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Summer Scholars Mathematics Rising 6th Grade

This sample includes the following:

Management Guide pages
- Cover and Table of Contents (3 pages)
- How to Use This Resource pages (4 pages)
- Grade Level Details pages (8 pages)

Teacher's Guide pages
- Cover (1 page)
- Days 3–4 Overview (1 page)
- Day 3 Lesson (5 pages)
- Day 4 Lesson (3 pages)

Student Guided Practice Book pages
- Cover (1 page)
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- Day 4 Student Pages (5 pages)

To **Create** a World in which **Children** love to **Learn!**

SUMMER Scholars

Mathematics

Management Guide

Table of Contents

Table of Contents *(cont.)*

How to Use This Resource

The *Summer Scholars Mathematics* curriculum has been designed to meet the needs of summer learning programs. Scaffolded lessons, mathematical discourse, and STEAM activities are presented in a flexible format to make learning (and teaching) fun and effective for everyone.

What's Included?

Teacher's Guide
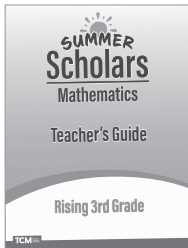
The daily lessons enhance instruction with research-based mathematics instructional practices.

Student Guided Practice Book
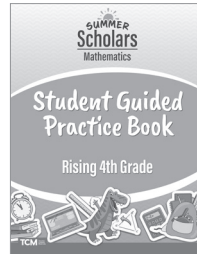
This book encourages students' mathematical fluency with multiple opportunities to apply learning.

Management Guide
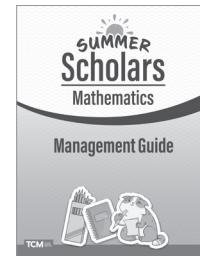
This guide helps teachers plan effectively with flexible lesson pacing and a scope and sequence designed specifically for varied summer settings.

12 Mathematical Discourse Task Cards
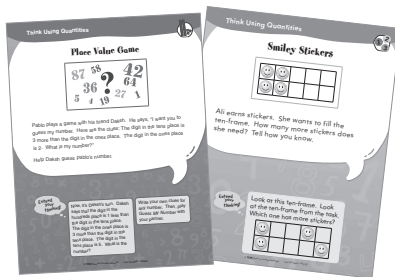
These cards provide rich problem-solving tasks for students to solve and discuss collaboratively. They are provided in both print and digital format.

Smithsonian STEAM Readers

These books and the included STEAM challenges foster content-area literacy and encourage students to collaboratively solve real-world problems.

Digital Resources
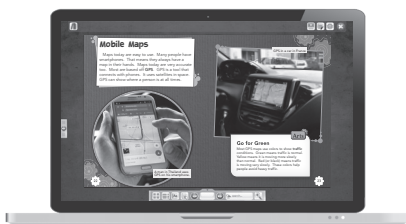
These resources increase student engagement and enhance instruction. Family Engagement Letters are provided for a strong school-home connection.

Classroom Library with 10 Books

These mathematics- and science-focused books inspire curiosity and a love of reading.

How to Use This Resource *(cont.)*

Scaffolded Mathematics Instruction

The student-centered Gradual Release of Responsibility model is embedded into each of the mathematics lessons. Within every two-day lesson, the responsibility shifts from the teacher (I Do) to the student (You Do).

Icons indicate student groupings: whole group, collaborative, and independent.

Stopwatch icons indicate suggested durations.

Each lesson page and student page clearly indicates the instructional day.

Assessment opportunities are provided in every lesson.

There are many ways for students to access the student activity pages:

- use individual books (purchased separately)
- make copies from provided book
- project pages on an interactive whiteboard
- print pages from digital resources
- share on digital devices (see page 41 for more information)

How to Use This Resource *(cont.)*

Mathematical Discourse Task Cards

The Mathematical Discourse Task Cards present rich math problems for students to solve and discuss collaboratively. The three mathematical discourse routines walk students through the problem-solving process.

Construct and Critique Arguments

Building with Blocks

Sara's work	George's work

Sara says, "3 tens and 16 ones equal 46."

George says, "2 tens and 26 ones equal 46."

Are they both correct? Explain your thinking.

Extend your thinking!

Make 51 using base-ten blocks. How many different ways can you make 51?

How many ways can you make 105 using base-ten blocks?
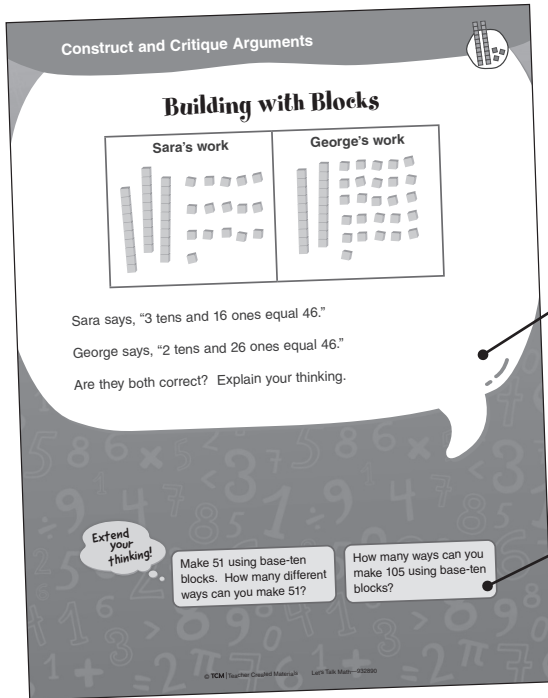
Cards can be displayed for the whole class.

