Teacher's Manual

Support Coach™

5 TARGET Foundational Mathematics

Dear Educator,

We are pleased to provide for you the new edition of *Support Coach*. This program 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 targeted instruction, practice, and assessment.

The Triumph Learning Team

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Support Coach, Target: Foundational Mathematics, First Edition, Teacher's Manual, Grade 5
547NATE ISBN-13: 978-1-62928-527-6

Triumph Learning® 136 Madison Avenue, 7th Floor, New York, NY 10016

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Printed in the United States of America. 10 9 8 7 6 5 4 3 2 1

Contents

Student Edition Contents vi
Instructional Overview viii
Student Edition Overview viii
Teacher's Manual: An Annotated Guide xi

Lesson 1 **Analyzing Numerical Patterns** 2
- Number and Shape Patterns
- Understanding Ordered Pairs
- Analyzing Numerical Patterns

Lesson 2 **Powers of Ten** 10
- Understanding Place Value
- Multiplying One-Digit Whole Numbers by Multiples of 10
- Powers of Ten

Lesson 3 **Reading and Writing Decimals** 18
- Reading and Writing Whole Numbers
- Place Value
- Reading and Writing Decimals

Lesson 4 **Comparing Decimals** 26
- Comparing Whole Numbers
- Writing Decimals
- Comparing Decimals

Lesson 5 **Multiplying Whole Numbers** 34
- Multiplying by Multiples of 10
- Multiplying by 1- and 2-Digit Factors
- Multiplying Whole Numbers

Lesson 6 **Dividing Whole Numbers** 42
- Dividing by One-Digit Divisors
- Multiplying Whole Numbers
- Dividing Whole Numbers

Lesson 7 **Dividing Decimals** 50
- Adding and Subtracting Decimals
- Multiplying Decimals
- Dividing Decimals

Lesson 8 **Adding and Subtracting Fractions with Unlike Denominators** 58
- Adding and Subtracting Mixed Numbers
- Understanding Equivalent Fractions
- Adding and Subtracting Fractions with Unlike Denominators

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M_547NA_TM_5.indd 3 8/12/14 9:06 AM

Lesson 9 **Fractions as Division** 66
- Dividing by One-Digit Divisors
- Multiplying Fractions by Whole Numbers
- Fractions as Division

Lesson 10 **Multiplying Fractions** 74
- Understanding Fractions as Multiples
- Multiplying a Fraction by a Whole Number
- Multiplying Fractions

Lesson 11 **Areas of Rectangles** 82
- Using the Formula for Area of a Rectangle
- Multiplying Fractions
- Areas of Rectangles

Lesson 12 **Interpreting Multiplication of Fractions** 90
- Multiplying Fractions
- Comparing Products of Fractions
- Interpreting Multiplication of Fractions

Lesson 13 **Multiplying Fractions and Mixed Numbers** 98
- Improper Fractions and Mixed Numbers
- Multiplying Mixed Numbers
- Multiplying Fractions and Mixed Numbers

Lesson 14 **Dividing Unit Fractions and Whole Numbers** 106
- Multiplying Fractions
- Fractions as Division
- Dividing Unit Fractions and Whole Numbers

Lesson 15 **Converting Measurements** 114
- Units of Measurement
- Multiplying and Dividing Whole Numbers
- Converting Measurements

Lesson 16 **Line Plots** 122
- Creating Line Plots
- Operations with Fractions
- Line Plots

Lesson 17 **Measuring Volume of Rectangular Prisms** 130
- Understanding Cubic Units
- Understanding Volume
- Measuring Volume of Rectangular Prisms

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M_547NA_TM_5.indd 4 8/12/14 9:06 AM

Lesson 18 **Formulas for Volume of Rectangular Prisms** 138
- Using the Formula for Area of a Rectangle
- Measuring Volume of Rectangular Prisms
- Formulas for Volume of Rectangular Prisms

Lesson 19 **Solving Real-World Problems on Coordinate Planes** 146
- Number Lines
- Graphing Ordered Pairs
- Solving Real-World Problems on Coordinate Planes

Lesson 20 **Classifying Two-Dimensional Figures** 154
- Points, Lines, Rays, and Angles
- Two-Dimensional Figures
- Classifying Two-Dimensional Figures

White Paper: Instructional Strategies that Build Mathematical Proficiency 163

Appendix: Math Tools . . . . . A

Appendix: Correlations Charts . . . . . B

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M_547NA_TM_5.indd 5 8/12/14 9:06 AM

Student Edition Contents

Contents

Lesson 1	Analyzing Numerical Patterns	4
Lesson 2	Powers of Ten	14
Lesson 3	Reading and Writing Decimals	24
Lesson 4	Comparing Decimals	34
Lesson 5	Multiplying Whole Numbers	44
Lesson 6	Dividing Whole Numbers	54
Lesson 7	Dividing Decimals	64
Lesson 8	Adding and Subtracting Fractions with Unlike Denominators	74
Lesson 9	Fractions as Division	84
Lesson 10	Multiplying Fractions	94
Lesson 11	Areas of Rectangles	104
Lesson 12	Interpreting Multiplication of Fractions	114

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M_547NA_TM_5.indd 6 8/7/14 3:38 PM

Lesson 13 Multiplying Fractions and Mixed Numbers 124

Lesson 14 Dividing Unit Fractions and Whole Numbers. 134

Lesson 15 Converting Measurements 144

Lesson 16 Line Plots 154

Lesson 17 Measuring Volume of Rectangular Prisms 164

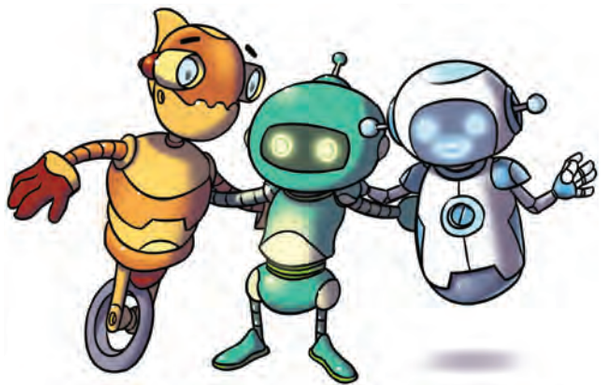
Lesson 18 Formulas for Volume of Rectangular Prisms. . . . 174

Lesson 19 Solving Real-World Problems on Coordinate Planes 184

Lesson 20 Classifying Two-Dimensional Figures. 194

Glossary 204

Math Tools 211



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Instructional Overview

This mathematics skills and concepts program provides scaffolded instruction and support for students struggling with grade-level content. Aimed at students requiring strategic intervention—specifically, those students missing a critical foundation for grade-level understandings—*Support Coach* reflects a careful analysis of the prerequisites of key grade-level standards. This means that students will be able to rehearse and review prior skills that will ensure competency at a specific grade.

The program consists of three components:

- Student Edition Worktext
- Comprehensive Teacher's Manual with reduced, annotated Student Edition pages
- Assessment Booklet containing lesson quizzes, two performance tasks for each of the five domains, and two practice tests

Student Edition Overview

The Student Edition features 20 key lessons. While each lesson connects to prior foundational skills and concepts, it can be viewed as an independent unit of instruction. In this way, the 20 lessons allow teachers to differentiate instructions according to the requirements of each student.

Key to the philosophy behind *Support Coach* is the recognition that math skills and concepts are part of a progression that begins early in students' lives and continues beyond their current grade level with increased complexity and depth.

For students, achieving true understanding at any grade level means mastery of prior content that connects to this grade and mastery of content that connects within the grade. Often, students who cannot cope with a specific part of their grade's curriculum are missing one or more understandings that would allow mastery. *Support Coach* supplies the missing pieces.

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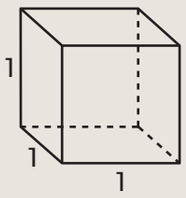
Lesson Structure

Each lesson is divided into three parts: **Plug In**, **Power Up**, and **Ready to Go**. The first two parts provide students with a review and practice of the prerequisite content necessary for success. The Plug In component reacquaints students with skills and concepts that are foundational to performing at grade level. Power Up picks up from Plug In to add another layer of prerequisite content that ensures a smooth transition to Ready to Go. This section affords an opportunity for instruction. Each part highlights key vocabulary and supplies sufficient practice to ensure mastery before moving forward. Ready to Go, the on-grade-level portion of the lesson, ends with an important emphasis on problem solving.

PLUG IN	POWER UP	GO!
Foundational skill remediating specific content	Transitional skill connects Foundational skill to Target skill	Target skill on grade level

A Lesson Link is included to show both teachers and students how these skills connect!

