairs can provide insight for students when finding all of the factor pairs of a given number. Area models are particularly useful because they show the shape for each factor pair. To help develop conceptual understanding, begin by noting that the first area model is in the shape of a rectangle with 1 row, and that there are 24 squares in that row. Then note that the second model is also in the shape of a rectangle, but has 2 rows with 12 squares in each row. Emphasize that this rectangle also has a total of 24 squares but it is shorter than the rectangle with 1 row because the 24 squares are broken equally into 2 rows. Point out that the third area model shows a rectangle made of 3 rows with 8 squares in each row, and that this rectangle is shorter and wider than the first two rectangles. When discussing the last area model, explain that this rectangle is the shortest and widest because the 24 squares are divided equally into 4 rows, so there are fewer squares in each row. Emphasize that each model shows 24 squares, but they are arranged differently each time.

To connect the concept to the procedural understanding, explain the steps for finding all of the factor pairs of a given number by using a multiplication table. Explain that this is another way to find factor pairs without the use of models. Emphasize that students can list all the basic

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## Answers to Interactive Questions

multiplication facts with a product of 24 to help them find the factor pairs. Point out that the multiplication table only shows factors up to 12, so that they cannot find the factor pair of  $1 \times 24$  on the table.

**DISCUSS** Discuss with students how to use a multiplication table to find the factor pairs of 12. Encourage students to use the terms *factor* and

*product* in their explanations. Ask: *How can you use a visual representation to help you determine if there are other factor pairs of 12 besides those you found using the multiplication table?*

Answers may vary. Possible answer: Find all the 12s in the table. Use the table to write the factor pairs: 1 and 12, 2 and 6, 3 and 4. The factors of 12 are 1, 2, 3, 4, 6, and 12.

## Examples

**EXAMPLE A** This example introduces the term *multiple*. Emphasize that to determine the multiples of 5, students can use basic multiplication facts that have 5 as one factor and the whole numbers in order (1, 2, 3, 4, and so on) as the second factor.

**DISCUSS** Discuss with students how to determine if one number is a multiple of another. Ask: *How can you use a multiplication table to help you determine whether 30 is a multiple of 5?*

Yes; 30 is a multiple of 5 since  $5 \times 6 = 30$ .

**EXAMPLE B** This example shows a given number (42) that is not a multiple of another given number (8). Ask: *How can you use division to determine if 42 is a multiple of 8?*

**EXAMPLE C** This example shows a given number (45) that is a multiple of another given number (9). Ask: *How do you know that 45 is a multiple of 9?*

**TRY** Discuss with students the process they can use to determine if 33 is a multiple of 4.

No. The multiples of 4 are: 4, 8, 12, 16, 20, 24, 28, 32, 36, and so on. 33 is not a multiple of 4.

**EXAMPLE D** This example introduces the terms *array*, *prime number*, and *composite number*. Point out that an array is different from an area model in that an array is made of a set of objects

**MODEL** Explain that the number of models that students can draw for the factor pairs of a given number determines whether the number is prime or composite. If just one model can be drawn, then the number must be a prime number.

Students draw a 1 by 7 array. 7 is a prime number.

## The Sieve of Eratosthenes

Have students complete the chart. Stress that students should cross off the multiples in order and work through to the end of the hundreds chart for each multiple. You may wish to provide calculators for this activity.

For answers, see page 81.

## Practice

As students are working, pay special attention to problems 14 and 15, which provide an opportunity for students to apply their understanding of factors to a real-world situation.

For answers, see page 81.

## Common Errors

When writing the factors for a number, students may forget to include 1. Remind them that the first two factors they should list for any number are the number itself and 1, and that all of the other factors will be between these two numbers.

Students may identify a composite number as a prime number. When students make this error, attempt to correct the misconception by demonstrating how to check a number in a systematic way. Ask: *Is there an expression that has 2 as a factor and this number as a product? Is there an expression that has 3 as a factor and this number as a product?* and so on.

Common Errors section anticipates likely student errors and suggests ways to help

# LESSON 1

## Representing Multiplication

### Learning Objectives

- Students will use visual representations of equal groups to show multiplication.
- Students will use skip counting and repeated addition to show multiplication.

### Vocabulary

**factor** a number being multiplied in a multiplication problem

**multiplication (multiply)** an operation that joins equal groups

**product** the answer in a multiplication problem

### Materials

- counters
- Fluency Practice, page A1
- Fluency Practice, page A10

### Before the Lesson

Provide students with an opportunity to explore the meaning of multiplication. Distribute counters to each student. Have them make 4 groups of counters with 3 counters in each group. Ask: *How can we find the total number of counters?* Students might suggest that they can count them or use repeated addition to find the total. Let students know that there is another way to find a total of equal groups, and that they will learn about it in this lesson.

### Fluency

You might want to use Fluency Practice page A1 to help students review Addition: Sums to 20.

### Understand Connect

This page introduces the term *multiplication*. Using visual representations (objects or pictures) will help students when they explore multiplication. Having students group objects into equal groups or draw circles around equal groups of pictures will help them to visualize the concept that multiplication is simply adding the same number of things multiple times.

To help develop conceptual understanding, begin by noting that the first model shows 3 groups, representing the first number in the multiplication expression  $3 \times 5$ . The second model shows 5 squares inside each oval, representing the second number in the multiplication expression. Once each group is drawn, use repeated addition to find the total. Add the number of squares in each group. The sum is the total number of squares in 3 groups of 5 squares.

To connect the concept to procedural understanding, explain the steps for finding the product of  $3 \times 5$ . This page introduces the terms *factor* and *product*. Explain that skip counting by 5 three times is another way to find the product. This will illustrate the connection of addition to multiplication by showing that  $5 + 5 + 5$  is the same as  $3 \times 5$ .

**TRY** Remind students to think of the multiplication problem as 3 groups of 4. Then students should skip count by 4 three times to find the product of  $3 \times 4$ .

Answers may vary. Possible answer: Skip count by 4 three times: 4, 8, 12.  $3 \times 4 = 12$

## Example

This example presents students with equal groups of bears and asks them to find the total number. Note that the total number of bears can be found by adding, and since each group has the same number of bears, the total can also be found by multiplying. Identify both factors, and use repeated addition to find the total of 6 groups of 4. Then multiply to find  $6 \times 4$ . Emphasize that the total is the same whether it is found by using addition or multiplication.

**DISCUSS** Discuss with students how they can create equal groups by using the factors, 5 and 2.

Answers may vary. Possible answer: I can make 5 equal groups with 2 in each group to make 10 in all.

## Multiplication Models

Working independently or in pairs, have students draw equal groups of objects inside each shape to represent the multiplication problem. Remind students that the first factor represents the number of groups and the second factor represents the number of objects in each group.

For answers, see page 68.

## Practice

As students are working, pay special attention to problems 9 and 10, which provide an opportunity for students to apply their understanding of multiplication by either breaking down a problem into its pieces (factors and product) or providing a visual to illustrate the problem.

For answers, see page 68.

## Fluency

Have students complete Fluency Practice page A10 to provide practice with Multiplication: Factors to 6.

## Common Errors

When creating groups, students may make unequal groups or use the same factor for both the number of groups and the number in each group. Remind students that groups must all have the same number of objects, and that the first factor represents the number of groups while the second factor represents the number in each group.