Extension questions challenge students to think more deeply about the mathematical concept.

Name: _____ Date: _____

Construct and Critique Arguments

Student 1: "How did we prove that our answers are correct?"

...gree with each other's ...cess?"

...t and critique arguments?"

Name: _____ Date: _____

Building with Blocks

Sara's work	George's work

Sara says, "3 tens and 16 ones equal 46."

George says, "2 tens and 26 ones equal 46."

Are they both correct? Explain your thinking.

Extend your thinking!

Make 51 using base-ten blocks. How many different ways can you make 51?

How many ways can you make 105 using base-ten blocks?

Cards are reproduced in the *Student Guided Practice Book* for individual use.

Activity sheets help walk students through the routines.

How to Use This Resource *(cont.)*

STEAM Challenges

There are five STEAM Challenges included in each level of *Summer Scholars*. Each challenge is completed over five days to give students ample time to investigate, test, and retest their ideas. In addition to meeting specific criteria, students are also challenged to improve their work over the five days.

STEAM CHALLENGE

Day 1

Define the Problem

A new student just joined your class. Your teacher has asked you to create a school map for the student.

Constraints: Your map must be drawn from a bird's-eye view. You must include color in your map.

Criteria: Your map must have a map legend, a compass rose, and drawings of important places at your school. It should be clear and easy to use.

1 Research and Brainstorm

How do maps help people get around? What will different colors mean on your map? What are the important places at your school? Where are they located?

2 Design and Build

Decide what you will include in your map legend. Then, sketch your school as though you were looking from above. Draw and color your map.

3 Test and Improve

Share your map with your friends. Ask them to find a place on your map. Did they find it easily? Is your map clear? How can you improve your map? Improve your map, and present it again.

4 Reflect and Share

Could a new student read and understand your map? How can you make your map easier to follow?

> Build background knowledge and spark student interest with engaging readers and short texts.

> Students reflect on the process and their final products.

Days 3–4 Overview

Numbers to 1,000

Learning Outcome
- Read and write numbers to 1,000 using base ten numerals and number names.

Focus

The following lesson will address these focus questions: *What is the form numerals and number names?* When can both forms be h...
questions on the board or on chart paper and read them aloud...

Student Misconception

This particular standard expands on students' previous knowled...
It is common and incorrect for students to add the word *and*...
over 100. Watch and listen for this so clarification can be mad...
point, which is why the word is not correctly used within whe...

Building with Blocks

Learning Outcome
- Work collaboratively to solve a problem.

Making Maps

Learning Outcomes
- Create and test a map of the school.

Materials
- *Student Guided Practice Book* (pages xx–xx)
- Number Name Cards (numname.pdf)
- base ten blo...
- chart paper
- constructi...

> Materials needed for each challenge are clearly listed. A full list of all STEAM Challenge materials is included in the digital resources.

Name: _____

Date: _____

Rebuild and Refine

Day 9

Directions: Gather your materials. Plan your steps. Rebuild your structure. Record the changes you make. Tell why you made those changes.

Think About It!

How do you need to change your steps to rebuild your structure?

Steps to Rebuild

_____

_____

_____

Changes Made While Building	Reason for Changes

> Activity sheets lead students through the Engineering Design Process.

SUMMER

Scholars

Mathematics

Rising 6th Grade

Grade Level Details

Rising 6th Grade Scope and Sequence

	Mathematics Skills and Concepts 60–65 minutes per day		Problem-Solving and Discourse 10–15 minutes per day		STEAM 45 minutes per day	
	Mathematics Focus	Standards	Mathematical Practice and Card Title	Standard	Challenge Title and STEAM Step	Standard
Day 1	Using Parenthesis, Brackets, and Braces	Evaluate multi-step numerical expressions using order of operations, including parenthesis, brackets, and braces.	Use Tools Strategically "Mr. Petz's Question"	Consider and use available tools when solving problems.	*Life in a Cube* Define the Problem	Convert among different-sized standard measurement units within a given measurement system and use these conversions to solve real-world problems.
Day 2					*Life in a Cube* Design	
Day 3	Working with Expressions	Translate written real-world and mathematical problems into numerical expressions that record calculations with numbers.	Analyze the Structure "Ms. Suh's Math"	Observe closely to discern a pattern or structure in a problem.	*Life in a Cube* Build and Test	Apply mathematics to solve problems arising in everyday life, society, and the workplace.
Day 4					*Life in a Cube* Improve	
Day 5	Comparing Decimals to the Thousandths	Compare and order decimals to the thousandths using >, =, and < symbols to record the results of the comparisons.	Construct and Critique Arguments "Diana Disagrees"	Use assumptions, definitions, and previously established results to construct arguments.	*Life in a Cube* Reflect and Share	Make sense of problems and plan, solve, justify and evaluate solutions.
Day 6					*Gravity* Learn Content, Understand the Challenge, and Brainstorm	Define gravity, identify how its forces affect life on Earth, and explore how these forces can be manipulated.
Day 7	Adding and Subtracting Decimals	Add and subtract numbers with decimals using strategies, like the standard algorithm, based on place value and properties of operations.	Think Using Quantities "Larry's Leashes"	Make sense of quantities and their relationships in problems.	*Gravity* Design and Build	Apply mathematics to solve problems arising in everyday life, society, and the workplace.
Day 8					*Gravity* Test and Reflect	