LESSON LINK

PLUG IN	POWER UP	GO!
Unit cubes have one cubic unit of volume. 	**Volume is the number of unit cubes that fit inside a solid.**	*I understand! I can find the volume of a rectangular prism with side lengths that are measured in any unit used to measure length!*

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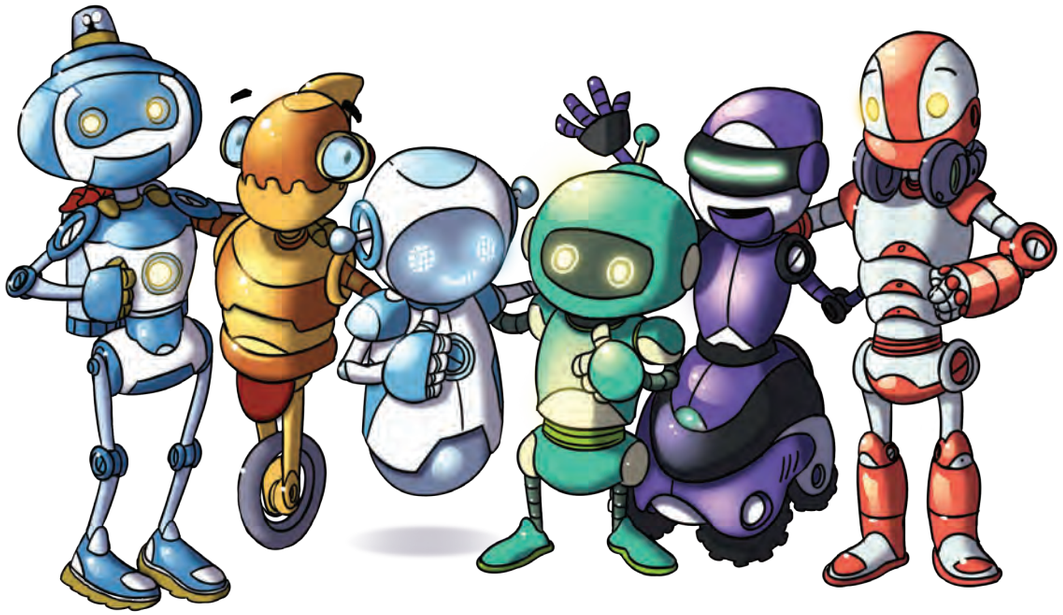
Using Support in the Classroom

The broad outline of *Support Coach*'s features suggests that the best way to use it in your classroom is to take advantage of its versatility. This means that even as *Support Coach* aims to help bring students to grade-level competency, there are many ways to implement it:

- *Support Coach* can be used with any other set of materials you are using for Mathematics.
- The lessons do not have to be taught in a particular sequence.
- You can use *Support Coach* with one or many students at any given time.
- *Support Coach* can be used in the classroom, at home, in after-school programs, and in summer programs.
- You can use several levels of *Support Coach* at any grade to assist students who have missed earlier skills.

The most important aspect of *Support Coach* is that it digs to uncover elements that are missing from the hierarchy of math skills and concepts and assists students who have forgotten or never mastered these elements. This applies to any student who struggles when encountering new content.



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Teacher's Manual: An Annotated Guide

Support Coach Teacher's Manual provides all the instructional support you need to help your students achieve mastery of key skills.

Lessons in this Teacher's Manual include the following features:

- A **Lesson Overview** chart detailing objectives for each section, concepts and skills, and key vocabulary terms
- A list of required and suggested **Materials**
- **Spotlight on Mathematical Practice** notes that support teachers at point-of-use to develop strong mathematical behaviors in their students
- **Spotlight on Mathematical Language** provides a series of prompts using appropriate mathematical language and terms that are designed to elicit similar mathematical language from students
- **English Language Learner** notes included at point-of-use to prepare teachers for the diverse needs of the student population
- **Common Error** notes that provide insight into student misconceptions at point-of-use
- Robust **Discussion Support** that includes Prompts and Sentence Starters to facilitate mathematical discourse
- **Observation-Action tables** that outline how teachers can address specific student needs during independent practice
- A **Lesson Link** that outlines how each section of the lesson connects and works to bring the student to the on-level standard

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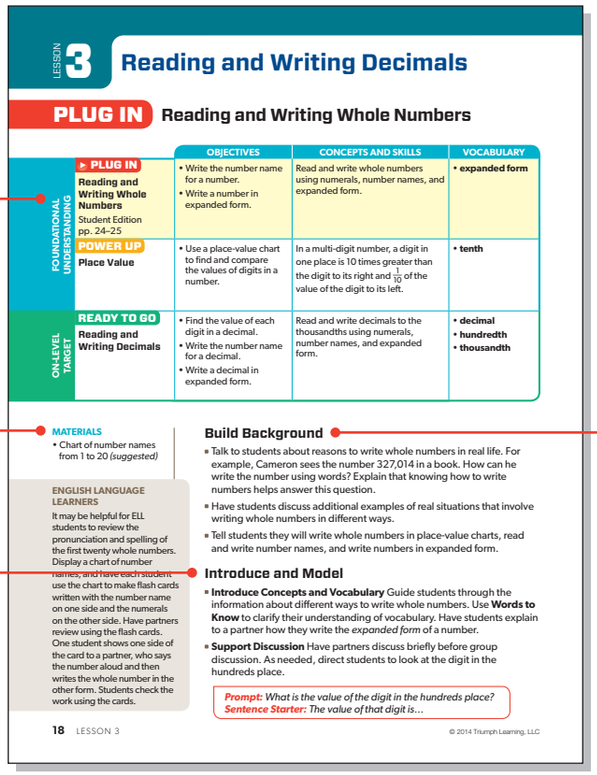
▶ Plug In Pages

The **Lesson Overview** chart saves preparation time.

A breakdown of the lesson's components helps you plan.

The **Materials** list details the required and suggested tools for each section.

Introduce and Model outlines how to introduce a topic and model thinking and problem solving.



LESSON 3

Reading and Writing Decimals

PLUG IN Reading and Writing Whole Numbers

		OBJECTIVES	CONCEPTS AND SKILLS	VOCABULARY
FOUNDATIONAL UNDERSTANDING	▶ PLUG IN **Reading and Writing Whole Numbers** Student Edition pp. 24–25	• Write the number name for a number. • Write a number in expanded form.	Read and write whole numbers using numerals, number names, and expanded form.	• **expanded form**
	POWER UP **Place Value**	• Use a place-value chart to find and compare the values of digits in a number.	In a multi-digit number, a digit in one place is 10 times greater than the digit to its right and $\frac{1}{10}$ of the value of the digit to its left.	• **tenth**
ON-LEVEL TARGET	**READY TO GO** **Reading and Writing Decimals**	• Find the value of each digit in a decimal. • Write the number name for a decimal. • Write a decimal in expanded form.	Read and write decimals to the thousandths using numerals, number names, and expanded form.	• **decimal** • **hundredth** • **thousandth**

MATERIALS
- Chart of number names from 1 to 20 *(suggested)*

ENGLISH LANGUAGE LEARNERS
It may be helpful for ELL students to review the pronunciation and spelling of the first twenty whole numbers. Display a chart of number names, and have each student use the chart to make flash cards written with the number name on one side and the numerals on the other side. Have partners review using the flash cards. One student shows one side of the card to a partner, who says the number aloud and then writes the whole number in the other form. Students check the work using the cards.

Build Background
- Talk to students about reasons to write whole numbers in real life. For example, Cameron sees the number 327,014 in a book. How can he write the number using words? Explain that knowing how to write numbers helps answer this question.
- Have students discuss additional examples of real situations that involve writing whole numbers in different ways.
- Tell students they will write whole numbers in place-value charts, read and write number names, and write numbers in expanded form.

Introduce and Model
- **Introduce Concepts and Vocabulary** Guide students through the information about different ways to write whole numbers. Use **Words to Know** to clarify their understanding of vocabulary. Have students explain to a partner how they write the *expanded form* of a number.
- **Support Discussion** Have partners discuss briefly before group discussion. As needed, direct students to look at the digit in the hundreds place.

Prompt: *What is the value of the digit in the hundreds place?*
Sentence Starter: *The value of that digit is…*

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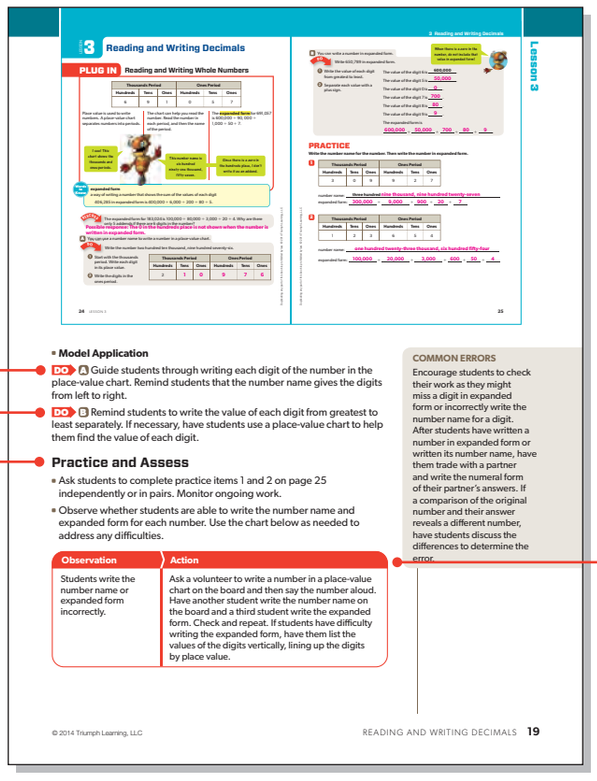
The **Build Background** section provides suggested activities to set up the lesson and assess student preparedness.

Support is included for guiding students through the gradual release of modeling to independent practice.

Each section of the student lesson culminates in an independent practice set.



Model Application

DO A Guide students through writing each digit of the number in the place-value chart. Remind students that the number name gives the digits from left to right.

DO B Remind students to write the value of each digit from greatest to least separately. If necessary, have students use a place-value chart to help them find the value of each digit.

Practice and Assess
- Ask students to complete practice items 1 and 2 on page 25 independently or in pairs. Monitor ongoing work.
- Observe whether students are able to write the number name and expanded form for each number. Use the chart below as needed to address any difficulties.

Observation	Action
Students write the number name or expanded form incorrectly.	Ask a volunteer to write a number in a place-value chart on the board and then say the number aloud. Have another student write the number name on the board and a third student write the expanded form. Check and repeat. If students have difficulty writing the expanded form, have them list the values of the digits vertically, lining up the digits by place value.

COMMON ERRORS
Encourage students to check their work as they might miss a digit in expanded form or incorrectly write the number name for a digit. After students have written a number in expanded form or written its number name, have them trade with a partner and write the numeral form of their partner's answers. If a comparison of the original number and their answer reveals a different number, have students discuss the differences to determine the error.

The **Observation-Action table** offers suggestions for addressing certain behaviors students may exhibit during independent practice.