Rising 6th Grade Scope and Sequence *(cont.)*

	Mathematics Skills and Concepts 60–65 minutes per day		Problem-Solving and Discourse 10–15 minutes per day		STEAM 45 minutes per day	
	Mathematics Focus	Standards	Mathematical Practice and Card Title	Standard	Challenge Title and STEAM Step	Standard
Day 9	Multiplying Decimals	Represent the multiplication of numbers with decimals and multiply numbers with decimals using strategies based on place value and properties of operations.	Think Using Quantities "Magic or Math?"	Make sense of quantities and their relationships in problems.	*Gravity* Redesign and Rebuild	Make sense of problems and plan, solve, justify and evaluate solutions.
Day 10					*Gravity* Retest and Share	
Day 11	Dividing Decimals	Divide numbers with decimals using strategies based on place value and properties of operations with procedural reliability.	Generalize Your Thinking "Division Dilemma"	Look for and express regularity in repeated reasoning.	*Digging Up Dinosaurs* Define the Problem	Make sense of problems and plan, solve, justify and evaluate solutions.
Day 12					*Digging Up Dinosaurs* Design	Fluently multiply multi-digit whole numbers using the standard algorithm.
Day 13	Adding and Subtracting Fractions (Unlike Denominators)	Add and subtract fractions with unlike denominators that refer to the same whole by generating equivalent fractions.	Use Tools Strategically "Liz's Leftovers"	Consider and use available tools when solving problems.	*Digging Up Dinosaurs* Build and Test	Apply mathematics to solve problems arising in everyday life, society, and the workplace.
Day 14					*Digging Up Dinosaurs* Improve	
Day 15	Multiplying Fractions	Extend previous understandings of multiplication to represent and solve multiplication of a fraction by a whole number or another fraction.	Analyze the Structure "Richie's Ribbons"	Observe closely to discern a pattern or structure in a problem.	*Digging Up Dinosaurs* Reflect and Share	Make sense of problems and plan, solve, justify and evaluate solutions.
Day 16					*Bones and Skeletons* Learn Content, Understand the Challenge, and Brainstorm	Create a model of a human skeleton to experiment with how humans bend their bodies.

Rising 6th Grade Scope and Sequence *(cont.)*

	Mathematics Skills and Concepts 60–65 minutes per day		Problem-Solving and Discourse 10–15 minutes per day		STEAM 45 minutes per day	
	Mathematics Focus	Standards	Mathematical Practice and Card Title	Standard	Challenge Title and STEAM Step	Standard
Day 17	Dividing Fractions, Part I	Interpret and represent division of a whole number by a unit fraction and division of a unit fraction by a whole number.	Think Using Quantities "Leftovers"	Make sense of quantities and their relationships in problems.	*Bones and Skeletons* Design and Build	Apply mathematics to solve problems arising in everyday life, society, and the workplace.
Day 18					*Bones and Skeletons* Test and Reflect	
Day 19	Dividing Fractions, Part II	Extend previous understanding of division to divide a unit fraction by a non-zero whole number.	Use Tools Strategically "Brownies to Share"	Consider and use available tools when solving problems.	*Bones and Skeletons* Redesign and Rebuild	Make sense of problems and plan, solve, justify and evaluate solutions.
Day 20					*Bones and Skeletons* Retest and Share	
Day 21	Finding Volume	Determine volumes of three-dimensional figures with whole number side lengths by counting individual unit cubes or layers of unit cubes.			*Living and Working in Space* Define the Problem	Make sense of problems and plan, solve, justify and evaluate solutions.
Day 22			Generalize Your Thinking "Prism Patterns"	Look for and express regularity in repeated reasoning.	*Living and Working in Space* Design	Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.
Day 23	Locating and Plotting on a Coordinate Plane	Understand and describe key attributes of the coordinate plane. Plot and label ordered pairs using the origin (0, 0).	Think Using Quantities "What's the Point?"	Make sense of quantities and their relationships in problems.	*Living and Working in Space* Build and Test	Apply mathematics to solve problems arising in everyday life, society, and the workplace.
Day 24					*Living and Working in Space* Improve	
Day 25	Culminating Activity				*Living and Working in Space* Reflect and Share	Make sense of problems and plan, solve, justify and evaluate solutions.

Rising 6th Grade STEAM Challenges and Materials

This chart includes descriptions and needed materials for the five STEAM Challenges.

Challenge Name	Description	Materials	
Life in a Cube (reader)	Teams re-create cubes similar to the one photographer David Liittschwager used to observe various habitats.	• classroom supplies (construction paper, glue, markers) • aluminum foil • cardboard pieces and tubes • craft sticks	• masking tape • newspaper • paint • plastic wrap • spray bottle
Gravity	Students create devices that slow a package as it falls.	• books or online resources about helicopter seeds, animals, and parachutes • calculator • coffee filters (2) • fabric (various types)	• plastic wrap • small box or another object weighing about 1 oz. (30 g) • stopwatch • string/yarn (3–4 ft, 1 m)
Digging Up Dinosaurs (reader)	Teams create displays that can present dinosaur skeletons.	• cardboard pieces • construction paper • cotton swabs • craft sticks • cue tips • foil	• masking tape • modeling clay • paper-mache materials • pipe cleaners • scissors

Rising 6th Grade STEAM Challenges and Materials *(cont.)*

Challenge Name	Description	Materials	
Bones and Skeletons	Students create simple model hands with fingers that can move.	• cardboard sheets (2–3) • cardstock • craft sticks (5–10) • disposable gloves (2) • fishing line (3–4 ft., 1 m) • modeling clay	• pipe cleaners (10–15) • straws (10–15) • wire (different gauges; optional) • yarn (3–4 ft., 1 m)
Living and Working in Space (reader)	Teams design and build specialized tools that improve the daily lives of astronauts in microgravity.	• cardboard pieces • cloth • craft sticks and tubes • masking tape • paper cups	• pipe cleaners • rubber bands • straws • string or twine

Rising 6th Grade Classroom Library Information

This chart includes important information about the books included in the classroom library.