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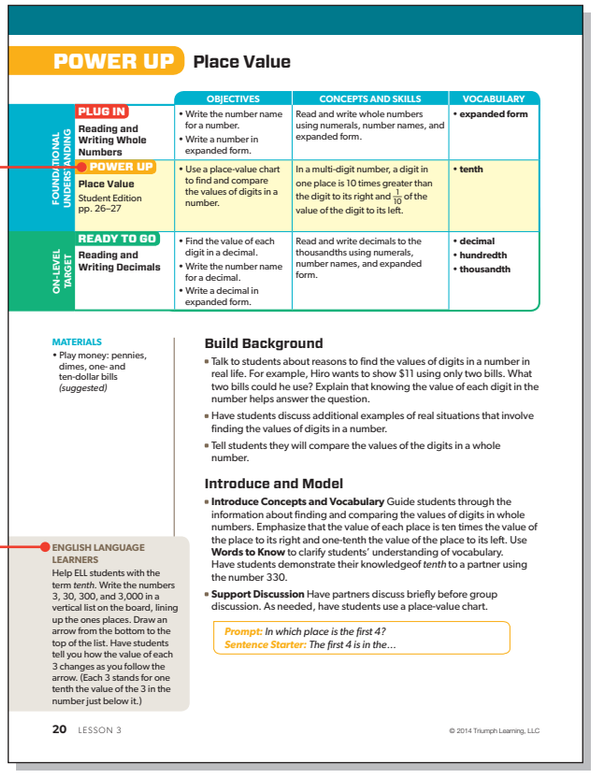
▶ Power Up Pages

Each section of the lesson has specific objectives, concepts and skills, and key vocabulary.



POWER UP Place Value

		OBJECTIVES	CONCEPTS AND SKILLS	VOCABULARY
FOUNDATIONAL UNDERSTANDING	**PLUG IN** Reading and Writing Whole Numbers	• Write the number name for a number. • Write a number in expanded form.	Read and write whole numbers using numerals, number names, and expanded form.	• expanded form
	POWER UP Place Value Student Edition pp. 26–27	• Use a place-value chart to find and compare the values of digits in a number.	In a multi-digit number, a digit in one place is 10 times greater than the digit to its right and $\frac{1}{10}$ of the value of the digit to its left.	• tenth
ON-LEVEL TARGET	**READY TO GO** Reading and Writing Decimals	• Find the value of each digit in a decimal. • Write the number name for a decimal. • Write a decimal in expanded form.	Read and write decimals to the thousandths using numerals, number names, and expanded form.	• decimal • hundredth • thousandth

MATERIALS
- Play money: pennies, dimes, one- and ten-dollar bills *(suggested)*

Build Background
- Talk to students about reasons to find the values of digits in a number in real life. For example, Hiro wants to show $11 using only two bills. What two bills could he use? Explain that knowing the value of each digit in the number helps answer the question.
- Have students discuss additional examples of real situations that involve finding the values of digits in a number.
- Tell students they will compare the values of the digits in a whole number.

Introduce and Model
- **Introduce Concepts and Vocabulary** Guide students through the information about finding and comparing the values of digits in whole numbers. Emphasize that the value of each place is ten times the value of the place to its right and one-tenth the value of the place to its left. Use **Words to Know** to clarify students' understanding of vocabulary. Have students demonstrate their knowledgeof *tenth* to a partner using the number 330.
- **Support Discussion** Have partners discuss briefly before group discussion. As needed, have students use a place-value chart.

Prompt: In which place is the first 4?
Sentence Starter: The first 4 is in the…

Support for **English Language Learners** is embedded throughout instruction.

ENGLISH LANGUAGE LEARNERS
Help ELL students with the term *tenth*. Write the numbers 3, 30, 300, and 3,000 in a vertical list on the board, lining up the ones places. Draw an arrow from the bottom to the top of the list. Have students tell you how the value of each 3 changes as you follow the arrow. (Each 3 stands for one tenth the value of the 3 in the number just below it.)

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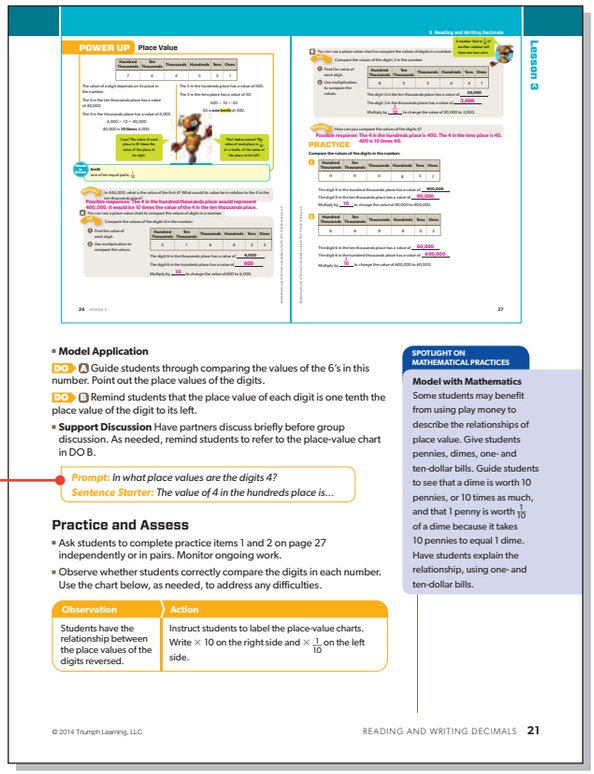
Mathematical Discourse is included in every lesson. Prompts and Sentence Starters are outlined to help facilitate discussion.



Model Application

DO A Guide students through comparing the values of the 6's in this number. Point out the place values of the digits.

DO B Remind students that the place value of each digit is one tenth the place value of the digit to its left.

- **Support Discussion** Have partners discuss briefly before group discussion. As needed, remind students to refer to the place-value chart in DO B.

Prompt: In what place values are the digits 4?
Sentence Starter: The value of 4 in the hundreds place is…

Practice and Assess
- Ask students to complete practice items 1 and 2 on page 27 independently or in pairs. Monitor ongoing work.
- Observe whether students correctly compare the digits in each number. Use the chart below, as needed, to address any difficulties.

Observation	Action
Students have the relationship between the place values of the digits reversed.	Instruct students to label the place-value charts. Write × 10 on the right side and × $\frac{1}{10}$ on the left side.

SPOTLIGHT ON MATHEMATICAL PRACTICES

Model with Mathematics
Some students may benefit from using play money to describe the relationships of place value. Give students pennies, dimes, one- and ten-dollar bills. Guide students to see that a dime is worth 10 pennies, or 10 times as much, and that 1 penny is worth $\frac{1}{10}$ of a dime because it takes 10 pennies to equal 1 dime. Have students explain the relationship, using one- and ten-dollar bills.

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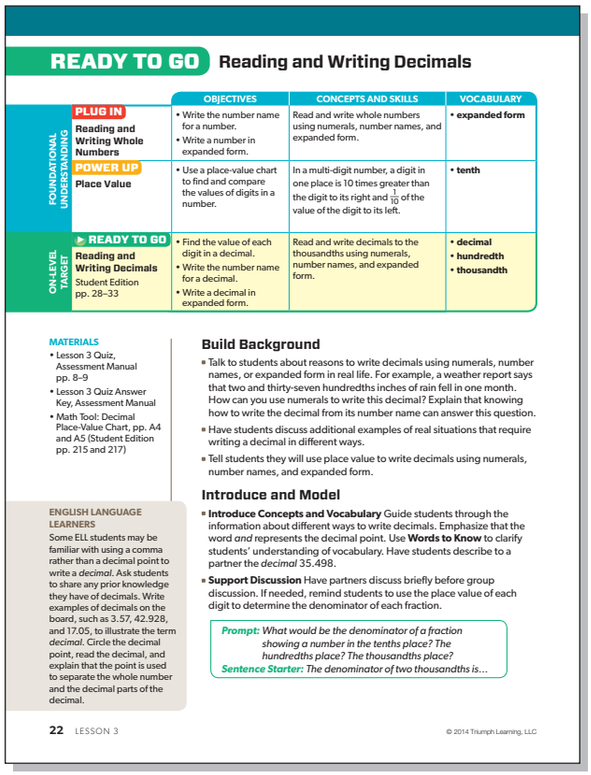
▶ Ready to Go Pages



READY TO GO Reading and Writing Decimals

		OBJECTIVES	CONCEPTS AND SKILLS	VOCABULARY
FOUNDATIONAL UNDERSTANDING	PLUG IN Reading and Writing Whole Numbers	• Write the number name for a number. • Write a number in expanded form.	Read and write whole numbers using numerals, number names, and expanded form.	• expanded form
	POWER UP Place Value	• Use a place-value chart to find and compare the values of digits in a number.	In a multi-digit number, a digit in one place is 10 times greater than the digit to its right and $\frac{1}{10}$ of the value of the digit to its left.	• tenth
ON-LEVEL TARGET	▶ READY TO GO Reading and Writing Decimals Student Edition pp. 28–33	• Find the value of each digit in a decimal. • Write the number name for a decimal. • Write a decimal in expanded form.	Read and write decimals to the thousandths using numerals, number names, and expanded form.	• decimal • hundredth • thousandth

MATERIALS
- Lesson 3 Quiz, Assessment Manual pp. 8–9
- Lesson 3 Quiz Answer Key, Assessment Manual
- Math Tool: Decimal Place-Value Chart, pp. A4 and A5 (Student Edition pp. 215 and 217)

ENGLISH LANGUAGE LEARNERS
Some ELL students may be familiar with using a comma rather than a decimal point to write a *decimal*. Ask students to share any prior knowledge they have of decimals. Write examples of decimals on the board, such as 3.57, 42.928, and 17.05, to illustrate the term *decimal*. Circle the decimal point, read the decimal, and explain that the point is used to separate the whole number and the decimal parts of the decimal.

Build Background
- Talk to students about reasons to write decimals using numerals, number names, or expanded form in real life. For example, a weather report says that two and thirty-seven hundredths inches of rain fell in one month. How can you use numerals to write this decimal? Explain that knowing how to write the decimal from its number name can answer this question.
- Have students discuss additional examples of real situations that require writing a decimal in different ways.
- Tell students they will use place value to write decimals using numerals, number names, and expanded form.

Introduce and Model
- **Introduce Concepts and Vocabulary** Guide students through the information about different ways to write decimals. Emphasize that the word *and* represents the decimal point. Use **Words to Know** to clarify students' understanding of vocabulary. Have students describe to a partner the *decimal* 35.498.
- **Support Discussion** Have partners discuss briefly before group discussion. If needed, remind students to use the place value of each digit to determine the denominator of each fraction.

Prompt: *What would be the denominator of a fraction showing a number in the tenths place? The hundredths place? The thousandths place?*
Sentence Starter: *The denominator of two thousandths is…*

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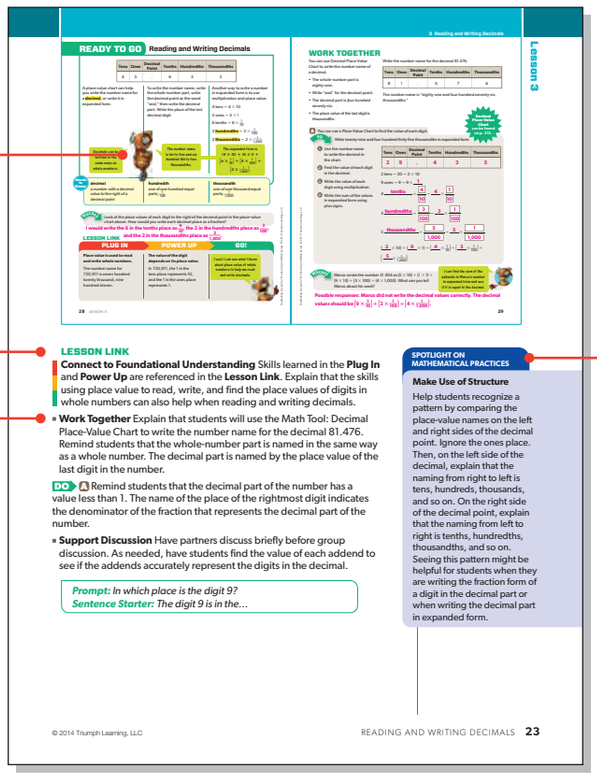
The Support Coach Avatars model exemplary student thinking, questioning, and problem solving!

The **Lesson Link** connects the foundational skills from the Plug In and Power Up sections to the on-level standard in the Ready to Go section.

The **Ready to Go** section of the lesson often furnishes an opportunity for students to work together.



LESSON LINK
Connect to Foundational Understanding Skills learned in the **Plug In** and **Power Up** are referenced in the **Lesson Link**. Explain that the skills using place value to read, write, and find the place values of digits in whole numbers can also help when reading and writing decimals.

- **Work Together** Explain that students will use the Math Tool: Decimal Place-Value Chart to write the number name for the decimal 81.476. Remind students that the whole-number part is named in the same way as a whole number. The decimal part is named by the place value of the last digit in the number.

DO A Remind students that the decimal part of the number has a value less than 1. The name of the place of the rightmost digit indicates the denominator of the fraction that represents the decimal part of the number.

- **Support Discussion** Have partners discuss briefly before group discussion. As needed, have students find the value of each addend to see if the addends accurately represent the digits in the decimal.

Prompt: *In which place is the digit 9?*
Sentence Starter: *The digit 9 is in the…*

SPOTLIGHT ON MATHEMATICAL PRACTICES
Make Use of Structure
Help students recognize a pattern by comparing the place-value names on the left and right sides of the decimal point. Ignore the ones place. Then, on the left side of the decimal, explain that the naming from right to left is tens, hundreds, thousands, and so on. On the right side of the decimal point, explain that the naming from left to right is tenths, hundredths, thousandths, and so on. Seeing this pattern might be helpful for students when they are writing the fraction form of a digit in the decimal part or when writing the decimal part in expanded form.

The **Spotlight on Mathematical Practices** box provides embedded professional development.

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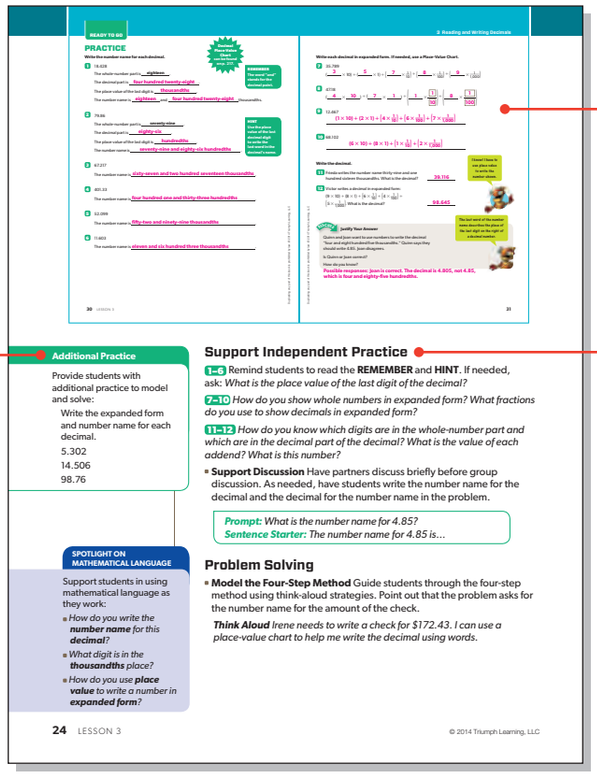
▶ Ready to Go Pages

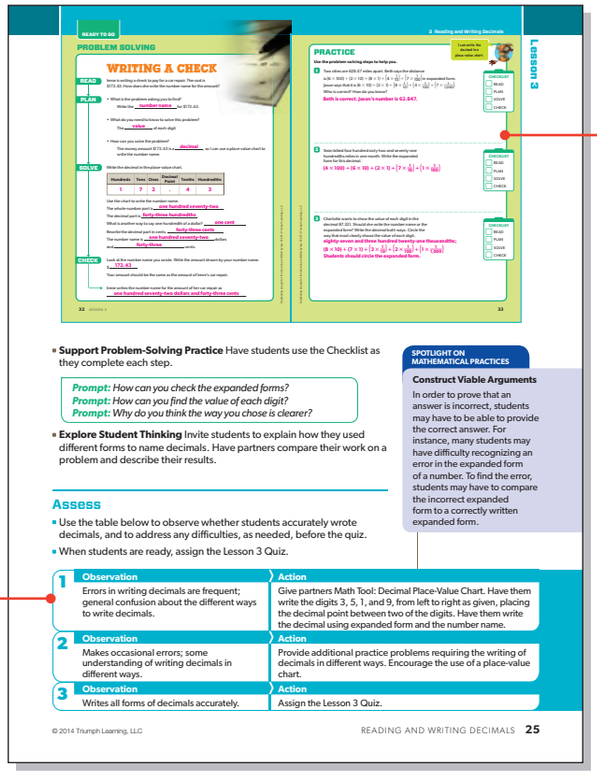


Suggestions for **Additional Practice** are provided for each lesson.

Full support is provided for modeling the **Four-Step Method** for problem solving in the context of each lesson.

The Ready to Go part of each lesson includes a robust section of **Independent Practice**.

To help **Support Independent Practice**, teachers are supplied with suggestions for helping students who are struggling with specific items.



Two full pages are dedicated to **Problem Solving**, giving students the opportunity to apply their newly acquired conceptual understandings and procedural fluencies to contextualized problem situations.

A three-part **Observation-Action table** can be used to determine whether students need more time with the lesson content or can move on to the Lesson Quiz.

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Assessments

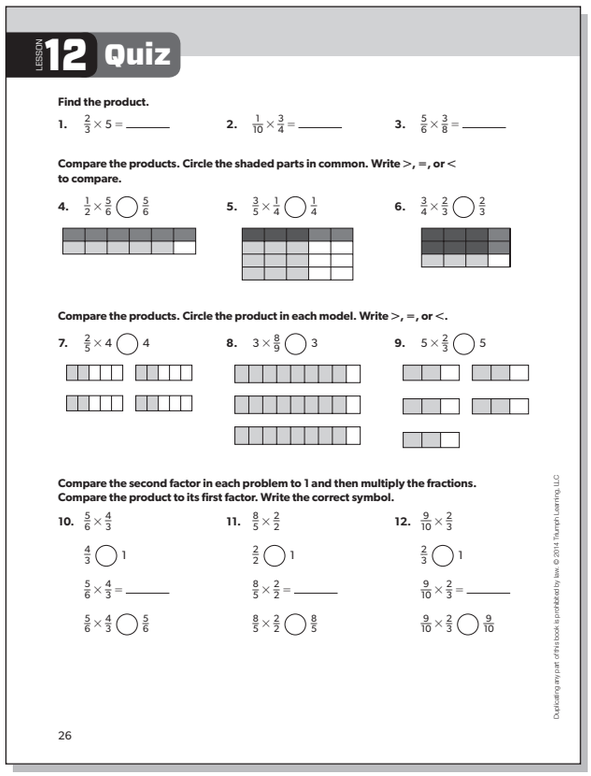
The Assessment Booklet contains lesson quizzes, two performance tasks for each of the five domains, and two practice tests.

Each Lesson Quiz helps you evaluate students' understanding of the skills taught in the lesson and determine whether they are prepared to move on to new material.

There are ten Performance Tasks in the Assessment Booklet. The two Performance Tasks for each lesson have a task-specific rubric. The first of the two tasks is a bit easier than the second—which allows teachers to differentiate instruction on performance task practice.