Book Title	Lexile® Measure	*Guided Reading Level	Summary
At the Aquarium	840L	V	Get a behind-the-scenes look at how an aquarium functions. Discover and learn about different kinds of marine life while studying the sizes, shapes, and volumes of tanks. Learn how to measure volume by weighing aquarium animals and determining how much food they need to eat.
Basketball Angles	780L	U	Learn about angles through the fast-paced sport of basketball! Explore where angles exist in basketball strategies, such as dribbling, shooting, passing, and rebounding the ball. Discover how predicting angles can help you become a better basketball player!
Cells	770L	X	You can't see them, but every living thing is made of cells. They are the building blocks of life. And each cell has a specific function. What do the cells in your blood do? What about the cells in your eyes? You might be surprised to learn how these tiny cells have such important duties.
Chemical Reactions	720L	Y	Dynamite is highly explosive. This is because it's a chemical reaction waiting to happen. Many things go through chemical reactions. When you cook or eat, a chemical reaction takes place. Understanding chemical reactions will not only keep you safe, but it will also help reveal the world around you.
DNA	820L	Y	Twins can look identical. And siblings or children may look similar to other people in their family. Even kittens can have the same markings as other kittens in a litter. But why? The answer is DNA. DNA is what makes family members look similar but also makes them unique. DNA is what makes you, well, you!
Comic Conventions: Division	790L	T	Join Zach as he visits a comic convention and finds out why "fans" is short for "fanatics"! Show off your strategies for division as the crowds show off their love for comic books, movies, and characters.

Rising 6th Grade Classroom Library Information (cont.)

Book Title	Lexile® Measure	*Guided Reading Level	Summary
Graphs in Action	770L	S	Explore the world of graphs! Learn how to create bar graphs, line graphs, pictographs, and circle graphs. Discover how graphs are labeled and can visually organize information. Then, create your own graphs.
Hot Air Balloons	830L	V	Have you ever wondered how hot air balloons work? Discover the mechanics of hot air balloons while also learning how to calculate the volume of a balloon and its basket. Explore how volume has real-world applications.
Stars	860L	V	Stars light up the sky on a clear night. They may look the same from Earth, but they come in many sizes and colors. Some stars are closer to Earth than others. Some are old, and some are young. Even though stars are so far away, learning about them helps us to better understand the world around us.
The Powerful Ocean	780L	V	The ocean is beautiful, powerful, and refreshing. The salty water provides the perfect home for many plants and animals. Within these waters are choppy currents and strong tides. But without the ocean, our world would be a very different place.

These titles have been officially leveled using the F&P Text Level Gradient™ Leveling System.

SUMMER
Scholars
Mathematics

Teacher's Guide

Rising 6th Grade

Days 3–4 Overview

Working with Expressions

Learning Outcome

- Write simple expressions that record calculations with numbers and interpret numerical expressions without evaluating them. For example, *express the calculation "add 8 and 7, then multiply by 2" as $2 \times (8 + 7)$. Recognize that $3 \times (18,932 + 921)$ is three times as large as $18,932 + 921$, without having to calculate the indicated sum or product.*

Focus

The following lesson will address this focus question: *How do you write a numerical expression?* You may wish to write the focus question on the board or chart paper and read it aloud to students.

Student Misconceptions

Students often do not understand the difference between the terms *expression* and *equation*. They may use the two terms interchangeably. An *equation* results when two expressions are *equivalent* or *equal*. For example, $3 \times 8 = 6 \times 4$ and $4 = 24 \div 6$ are equations. An *expression* includes numbers and operational symbols but does not contain an equal sign. An easy way to teach the difference is to point out that the term *equation* contains most of the word *equal*; therefore, it needs an equal sign.

• •

Mathematical Discourse

Learning Outcome

- Look for and make use of structure while solving math problems. Understand that analyzing structure means to look at how the mathematics in the task is organized to solve.

• •

Life in a Cube

Learning Outcome

- Use mathematical knowledge to build and improve upon an engineering design.

Materials

- *Student Guided Practice Book* (pages 16–27)
- *Ms. Suh's Math Question* task card
- *Life in a Cube* book
- index cards

Materials per STEAM Group

- classroom supplies (construction paper, glue, markers)
- aluminum foil
- cardboard pieces and tubes
- craft sticks
- masking tape
- newspaper
- paint
- plastic wrap
- spray bottle

Working with Expressions

Warm-Up

1. Say, "Today, you will be practicing using the Order of Operations by creating your own expressions and making a clock face. You will use the number *4* to create expressions that equal the numbers 1–12. You can only write the number *4* four times in each expression. Remember to use the correct order of operations to solve the problems: *Parentheses*, *Exponents*, *Multiply*, *Divide*, *Add*, or *Subtract*.

2. Show students an example. Say, "In the expression $4 \times (4 \div 4) + 4$, the first step I need to complete is to solve inside the parentheses. The second step is to multiply, and the last step is to add." Show the steps on the board or chart paper. Say, "Since the solution is *8*, I am going to write that expression on my clock where the number *8* is." Draw a clock by making a circle on the board or chart paper, and write the expression $4 \times (4 \div 4) + 4$ in place of the 8.

3. Allow students time to work with partners to complete their clocks. Have students share their expressions to confirm their answers.

Language and Vocabulary

1. Write the following vocabulary terms on the board or chart paper. Review the definition of each term with the class.

   equation   expression

   evaluate

2. Explain to students that they will create a visual image for each word to help them remember its meaning. Begin with the word *equation*. Say, "Equations are number sentences that include an equal sign and a value on either side of the equal sign." Ask students to think of a relevant visual image that goes with this word. Direct the discussion toward the use of an equal sign. Draw an equal sign on the board or chart paper.

3. Now, do the same with the word *expression*. Say, "An expression is a number sentence that does not have an equal sign." Ask students to think of a relevant visual image. If students do not have any ideas, suggest an equal sign circled with a line through it.

4. Conclude with the word *evaluate*. Say, "In math, you may be asked to evaluate a problem. This means to simplify or solve the problem." Ask students to think of a relevant visual image that goes with this word. The letter *S* may help them to remember that *evaluate* means "to simplify or solve."

5. Show examples of expressions and equations. Ask students to state whether the example is an expression or an equation. Examples may include:

   $(10 \div 2) + 5$
   $25 - (6 + 3) = 2 \times 8$
   $4 \times 2 + (6 \div 3)$
   $(60 + 24) \div 4 = 3 \times 7$

Working with Expressions

I Do ⏱ 10 min

1. Say, "Today, we are going to write mathematical expressions. Here is an example: *Add 5 and 6 together. Then, multiply the sum by 2.*" Say, "Write an expression that uses numbers and symbols to represent these two sentences." Allow time for students to write an expression. Observe students' answers.

2. Write $5 + 6 \times 2$ on the board or chart paper. Say, "I noticed that some of you wrote this expression. This makes sense as we follow what the words say. First, it says to add 5 and 6. Then, it says to multiply by 2." As you talk, point to each part of the sentence and the expression to make a connection between the two representations.

3. Say, "I remember that the Order of Operations says we must multiply *before* we add. In this problem, I must multiply 6 times 2, and then add 5. But that is not what the words say to do."

4. Ask, "What can I do to make sure that we add before we multiply?" Allow for student responses. If students do not suggest that parentheses are needed, ask, "What mathematical symbol is used to indicate that part of the expression needs to be completed first?" Add parentheses to the expression: $(5 + 6) \times 2$. Then, say, "The parentheses show I need to add 5 and 6 together first. Then, I need to multiply the sum by 2." Ask, "Is there another way I can write this expression?" *($2 \times (5 + 6)$ or $2(5 + 6)$)*

5. Say, "Let's do another example: *Divide 16 and 8. Then, double it.* Have students write the expression. Ask for volunteers to write their expression on the board or chart paper, and have the class agree or disagree by giving a thumbs-up or thumbs-down. Ask if any students wrote the expression a different way and have them present their expression on the board or chart paper. Students may have suggested *($16 \div 8) \times 2$ or $2 \times (16 \div 8)$ or $2(16 \div 8)$.*

6. Next, write the expression $25 \times (104 + 246)$ on the board or chart paper. Say, "I don't want you to solve or evaluate this expression. Instead, I want you to interpret the expression. Tell your partner what the expression means." Allow time for students to discuss the meaning of the expression. Have students share their responses. Students should indicate that the parentheses tell them to add first. The solution will be 25 times greater than the sum. Say, "The reason we are interpreting the expression and not solving it is to get practice in understanding the meaning of the expression before solving. If we understand what we are doing before doing it, we know if our solution is reasonable."

Working with Expressions

We Do 🕐 15 min

1. Display *Expressive Expressions* from page 16 of the *Student Guided Practice Book.* Say, "Let's look at some more expressions together." First, read Question 1: *Add seven and two. Multiply the sum by four.*

2. Ask, "How can we write this expression to make sure we calculate it in the correct order?" Allow students to write the expression on their activity sheets. Provide specific feedback to students, such as "I notice you have 7 + 2 × 4. That is the order of the wording in the problem, but the Order of Operations tells us that we must multiply before adding. How can you make sure the addition expression is completed first? Is there a grouping symbol you could use? Which one?"

Support for Language Learners: As you work through this lesson, provide each student an index card with relevant math vocabulary and symbols recorded on it. For example: *sum, add, plus*; *difference, minus, subtract*; *product, times*; *quotient, divide.* To further support students' vocabulary development, you can display these words on a word wall with their definitions and examples. It may also be helpful to list the relevant grouping symbols students will use on the board or chart paper.

3. Have students explain their solution for Question 1. To help students explain their reasoning, provide them with the following sentence frames:

   • *In this problem, the _____ and the _____ need to be calculated first.*

   • *I can represent this by putting those numbers and the operation in _____.*

   • *After I find the _____, then I have to _____.*

4. Repeat Steps 1–3 for Question 2: *Four times the difference of five and two.*

5. Ask students to study the expression in Question 3: $(12 − 6) ÷ 3$. Say, "We are not going to solve this problem. Instead, we will interpret what it means." Have students discuss the expression with their partner. Ask students to share their interpretations. Write a sample response on the board or chart paper: *First, we need to find the difference of 6 from 12. Then, we divide the difference by 3. The solution will be $\frac{1}{3}$ of the difference.*

6. Have students explain their reasoning for Question 3. To help students explain their reasoning, provide them with the following sentence frames:

   • *First, calculate what is in the _____ and find the difference.*

   • *Next, _____ the difference by 3.*

   • *The solution to the expression will be a _____ of the difference.*

7. Repeat Step 6 for Question 4: $3 × (2,489 + 1,321)$.

You Do 🕐 10 min

1. Display *Examining Expressions* from page 17 of the *Student Guided Practice Book.* Provide the sentence frames from Steps 3 and 6 of the We Do section to help students explain their reasoning.