Practice Test 1 can be administered before students begin the lessons in the Student Edition. The results allow you to establish a baseline measure of students' mathematics proficiency before starting the Student Edition lessons. You can then use Practice Test 2 to measure students' progress after completing the program.

The answer keys for the Lesson Quizzes, Performance Tasks, and Practice Tests identify the correct answers.



LESSON 12 Quiz

Find the product.

1. $\frac{2}{3} \times 5 =$ _____
2. $\frac{1}{10} \times \frac{3}{4} =$ _____
3. $\frac{5}{6} \times \frac{3}{8} =$ _____

Compare the products. Circle the shaded parts in common. Write >, =, or < to compare.

4. $\frac{1}{2} \times \frac{5}{6} \bigcirc \frac{5}{6}$
5. $\frac{3}{5} \times \frac{1}{4} \bigcirc \frac{1}{4}$
6. $\frac{3}{4} \times \frac{2}{3} \bigcirc \frac{2}{3}$

Compare the products. Circle the product in each model. Write >, =, or <.

7. $\frac{2}{5} \times 4 \bigcirc 4$
8. $3 \times \frac{8}{9} \bigcirc 3$
9. $5 \times \frac{2}{3} \bigcirc 5$

Compare the second factor in each problem to 1 and then multiply the fractions. Compare the product to its first factor. Write the correct symbol.

10. $\frac{5}{6} \times \frac{4}{3}$
    $\frac{4}{3} \bigcirc 1$
    $\frac{5}{6} \times \frac{4}{3} =$ _____
    $\frac{5}{6} \times \frac{4}{3} \bigcirc \frac{5}{6}$
11. $\frac{8}{5} \times \frac{2}{2}$
    $\frac{2}{2} \bigcirc 1$
    $\frac{8}{5} \times \frac{2}{2} =$ _____
    $\frac{8}{5} \times \frac{2}{2} \bigcirc \frac{8}{5}$
12. $\frac{9}{10} \times \frac{2}{3}$
    $\frac{2}{3} \bigcirc 1$
    $\frac{9}{10} \times \frac{2}{3} =$ _____
    $\frac{9}{10} \times \frac{2}{3} \bigcirc \frac{9}{10}$

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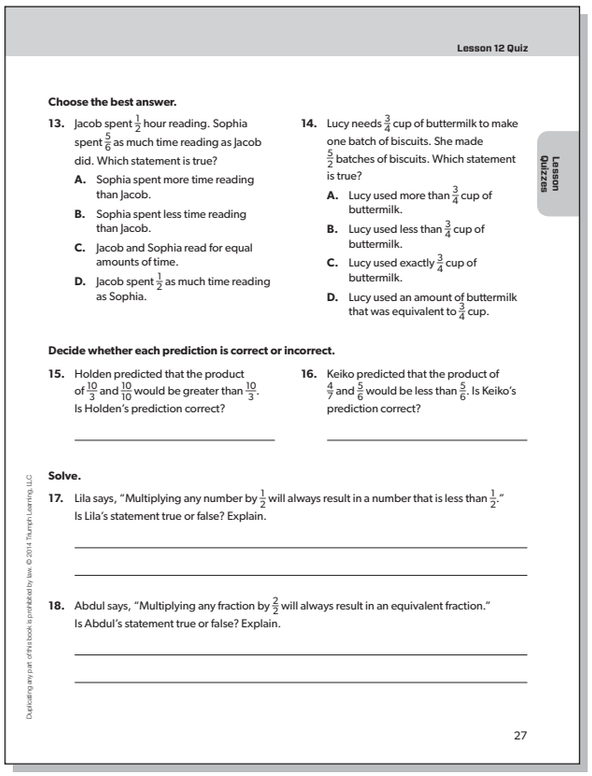
26



Choose the best answer.

13. Jacob spent $\frac{1}{2}$ hour reading. Sophia spent $\frac{5}{6}$ as much time reading as Jacob did. Which statement is true?
    - **A.** Sophia spent more time reading than Jacob.
    - **B.** Sophia spent less time reading than Jacob.
    - **C.** Jacob and Sophia read for equal amounts of time.
    - **D.** Jacob spent $\frac{1}{2}$ as much time reading as Sophia.
14. Lucy needs $\frac{3}{4}$ cup of buttermilk to make one batch of biscuits. She made $\frac{5}{2}$ batches of biscuits. Which statement is true?
    - **A.** Lucy used more than $\frac{3}{4}$ cup of buttermilk.
    - **B.** Lucy used less than $\frac{3}{4}$ cup of buttermilk.
    - **C.** Lucy used exactly $\frac{3}{4}$ cup of buttermilk.
    - **D.** Lucy used an amount of buttermilk that was equivalent to $\frac{3}{4}$ cup.

Decide whether each prediction is correct or incorrect.

15. Holden predicted that the product of $\frac{10}{3}$ and $\frac{10}{10}$ would be greater than $\frac{10}{3}$. Is Holden's prediction correct?

    _____
16. Keiko predicted that the product of $\frac{4}{7}$ and $\frac{5}{6}$ would be less than $\frac{5}{6}$. Is Keiko's prediction correct?

    _____

Solve.

17. Lila says, "Multiplying any number by $\frac{1}{2}$ will always result in a number that is less than $\frac{1}{2}$." Is Lila's statement true or false? Explain.

    _____

    _____
18. Abdul says, "Multiplying any fraction by $\frac{2}{2}$ will always result in an equivalent fraction." Is Abdul's statement true or false? Explain.

    _____

    _____

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27

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LESSON 1

Analyzing Numerical Patterns

PLUG IN Number and Shape Patterns

		OBJECTIVES	CONCEPTS AND SKILLS	VOCABULARY
FOUNDATIONAL UNDERSTANDING	**PLUG IN** **Number and Shape Patterns** Student Edition pp. 4–5	• Use a rule to create a number pattern. • Use a rule to create a shape pattern. • Study a pattern and identify its features.	Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern.	• **rule** • **term**
	POWER UP **Understanding Ordered Pairs**	• Use an ordered pair to plot a point on a coordinate plane. • Use an ordered pair to name a point on a coordinate plane.	Use ordered pairs to plot points on a coordinate plane. Understand that the *x*-coordinate indicates how far to travel from the origin on the *x*-axis, and the *y*-coordinate indicates how far to travel from the origin on the *y*-axis.	• **ordered pair** • ***x*-coordinate** • ***y*-coordinate** • **origin**
ON-LEVEL TARGET	**READY TO GO** **Analyzing Numerical Patterns**	• Create ordered pairs to represent two numerical patterns. • Graph and label the ordered pairs on a coordinate plane. • Identify the relationship between two patterns.	Form ordered pairs consisting of corresponding terms from two numerical patterns and graph the ordered pairs on a coordinate plane. Identify apparent relationships between corresponding terms.	

ENGLISH LANGUAGE LEARNERS

ELL students may need extra support for understanding *term*. Explain that *term* has multiple meanings, such as a word and a period of time. In a numerical pattern, a term means one number. Write the pattern *2, 4, 6, 8, 10* on the board. Explain that this pattern has 5 terms.

Build Background

- Talk to students about reasons to create a number pattern in real life. For example, every third person in line receives a free balloon. Explain that creating a number pattern helps you determine which people will receive a free balloon.
- Have students discuss additional examples of real situations that involve creating number or shape patterns.
- Tell students they will use a rule to create number and shape patterns, and then they will study the patterns.

Introduce and Model

- **Introduce Concepts and Vocabulary** Guide students through the information about number and shape patterns. Emphasize that a rule tells you how to get from one term to the next term in a pattern. Use **Words to Know** to clarify students' understanding of vocabulary. Have students demonstrate to a partner their understanding of a *rule* and a *term* of a pattern.

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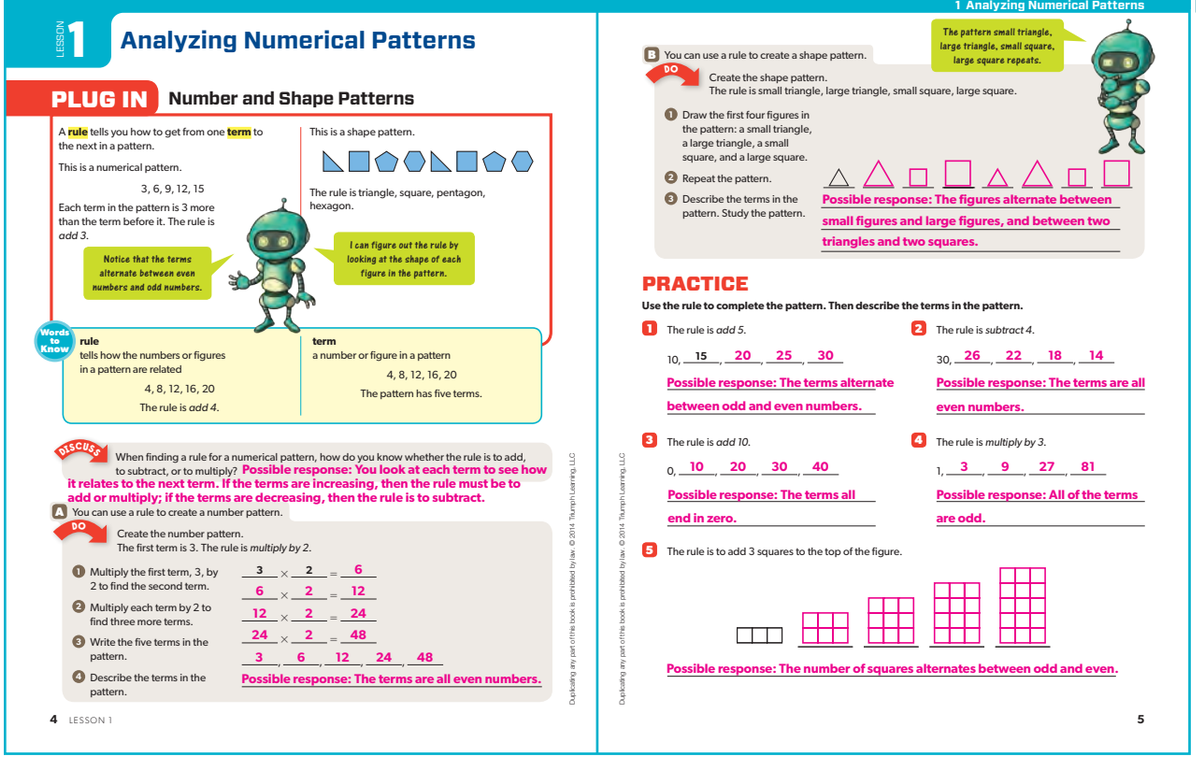

LESSON 1

Analyzing Numerical Patterns

PLUG IN Number and Shape Patterns

A **rule** tells you how to get from one **term** to the next in a pattern.