2. Have students share their expressions and reasoning. If students have difficulty explaining their reasoning, remind them to use the sentence frames and vocabulary terms.

Analyze the Structure

Ms. Suh's Math

Ms. Suh asks her students to find the sum of the following expression:

$(18 \times 2) + (18 \times 8)$

Her students find the correct value of 180. They use order of operations. Then, Ms. Suh says that they can calculate this answer in their heads! She shows them that they can rewrite the expression as $18 \times (2 + 8)$ because 18 is the same factor for both parts of the expression. So $18 \times (2 + 8)$ is the same as 18×10. Students can calculate 18×10 using mental math.

Here are 2 other examples to calculate. Think about structure as you look for ways to be able to calculate in your head.

$(24 \times 6) + (24 \times 4) = ?$

$(19 \times 3) + (19 \times 7) = ?$

Explain how to calculate these expressions using mental math.

Extend your thinking!

Solve the following problems:

$(24 \times 98) + (24 \times 2)$

$(35 \times 96) + (35 \times 4)$

$(8 \times 108) + (8 \times 12)$

Share your strategies and solutions with a partner.

Look back at the numbers in the task and the first extension. How did the structure of the expressions help you mentally solve them? Write an example expression where this structure isn't as easy to solve using mental math.

Understand the Strategy

The Analyze the Structure practice or process stems from *look for and make use of structure*. As this practice or process is introduced, it is important that students understand that analyzing structure is about looking at how the mathematics in the task is organized and using that to make the task easier to solve. For example, students might reorder addends into friendly numbers or rearrange a shape to resemble another shape to find its area. These tasks have been written strategically to elicit student thinking around numerical and geometric relationships, the properties of numbers, and applying strategies which they've used before.

Procedure

1. Display the *Ms. Suh's Math* task card and read aloud the text. Remind students to use the Understand and Plan, Share and Discuss, and Reflect and Write routines as they work through the task. Review these routines if needed. (See pages 21–26 in the *Management Guide*.)

2. Allow time for students to collaborate with partners as they follow the routines and work through the task from pages 18–19 of the *Student Guided Practice Book*. (Students will complete the extensions on the next day.)

Answer: $(24 \times 6) + (24 \times 4) = 24 \times 10 = 240$
$(19 \times 3) + (19 \times 7) = 19 \times 10 = 190$

Possible Misconception: Students may think that the order of operations is the only approach to these expressions.

Language Support

- **Tier 3:** order of operations, calculate
- **Tier 2:** value, structure, expressions

Scaffolding

Ask students to solve this expression: $3 \times (4 + 2)$. Have them compare their approaches. If they all add $(4 + 2)$ first, ask them to multiply $(3 \times 4) + (3 \times 2)$. Ask them to consider how these two approaches arrive at the same solution.

Life in a Cube

Materials and Preparation

- Prepare supplies for groups to use while building (construction paper, glue, markers, aluminum foil, cardboard pieces and tubes, craft sticks, masking tape, newspaper, paint, plastic wrap, spray bottle).

Read Aloud ⏱ (5 min)

1. Review the information from the previous day's read aloud.

2. Read another section of the *Life in a Cube* book. Pause periodically to discuss new information and any questions students may have.

Build ⏱ (30 min)

1. Have groups review their *Collaborative Design* from page 15 of the *Student Guided Practice Book*. Explain to students that when they work with their groups to build the cubes, they must follow their team's design plans. Reassure them that they will have an opportunity to change and improve their designs after they present them.

2. Review classroom expectations for working with materials. Then, give teams time to build their cubes.

3. Have students complete questions one and two on *Think about It* from page 20 of the *Student Guided Practice Book*. Explain that reflection is an important part of the engineering design process. After students have completed *Think about It*, ask volunteers to share their responses.

Teacher Tip: The students will test their cubes for durability. To create a more authentic experience for the Life in a Cube challenge, consider setting the cubes outdoors before the start of Day 5 and bringing students outside during STEAM to observe life in their cubes.

Test ⏱ (15 min)

1. Gather teams for testing. Have teams transport their cubes to the testing location. Tell students they will test whether their cubes are waterproof and durable.

2. Explain that teams will offer feedback after each test. Use *Friendly Feedback* from page 21 of the *Student Guided Practice Book* to review best practices for giving feedback.

3. Display *Cube Test Results* from page 22 of the *Student Guided Practice Book*. Ask students to record results for each team.

4. Give time for each team to test. Ask a member of each group to explain how their models blend into the environment. Ask another member of the group to spray the cube with water and drop the cube from 1 meter (3 feet) high. A successful design blends in with the environment and survives the durability tests.

5. Tell students that teams will brainstorm ways to improve their designs on the next day of instruction.

Working with Expressions

Progress Monitoring 👤 ⏱(5 min)

1. Have students complete *Quick Check* from page 23 of the *Student Guided Practice Book* to gauge student progress toward mastery of the learning outcomes.

2. Based on the results of the *Quick Check* and your observations during the lesson, identify students who may benefit from additional instruction in the learning outcomes. These students should be placed in a small group for reteaching.

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Rotations 👥 👤 ⏱(30 min)

Place students in two groups. Work with one group on the Refocus activity while the other group is completing the Practice activity. Rotate after 15 minutes. Work with the second group on the Extend activity while the first group completes the Practice activity.

Refocus 👥

1. Say, "Let's practice writing expressions by matching the words to the correct expression." Read the following words: *the sum of six and three multiplied by two.* Write the following expressions on the board or chart paper: *2 × (6 + 3)* and *6 + 3 × 2*. Ask students to choose which expression matches the words and to explain their thinking. Students should choose *2 × (6 + 3)* and explain that first they need to add 6 and 3, and then multiply the sum by 2.