This is a numerical pattern.

3, 6, 9, 12, 15

Each term in the pattern is 3 more than the term before it. The rule is *add 3*.

Notice that the terms alternate between even numbers and odd numbers.

This is a shape pattern.

The rule is triangle, square, pentagon, hexagon.

I can figure out the rule by looking at the shape of each figure in the pattern.

Words to Know

rule
tells how the numbers or figures in a pattern are related
4, 8, 12, 16, 20
The rule is *add 4*.

term
a number or figure in a pattern
4, 8, 12, 16, 20
The pattern has five terms.

DISCUSS When finding a rule for a numerical pattern, how do you know whether the rule is to add, to subtract, or to multiply? Possible response: You look at each term to see how it relates to the next term. If the terms are increasing, then the rule must be to add or multiply; if the terms are decreasing, then the rule is to subtract.

A You can use a rule to create a number pattern.

DO Create the number pattern.
The first term is 3. The rule is *multiply by 2*.

1. Multiply the first term, 3, by 2 to find the second term. 3 × 2 = 6
2. Multiply each term by 2 to find three more terms. 6 × 2 = 12; 12 × 2 = 24; 24 × 2 = 48
3. Write the five terms in the pattern. 3, 6, 12, 24, 48
4. Describe the terms in the pattern. Possible response: The terms are all even numbers.

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B You can use a rule to create a shape pattern.

DO Create the shape pattern.
The rule is small triangle, large triangle, small square, large square.

The pattern small triangle, large triangle, small square, large square repeats.

1. Draw the first four figures in the pattern: a small triangle, a large triangle, a small square, and a large square.
2. Repeat the pattern.
3. Describe the terms in the pattern. Study the pattern. Possible response: The figures alternate between small figures and large figures, and between two triangles and two squares.

PRACTICE

Use the rule to complete the pattern. Then describe the terms in the pattern.

1. The rule is *add 5*.
10, 15, 20, 25, 30
Possible response: The terms alternate between odd and even numbers.

2. The rule is *subtract 4*.
30, 26, 22, 18, 14
Possible response: The terms are all even numbers.

3. The rule is *add 10*.
0, 10, 20, 30, 40
Possible response: The terms all end in zero.

4. The rule is *multiply by 3*.
1, 3, 9, 27, 81
Possible response: All of the terms are odd.

5. The rule is to add 3 squares to the top of the figure.

Possible response: The number of squares alternates between odd and even.

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- **Support Discussion** Have partners discuss briefly before group discussion. As needed, refer students to the numerical pattern in the Instruction box.

> ***Prompt:*** *Which operations would cause the numbers in a pattern to increase? To decrease?*
> ***Sentence Starter:*** *I look at each term in the pattern and…*

- **Model Application**

DO A Guide students through creating a number pattern. Explain that the terms will increase because the rule is multiply by 2.

DO B Monitor to make sure that students are using the rule to create the shape pattern. As needed, monitor their understanding and identification of the pattern's features.

Practice and Assess

- Ask students to complete practice items 1–5 on page 5 independently or in pairs. Monitor ongoing work.
- Observe whether students are using the rule to complete the pattern. Use the chart below as needed to address any difficulties.

Observation	Action
Students use the rule incorrectly when completing the pattern.	Have students underline the rule. Then have them show their work as they find each term in the pattern.

SPOTLIGHT ON MATHEMATICAL PRACTICES

Support students in using mathematical language as they work:

- *What is the **rule** for this numerical pattern?*
- *How is the second **term** different from the first **term** in the pattern?*

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POWER UP Understanding Ordered Pairs

		OBJECTIVES	CONCEPTS AND SKILLS	VOCABULARY
FOUNDATIONAL UNDERSTANDING	**PLUG IN** **Number and Shape Patterns**	• Use a rule to create a number pattern. • Use a rule to create a shape pattern. • Study a pattern and identify its features.	Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern.	• **rule** • **term**
	POWER UP **Understanding Ordered Pairs** Student Edition pp. 6–7	• Use an ordered pair to plot a point on a coordinate plane. • Use an ordered pair to name a point on a coordinate plane.	Use ordered pairs to plot points on a coordinate plane. Understand that the *x*-coordinate indicates how far to travel from the origin on the *x*-axis, and the *y*-coordinate indicates how far to travel from the origin on the *y*-axis.	• **ordered pair** • ***x*-coordinate** • ***y*-coordinate** • **origin**
ON-LEVEL TARGET	**READY TO GO** **Analyzing Numerical Patterns**	• Create ordered pairs to represent two numerical patterns. • Graph and label the ordered pairs on a coordinate plane. • Identify the relationship between two patterns.	Form ordered pairs consisting of corresponding terms from two numerical patterns and graph the ordered pairs on a coordinate plane. Identify apparent relationships between corresponding terms.	

MATERIALS

- Math Tool: Grid Paper, p. A3 (Student Edition p. 213)
- Colored pencils *(suggested)*

ENGLISH LANGUAGE LEARNERS

ELL students may need additional support for understanding *vertical* and *horizontal*. Use Math Tool: Grid Paper. Draw a set of axes in two different colors. Then, label the axes with the words in the respective colors.

Build Background

- Talk to students about reasons to use ordered pairs and a coordinate plane in real life. For example, you want to find a specific location on a map. Explain that some maps are divided into grids, and ordered pairs can be used to locate points of interest on the map.
- Have students discuss additional examples of real situations in which they might use ordered pairs and a coordinate plane.
- Tell students that they will be plotting and naming ordered pairs on a coordinate plane.

Introduce and Model

- **Introduce Concepts and Vocabulary** Guide students through the information about coordinate planes and ordered pairs. Use **Words to Know** to clarify their understanding of vocabulary. Have students demonstrate to a partner their understanding of *ordered pair*, *x-coordinate*, and *y-coordinate* by describing the location of a given point.
- **Support Discussion** Have partners discuss briefly before group discussion. If necessary, encourage students to draw a coordinate plane.

Prompt: *Which number is the x-coordinate? The y-coordinate?*
Sentence Starter: *From the origin, I move…*

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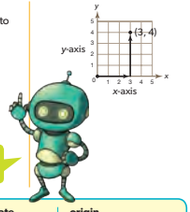
POWER UP Understanding Ordered Pairs

A coordinate plane is a grid formed by a horizontal number line and a vertical number line. An **ordered pair** of numbers is used to name the location of a point on a coordinate plane.

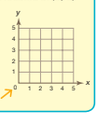
- The first number is the **x-coordinate**.
- The second number is the **y-coordinate**.
- The **origin** (0, 0) is the point where the *x*-axis and *y*-axis meet.
- To plot a point at (3, 4), start at the origin. Move 3 units to the right. Then move 4 units up. Draw a point and label the ordered pair.



I see! The ordered pair (3, 4) lines up with 3 on the x-axis, and with 4 on the y-axis.

Words to Know

ordered pair	x-coordinate	y-coordinate	origin
two numbers that give a location on a coordinate plane (2, 3)	tells how many units to move to the right along the *x*-axis (2, 3)	tells how many units to move up along the *y*-axis (2, 3)	point located at (0, 0)



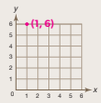
DISCUSS Explain where the point (4, 1) would be located on a coordinate plane.

Possible response: The point (4, 1) would be 4 units to the right of the origin and 1 unit up.

A You can use ordered pairs to plot a point on a coordinate plane.

DO Plot a point at (1, 6) on the coordinate plane.

1. Start at the origin.
2. Use the *x*-coordinate to move to the right.
3. Use the *y*-coordinate to move up.
4. Plot and label the point.



The origin is at (0, 0).

The *x*-coordinate is 1, so move 1 unit to the right.

The *y*-coordinate is 6, so move 6 units up.

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B You can use an ordered pair to name a point on the coordinate plane.

DO Name the point located at (3, 1) on the coordinate plane.

1. Start at the origin.
2. The *x*-coordinate tells how many units to move to the right.
3. The *y*-coordinate tells how many units to move up.
4. Name the point.

x comes before *y* in the alphabet, and the *x*-coordinate comes before the *y*-coordinate in an ordered pair.

The origin is at (0, 0).

The *x*-coordinate is 3, so move 3 units to the right.

The *y*-coordinate is 1, so move 1 unit up.

Point B is located at (3, 1).

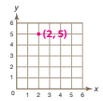
DISCUSS Gabriella says the point (2, 4) is 4 units to the right and 2 units up from the origin. Is she correct? What can you tell Gabriella?

No; Possible response: The first number in an ordered pair is the *x*-coordinate and the second number in an ordered pair is the *y*-coordinate, so the point (2, 4) is 2 units to the right and 4 units up from the origin.

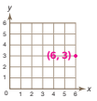
PRACTICE

Plot and label the ordered pair on the coordinate plane.

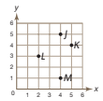
1. (2, 5)



2. (6, 3)



Use the coordinate plane below for problems 3–6. Name the point.