2. Write the following expression on the board or chart paper: *5 × (4 + 3)*. Ask, "How could we write this expression in words?" Provide words like *first*, *second*, *then*, or *next* to guide students to see that there is an order to solving the problem. Together, write the expression in word form. For example: *The sum of four and three multiplied by five.*

3. Support students as they complete Question 1 on *Refocus* from page 24 of the *Student Guided Practice Book*, and then have them solve Question 2 independently.

Extend 👥

1. Write on the board or chart paper: *{4 + [(0 + 5) × 3]} × 2*. Remind students that when there is more than one grouping symbol, they need to work from the inside to the outside of the expression, starting with the parentheses. Work together to interpret the expression.

2. Support students as they complete the *Extend Learning Task* from page 25 of the *Student Guided Practice Book*.

Practice 👤

- **Refocus Group Practice:** Have students complete the questions on *Refocus* from page 24 of the *Student Guided Practice Book* to reinforce their learning.

- **Extension Group Practice:** Have students complete *Independent Practice* from page 26 of the *Student Guided Practice Book*.

Working with Expressions

Math in the Real World ⬚⬚⬚ ⬚⬚ ⏱25min

1. Display *Math in the Real World: Double Day for Dogs* from page 27 of the *Student Guided Practice Book*. Have a student read the task aloud. Tell students to explain or summarize the task to their partners. Have a few students share their summaries.

2. Ask students to think about what information they need to solve the task and what the task is asking them to do. Then, have them share with partners. Ask a few students to share aloud. Students should identify that they know Finnegan bought 5 bags of Mutt's Mix and 3 Doggie Donuts. Then, he got 5 more bags and 3 more donuts for free. Students need to find out if Finnegan's expression is correct. Have students work in groups of two or three to complete the task.

3. As students are working, circulate and ask focusing, assessing, and advancing questions:

   • What information do you know?

   • How can you use this information in a mathematical expression?

   • How can you explain your reasoning?

4. Observe how students are solving the task, and choose a few groups who solved the task in different ways to share their solutions and reasoning. Try to have solutions move from concrete to abstract representations. For example, have students share solutions with a visual representation (drawing), and then the symbolic representation (expression). Make sure students explain their reasoning as they share solutions.

5. As groups are sharing their solution paths, reasoning, and strategies, ask questions:

   • Do you agree or disagree with the solution path and reasoning? Why?

   • Who can restate _____'s strategy/solution path/reasoning?

   • Which solution path makes the most sense to you? Why?

Support for Language Learners: Share these sentence frames to help students explain their reasoning.

• *Finnegan is/is not correct because _____.*

• *In this problem, he did/did not include the correct numbers and operations.*

• *He did/did not put the problem in the correct order. I know this because _____.*

Analyze the Structure

Mathematical Discourse Card Extensions 👥 ⏱15 min

1. Allow time for students to complete the routines for the *Ms. Suh's Math* task from the previous day.

2. Have students work in pairs to complete the extensions.

   • Solve the following problems: (24 × 98) + (24 × 2); (35 × 96) + (35 × 4); (8 × 108) + (8 × 12). Share your strategies and solutions with partners. (*2,400*; *3,500*; *960*)

   • Look back at the numbers in the task and the first extension. How did the structure of the expressions help you mentally solve them? Write an example expression where the structure isn't as easy to solve using mental math.

Life in a Cube

Materials and Preparation

• Prepare supplies for students to use while rebuilding their cubes (construction paper, glue, markers, aluminum foil, cardboard pieces and tubes, craft sticks, masking tape, newspaper, paint, plastic wrap, spray bottle).

Read Aloud 👥 ⏱5 min

1. Review the information from the previous day's read aloud.

2. Read pages of the *Life in a Cube* book for about five minutes. Pause periodically to discuss new information and any questions students may have.

Improve 👥 ⏱40 min

1. Have teams review the feedback they received on the previous day of instruction.

2. Provide time for teams to brainstorm ways to improve their designs based on test results and feedback. Refer students back to *Collaborative Design* from page 15 of the *Student Guided Practice Book*. Ask them to sketch their improved designs and explain any changes. Have students submit improved designs for approval before building.

3. Have teams gather materials to improve their designs. Then, have them retest their model cubes.

4. Have students answer numbers 3–4 on *Think about It* from page 20 of the *Student Guided Practice Book* to reflect.

Teacher Tip: To create a more authentic experience for the *Life in a Cube* challenge, consider setting the cubes outdoors before the start of Day 5 and bringing students outside during STEAM to observe life in their cubes.

Summer Scholars

Mathematics

Student Guided Practice Book

Rising 6th Grade

TCM | Teacher Created Materials

Expressive Expressions

Day 3

Directions: Write an expression to match the words. Then, explain your answer.

1 Add seven and two. Multiply the sum by four.

Expression: _____

✏️ **Explain:** _____

_____

2 Four times the difference of five and two

Expression: _____

✏️ **Explain:** _____

_____

Directions: Interpret the meaning of the expression. Then, explain your reasoning.

3 $(12 - 6) \div 3$

Meaning:_____

✏️ **Explain:** _____

_____

4 $3 \times (2{,}489 + 1{,}321)$

Meaning:_____

✏️ **Explain:** _____

_____

Examining Expressions

Directions: Write an expression to match the words. Then, explain your answer.

1 Subtract five from nine. Add two to the difference.

Expression: _____

✏️ **Explain:** _____

_____

2 Multiply the sum of three and six by five.

Expression: _____

✏️ **Explain:** _____

_____

Directions: Interpret the meaning of the expression. Then, explain your reasoning.

3 $3 \times (1 + 7)$

Meaning: _____

✏️ **Explain:** _____

_____

4 $(5{,}348 - 3{,}268) \times 2$

Meaning: _____

✏️ **Explain:** _____

_____

Name: _____   Date: _____

Ms. Suh's Math

Ms. Suh asks her students to find the sum of the following expression:

$(18 \times 2) + (18 \times 8)$

Her students find the correct value of 180. They use order of operations. Then, Ms. Suh says that they can calculate this answer in their heads! She shows them that they can rewrite the expression as $18 \times (2 + 8)$ because 18 is the same factor for both parts of the expression. So $18 \times (2 + 8)$ is the same as 18×10. Students can calculate 18×10 using mental math.

Here are 2 other examples to calculate. Think about structure as you look for ways to be able to calculate in your head.

$(24 \times 6) + (24 \times 4) = ?$

$(19 \times 3) + (19 \times 7) = ?$

Explain how to calculate these expressions using mental math.

Extend your thinking!

Solve the following problems:

$(24 \times 98) + (24 \times 2)$

$(35 \times 96) + (35 \times 4)$

$(8 \times 108) + (8 \times 12)$

Share your strategies and solutions with a partner.

Look back at the numbers in the task and the first extension. How did the structure of the expressions help you mentally solve them? Write an example expression where the structure isn't as easy to solve using mental math.

Analyze the Structure

" Reflect and Write

Student 1: "What did we look for to help make the task easier?"

Student 2: Respond.

Student 2: "How did we apply what we know to help us?"

Student 1: Respond.

Both reflect: "How did we analyze the structure in this task?"
"

Both write: We analyzed the structure by _____

_____

_____

_____
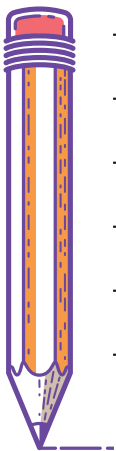
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_____

Name: _____ Date: _____

Think about It

1. What did your team struggle with? How did you deal with it? _____

_____

_____

_____

2. How did you contribute to your team? _____

_____

_____

3. How did you use science, technology, engineering, the arts, and/or math in your

designs? _____

_____

_____

_____

_____

_____

4. What was successful about your first design? How did you improve it? _____

_____

_____

_____

5. What is the most important thing you learned? What questions do you still have?

_____

_____

_____

_____

Name: _____ Date: _____

Friendly Feedback

Directions: Feedback can help people improve their work. Use these sentence stems to give feedback to your peers.

Clarify

Can you explain _____ ?

Why did you choose to _____ ?

How did you _____ ?

Warm Feedback

I like _____ because _____ .

It is interesting that _____ .

_____ is a good idea because _____ .

Cool Feedback

Have you thought about _____ ?

I wonder if _____ .

You might want to try _____ .

Cube Test Results

Directions: Record notes and sketches for at least 4 types of life that pass through your cube. Check boxes to show whether your team's model met the design constraints and criteria.

Test Results	
❑ accurate size ❑ waterproof	❑ durable when dropped from 1 meter (3 feet) ❑ blends into surroundings
Observations	
1.	3.
2.	4.

Quick ✔ Check

Directions: Match the expression to its correct word form.

Expression	Word Form
1 $4 \times 3 \div 2$	**A** Add two and three. Multiply the sum by four.
2 $(2 + 3) \times 4$	**B** Add two to the product of four and three.
3 $2 \times (3 + 4)$	**C** Double the sum of three and four.
4 $4 \times 3 + 2$	**D** Multiply three and four. Divide by two.

1 _____   **2** _____

3 _____   **4** _____

Directions: Interpret the meaning of the expression below. Explain your reasoning.

5 $4 \times (3{,}489 + 2{,}149)$

_____

_____

_____

_____

Refocus

Directions: Answer each question.

1 $5 \times (9 - 3)$

Write the expression using words.

First,_____.

Then,_____.

Interpret the meaning of the expression.

_____

_____

2 $(6 + 4) \times 8$

Write the expression using words.

First,_____.

Then,_____.

Interpret the meaning of the expression.

_____

_____

✎ **Choose Question 1 or 2. Explain your thinking.**

_____

_____

_____

Extend Learning Task

Directions: Answer each question.

1 $2 \times \{4 + [(6 + 7) \times 3]\}$

Write the expression using words.

_____

_____

_____

Interpret the meaning of the expression.

_____

_____

_____

2 $\{10 - [4 + (12 \div 6)]\} \times 4$

Write the expression using words.

_____

_____

_____

Interpret the meaning of the expression.

_____

_____

_____

Independent Practice

Directions: Write an expression to match the words.

1 Double the sum of ten and four.

_____

2 Subtract two from twelve. Divide by two.

_____

3 Six less than the sum of eight and five

_____

4 Seven times the difference of six and four

_____

Directions: Interpret the meaning of the expression.

5 $34 \times (13{,}214 + 435)$

_____

_____

_____

6 $(40 + 35) \div 5$

_____

_____

_____

Math in the Real World
Double Day for Dogs

Finnegan was never without his bulky bulldog named Big Mac. One day, Finnegan was shopping at Lucky Dog BARKery. He bought 5 bags of Mutt's Mix and 3 Doggie Donuts. The cashier said, "Today is your lucky day. It is Double Day for Dogs! You get double the treats without having to pay more." Finnegan wrote an expression for this deal: $5 + 3 \times 2$. Is his expression correct? Why or why not?

Unpack the Problem

Make a Plan

Solution

Look Back and Explain