3. Point M is located at (4, 1).
4. Point K is located at (5, 4).
5. Point L is located at (2, 3).
6. Point J is located at (4, 5).

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- **Model Application**

DO A Guide students to plot the point on the coordinate grid. Check that students start at the origin.

DO B Monitor that students move 3 units to the right from the origin and 1 unit up to name the point.

- **Support Discussion** Have partners discuss briefly before group discussion. As needed, remind students which number is the *x*-coordinate and which number is the *y*-coordinate.

> ***Prompt:*** *Which is the first coordinate in an ordered pair?*
>
> ***Sentence Starter:*** *The first coordinate is the…*

Practice and Assess

- Ask students to complete practice items 1–6 on page 7 independently or in pairs. Monitor ongoing work.
- Observe whether students accurately plot, label, and name each point. Use the chart below, as needed, to address any difficulties.

Observation	Action
Students mix up the order of the coordinates in the ordered pair.	Remind students that, just as *x* comes before *y* in the alphabet, ordered pairs are given in the form (*x*, *y*). So, the *x*-coordinate is the first number, and the *y*-coordinate is the second number.

SPOTLIGHT ON MATHEMATICAL PRACTICES

Critiquing Others' Reasoning

Help students think critically about Gabriella's reasoning by asking probing questions:

- *Which direction does the x-coordinate tell you to move?*
- *Which direction does the y-coordinate tell you to move?*
- *Which coordinate comes first in the ordered pair?*

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READY TO GO Analyzing Numerical Patterns

		OBJECTIVES	CONCEPTS AND SKILLS	VOCABULARY
FOUNDATIONAL UNDERSTANDING	**PLUG IN** **Number and Shape Patterns**	• Use a rule to create a number pattern. • Use a rule to create a shape pattern. • Study a pattern and identify its features.	Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern.	• **rule** • **term**
	POWER UP **Understanding Ordered Pairs**	• Use an ordered pair to plot a point on a coordinate plane. • Use an ordered pair to name a point on a coordinate plane.	Use ordered pairs to plot points on a coordinate plane. Understand that the *x*-coordinate indicates how far to travel from the origin on the *x*-axis, and the *y*-coordinate indicates how far to travel from the origin on the *y*-axis.	• **ordered pair** • ***x*-coordinate** • ***y*-coordinate** • **origin**
ON-LEVEL TARGET	**READY TO GO** **Analyzing Numerical Patterns** Student Edition pp. 8–13	• Create ordered pairs to represent two numerical patterns. • Graph and label the ordered pairs on a coordinate plane. • Identify the relationship between two patterns.	Form ordered pairs consisting of corresponding terms from two numerical patterns and graph the ordered pairs on a coordinate plane. Identify apparent relationships between corresponding terms.	

MATERIALS

- Lesson 1 Quiz, Assessment Manual pp. 4–5
- Lesson 1 Quiz Answer Key, Assessment Manual
- Math Tool: Grid Paper, p. A2 (Student Edition p. 211)

ENGLISH LANGUAGE LEARNERS

ELL students may need extra support for understanding *corresponding terms*. Point out the word "correspond" and explain that corresponding terms in 2 patterns are in the same positions in each pattern and are related.

Build Background

- Talk to students about reasons to compare numerical patterns in real life. For example, David always practices piano for twice as long as John. If John practices for 5 minutes one day and 10 minutes the next, for how many minutes does David practice each of those days? Explain that comparing numerical patterns can be used to answer this question.
- Have students discuss additional examples of real situations that might require the evaluation of numerical patterns.
- Tell students they will be using numerical patterns to create and graph ordered pairs. Then, they will describe the numerical patterns.

Introduce and Model

- **Introduce Concepts** Guide students through the information about using ordered pairs to show relationships between two numerical patterns. Emphasize that the terms of the first pattern are the *x*-coordinates and the terms of the second pattern are the *y*-coordinates.
- **Support Discussion** Have partners discuss briefly before group discussion. If needed, have students write out the terms for the new pattern.

Prompt: *How would the terms of the second pattern change?*
Sentence Starter: *The new rule means each term…*

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READY TO GO Analyzing Numerical Patterns

You can use ordered pairs to show relationships between two numerical patterns.

The table shows two patterns.

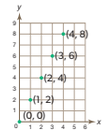
Rule: Add 1	Rule: Add 2
0	0
1	2
2	4
3	6
4	8

Write the pairs of values as ordered pairs.

Rule: Add 1	Rule: Add 2	Ordered Pairs
0	0	(0, 0)
1	2	(1, 2)
2	4	(2, 4)
3	6	(3, 6)
4	8	(4, 8)

You can graph the ordered pairs on a coordinate plane.

For each unit you move to the right, you move twice as many units up.



The terms in the table form pairs of values.

The terms of the first pattern are the *x*-coordinates, and the terms of the second pattern are the *y*-coordinates.

I see! Each term in the second pattern is 2 times the corresponding term in the first pattern.

DISCUSS How would the graph change if the rule of the second pattern were to add 3?

Possible response: The points would be spread apart even more. For each unit right, you would move 3 units up.

LESSON LINK

PLUG IN

You can follow a rule to create a pattern.

The first term is 0.

The rule is *add 2*.

0, 2, 4, 6, 8

POWER UP

An ordered pair is used to name a point on a coordinate plane.

GO!

I get it! I can use two patterns to make ordered pairs. Then I can graph the ordered pairs to show the relationship between the patterns.

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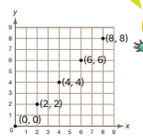
WORK TOGETHER

Use Grid Paper to graph the numerical pattern.

- Use the terms in the table to create ordered pairs.
- Graph each ordered pair on the coordinate plane.
- Each term in the second pattern is 1 times the corresponding term in the first pattern. Each point on the graph moves to the right and up 2 units from the previous point.

Rule: Add 2	Rule: Add 2	Ordered Pairs
0	0	(0, 0)
2	2	(2, 2)
4	4	(4, 4)
6	6	(6, 6)
8	8	(8, 8)

Ordered pairs are in the form (*x*, *y*).



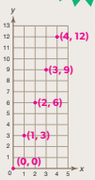
Grid Paper can be found on p. 211.

A You can use a table to help you graph and label ordered pairs.

DO Complete the pattern in the table. Graph the pattern.

1. Write the terms in each pattern.
2. Use the terms to create ordered pairs.
3. Graph and label the ordered pairs.
4. Describe the pattern.

Rule: Add 1	Rule: Add 3	Ordered Pairs
0	0	(0, 0)
1	3	(1, 3)
2	6	(2, 6)
3	9	(3, 9)
4	12	(4, 12)



Each term in the second pattern is 3 times the corresponding term in the first pattern.

Each point on the graph moves 1 unit to the right and 3 units up from the previous point.

DISCUSS Look at these ordered pairs: (0, 0), (1, 4), (2, 8), (3, 12), (4, 16). What is the relationship between the ordered pairs?

Look at how the *x*- and *y*-coordinates change from one ordered pair to the next.

Possible response: Each point is 1 unit to the right and 4 units up from the previous point. This shows that each second term is four times each first term.

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LESSON LINK

Connect to Foundational Understanding Skills learned in the **Plug In** and **Power Up** are referenced in the **Lesson Link**. Remind students that rules are used to create patterns. The patterns can then be used to create ordered pairs. The ordered pairs can be graphed to show the relationship between the patterns.

- **Work Together** Explain that students will use Grid Paper to graph ordered pairs. The terms in the table are used to create ordered pairs. Then, the ordered pairs are graphed on the coordinate plane.

DO A Monitor students as they create, graph, and label the ordered pairs. Remind students to use the terms from the first pattern for the *x*-coordinates and the terms from the second pattern for the *y*-coordinates.

- **Support Discussion** Have partners discuss briefly before group discussion. As needed, have students make a table that shows all of the *x*-coordinates and all of the *y*-coordinates.

Prompt: *What is the rule for the x-coordinates in the ordered pairs? For the y-coordinates?*

Sentence Starter: *The rule for the x-coordinates is…*

COMMON ERRORS

Students may not consider all of the ordered pairs when comparing the numerical patterns. Reinforce the importance of considering at least three ordered pairs to be sure a correct relationship is identified.

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READY TO GO

PRACTICE

Use the patterns to create ordered pairs.

1

Rule: Add 3	Rule: Add 6	Ordered Pairs
0	0	(0, 0)
3	6	(3, 6)
6	12	(6, 12)
9	18	(9, 18)
12	24	(12, 24)

2

Rule: Add 1	Rule: Add 5	Ordered Pairs
0	0	(0, 0)
1	5	(1, 5)
2	10	(2, 10)
3	15	(3, 15)
4	20	(4, 20)

REMEMBER Look at the first pattern for the *x*-coordinates.

Complete each pattern and create ordered pairs. Then describe the ordered pairs of the patterns.

3

Rule: Add 1	Rule: Add 4	Ordered Pairs
0	0	(0, 0)
1	4	(1, 4)
2	8	(2, 8)
3	12	(3, 12)
4	16	(4, 16)

Possible response: Each *y*-coordinate is four times each *x*-coordinate.

4

Rule: Add 2	Rule: Add 6	Ordered Pairs
0	0	(0, 0)
2	6	(2, 6)
4	12	(4, 12)
6	18	(6, 18)
8	24	(8, 24)

HINT Look at the second pattern for the *y*-coordinates.

Possible response: Each *y*-coordinate is three times each *x*-coordinate.

5

Rule: Add 3	Rule: Add 3	Ordered Pairs
0	0	(0, 0)
3	3	(3, 3)
6	6	(6, 6)
9	9	(9, 9)
12	12	(12, 12)

Possible response: Each *y*-coordinate is the same as each *x*-coordinate.

6

Rule: Add 4	Rule: Add 8	Ordered Pairs
0	0	(0, 0)
4	8	(4, 8)
8	16	(8, 16)
12	24	(12, 24)
16	32	(16, 32)

Possible response: Each *y*-coordinate is two times each *x*-coordinate.

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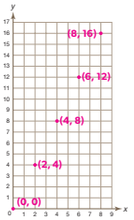
Complete each pattern and create ordered pairs. Then graph and label the ordered pairs.

7

Rule: Add 2	Rule: Add 4	Ordered Pairs
0	0	(0, 0)
2	4	(2, 4)
4	8	(4, 8)
6	12	(6, 12)
8	16	(8, 16)



What do you notice about the points on the graph?

Possible response: For every 2 units you move to the right, you move 4 units up. Each *y*-coordinate is two times each *x*-coordinate.

Solve.

8 Thomas plotted the points (0, 0), (1, 6), (2, 12), (3, 18), and (4, 24) on a coordinate plane. What do you notice about the ordered pairs?

Possible response: For every unit you move to the right, you move six times as many units up.

Look at how each ordered pair relates to the next ordered pair.

9 Avery used the rule *add 3* to create one pattern, and the rule *add 6* to create another pattern. Then she wrote ordered pairs. What is the relationship between the corresponding terms?

Possible response: The second term is twice the first term.

DISCUSS **Find the Pattern**

Mato used terms from two patterns to write these ordered pairs: (0, 0), (2, 8), (4, 16), (6, 24), (8, 32). Lillian says the next ordered pair will be (16, 34). What can you tell Lillian?

Possible response: Lillian is incorrect. The next ordered pair will be (10, 40).

What were the rules for Mato's patterns?

The rule for the first pattern is *add 2*. The rule for the second pattern is *add 8*.

Compare the ordered pairs to find each pattern.

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ADDITIONAL PRACTICE

Provide students with additional practice to model and solve:

Nicolas used the rule *add 2* to create one pattern and the rule *add 4* to create another pattern. What is the relationship between the first terms and the second terms of the patterns?

Support Independent Practice

1–2 Remind students to read the **REMEMBER**. If needed, ask: *How is the second term related to the first term of each ordered pair?*

3–6 Remind students to read the **HINT**. *What is the rule of the pattern?*

7 *When graphing, where on the coordinate plane will you start?*

8–9 *How are the ordered pairs related?*

Support Discussion Have partners discuss briefly before group discussion. As needed, have students make a table that shows all of Mato's *x*-coordinates and *y*-coordinates.

> ***Prompt:*** *How do the coordinates change from one ordered pair to the next ordered pair?*
> ***Sentence Starter:*** *The rule for the first pattern is…*

Problem Solving

- **Model the Four-Step Method** Guide students through the four-step method using think-aloud strategies. Point out each rule.

  Think Aloud *Abby is adding 5 and Jayden is adding 10.*

- **Support Problem-Solving Practice** Have students use the Checklist as they complete each step.

> ***Prompt:*** *What is the rule for each pattern?*
> ***Prompt:*** *Do you see a relationship between the two patterns?*
> ***Prompt:*** *Which number will you start with?*

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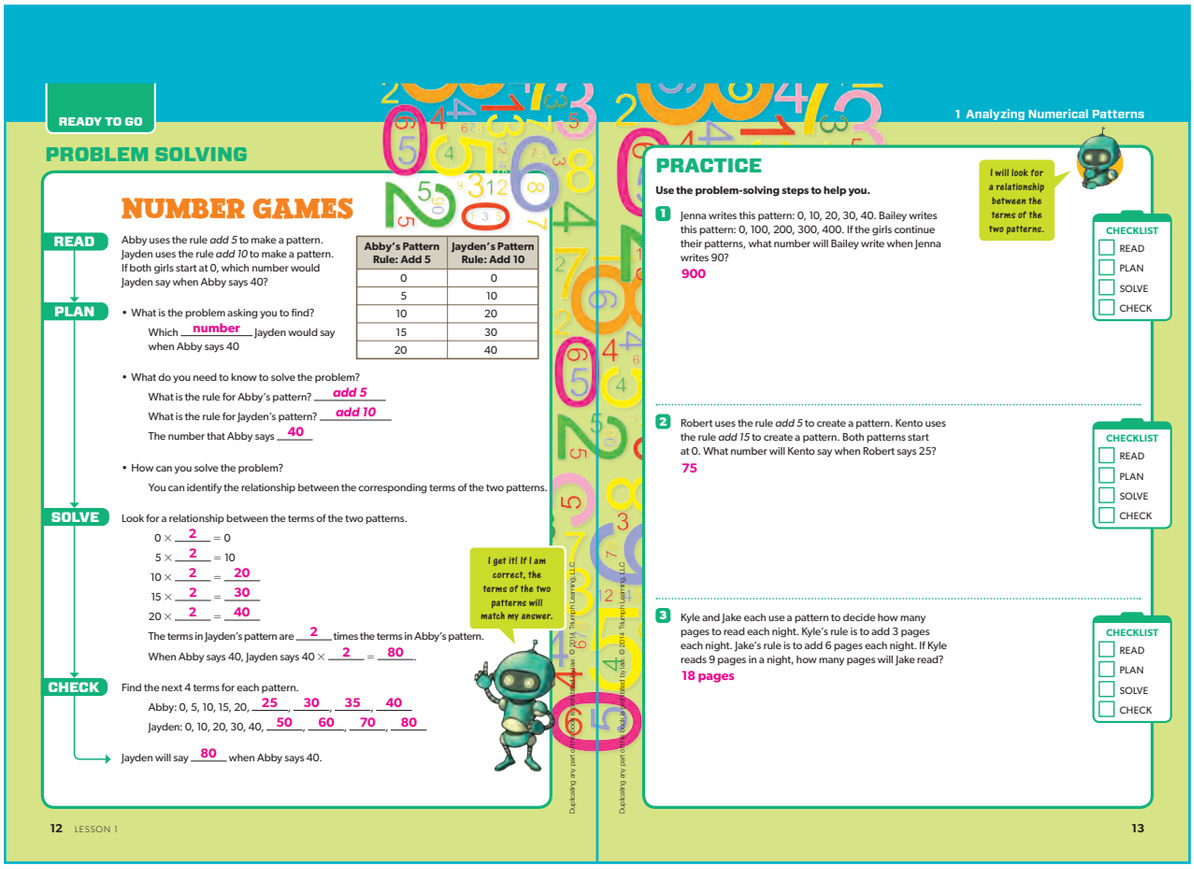

READY TO GO

PROBLEM SOLVING

NUMBER GAMES

READ

Abby uses the rule *add 5* to make a pattern. Jayden uses the rule *add 10* to make a pattern. If both girls start at 0, which number would Jayden say when Abby says 40?

Abby's Pattern Rule: Add 5	Jayden's Pattern Rule: Add 10
0	0
5	10
10	20
15	30
20	40

PLAN

- What is the problem asking you to find?
  Which number Jayden would say when Abby says 40
- What do you need to know to solve the problem?
  What is the rule for Abby's pattern? add 5
  What is the rule for Jayden's pattern? add 10
  The number that Abby says 40
- How can you solve the problem?
  You can identify the relationship between the corresponding terms of the two patterns.

SOLVE

Look for a relationship between the terms of the two patterns.

$0 \times 2 = 0$
$5 \times 2 = 10$
$10 \times 2 = 20$
$15 \times 2 = 30$
$20 \times 2 = 40$

The terms in Jayden's pattern are 2 times the terms in Abby's pattern.
When Abby says 40, Jayden says $40 \times 2 = 80$

I get it! If I am correct, the terms of the two patterns will match my answer.

CHECK

Find the next 4 terms for each pattern.
Abby: 0, 5, 10, 15, 20, 25, 30, 35, 40
Jayden: 0, 10, 20, 30, 40, 50, 60, 70, 80

Jayden will say 80 when Abby says 40.

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12 LESSON 1

PRACTICE

Use the problem-solving steps to help you.

I will look for a relationship between the terms of the two patterns.

1 Jenna writes this pattern: 0, 10, 20, 30, 40. Bailey writes this pattern: 0, 100, 200, 300, 400. If the girls continue their patterns, what number will Bailey write when Jenna writes 90?
900

CHECKLIST
READ
PLAN
SOLVE
CHECK

2 Robert uses the rule *add 5* to create a pattern. Kento uses the rule *add 15* to create a pattern. Both patterns start at 0. What number will Kento say when Robert says 25?
75

CHECKLIST
READ
PLAN
SOLVE
CHECK

3 Kyle and Jake each use a pattern to decide how many pages to read each night. Kyle's rule is to add 3 pages each night. Jake's rule is to add 6 pages each night. If Kyle reads 9 pages in a night, how many pages will Jake read?
18 pages

CHECKLIST
READ
PLAN
SOLVE
CHECK

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13

- **Explore Student Thinking** Invite volunteers to explain how they found the relationship between the patterns. Have partners compare their work on a problem and describe their results.

SPOTLIGHT ON MATHEMATICAL PRACTICES

Identify the Relationship

Help students identify the relationship between the ordered pairs by asking probing questions:

- *How does each coordinate change from one ordered pair to the next ordered pair?*
- *How do the coordinates change within each ordered pair?*

Assess

- Use the table below to observe whether students accurately identify the relationship between the patterns they created and to address any difficulties, as needed, before the quiz.
- When students are ready, assign the Lesson 1 Quiz.

	Observation	Action
1	Errors in identifying the relationship between two numerical patterns are frequent; general confusion about comparing numerical patterns.	Have students list the terms for each pattern, and draw arrows to show how the terms are related.
2	Makes occasional errors when identifying the relationship between two numerical patterns; some understanding of comparing numerical patterns.	Provide additional practice problems for comparing numerical patterns. Encourage students to write an expression that shows how they get from one *x*-coordinate to the next, and another expression that shows how they get from one *y*-coordinate to the next.
3	Accurately identifies the relationship between corresponding terms in two numerical patterns.	Assign the Lesson 1 Quiz.

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