Teacher Edition

Eureka Math® Grade 2 Modules 1 & 2

TEKS EDITION

Special thanks go to the Gordon A. Cain Center and to the Department of Mathematics at Louisiana State University for their support in the development of *Eureka Math*.

Great Minds® is the creator of *Eureka Math®*, *Wit & Wisdom®*, *Alexandria Plan™*, and *PhD Science®*.

Published by Great Minds PBC
greatminds.org

Printed in the USA

1 2 3 4 5 6 7 8 9 10 XXX 25 24 23 22 21

ISBN 978-1-63642-848-2

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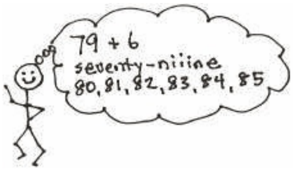
Sums and Differences to 100

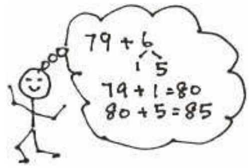
OVERVIEW

Fluency with basic facts within 20 (**2.4A**) is a year-long pursuit for students in Grade 2. Proficiency with basic facts is built over time with multiple encounters in many contexts. In Module 1, students must use their knowledge of decomposition to practice and apply basic facts. For example, when considering 17 + 8, students reason about how to make the next ten (20) by deciding how to best decompose 8. They may think about various ways of decomposing 8 before settling on 3 + 5. In this process, students are thinking about parts of 10 as well as parts of 8. Thus, students build not only basic facts, but also number sense. The current module helps to set the foundation for students to master sums and differences to 20 (**2.4A**). Students subsequently apply these skills to fluently add one-digit to two-digit numbers at least through 100 using place value understanding, properties of operations, and the relationship between addition and subtraction (**2.4A, 2.4B**). In Grade 1, students worked extensively with numbers to gain fluency with sums and differences within 10 (**1.3D**) and became proficient in counting on. They also began to make easier problems to add and subtract within 20 and 100 by making ten and taking from ten (**1.3A, 1.3D, 1.3E, 1.3F, 1.5C, 1.5G**).

Count on



Make an easier problem



In Module 1, students advance from Grade 1's subtraction of a multiple of ten to a new complexity, subtracting single-digit numbers from both multiples of ten (e.g., 40 – 9) and from any two-digit number within 100 (e.g., 41 – 9).

40 – 9 = 31
/\
30 10
10 – 9 = 1
30 + 1 = 31

41 – 9 = 32
/\
31 10
10 – 9 = 1
31 + 1 = 32

Topic A's two lessons are devoted solely to the important practice of fluency, the first lesson working within 20 and the second extending the same fluencies to numbers within 100. Topic A reactivates students' Kindergarten and Grade 1 learning as they energetically practice the following prerequisite skills for decomposition and composition methods:

- decompositions of numbers within ten (e.g., 0 + 7, 1 + 6, 2 + 5, and 3 + 4, all equal seven).
- partners to ten (e.g., 10 and 0, 9 and 1, 8 and 2, 7 and 3, 6 and 4, 5 and 5, and "I know 8 needs 2 to make ten").
- tens plus sums (e.g., 10 + 9, 10 + 8).

For example, students quickly remember make ten facts. They then immediately use those facts to solve problems with larger numbers (e.g., "I know 8 needs 2 to make 10, so 58 needs 2 to make 6 tens or sixty!"). Lessons 1 and 2 include Sprints that bring back automaticity with the *tens plus* sums, which are foundational for adding within 100 and expanded form (e.g., "I know 10 + 8 = 18, so 40 + 8 = 48").

Topic B takes Grade 1's work to a new level of fluency as students make easier problems to add and subtract within 100 by using the number system's base ten structure. The topic begins with students using place value understanding to solve problems by adding and subtracting like units (e.g., "I know 8 – 5 = 3, so 87 – 50 = 37 because 8 tens – 5 tens = 3 tens. I know 78 – 5, too, because 8 ones – 5 ones = 3 ones. I used the same easier problem, 8 – 5 = 3, just with ones instead of tens!"). Students then practice making ten within 20 before generalizing that strategy to numbers within 100 (e.g., "I know 9 + 6 = 15, so 79 + 6 = 85, and 89 + 6 = 95").

The preceding lessons segue beautifully into the new concepts of Topic B, subtracting single-digit numbers from two-digit numbers greater than 20. In Lesson 6, students use the familiar take from ten strategy to subtract single-digit numbers from multiples of ten (e.g., 60 – 8, as shown below). In Lesson 7, students practice taking from ten within 20 when there is the complexity of some ones in the total (e.g., 13 – 8, as shown below). In Lesson 8, they then subtract single-digit numbers from 2-digit numbers within 100 when there are also some ones (e.g., 63 – 8, as shown below).

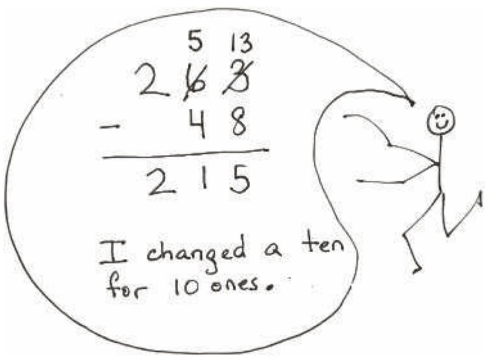
Lesson 6	Lesson 7	Lesson 8
60 – 8 = 52	13 – 8 = 5	63 – 8 = 55
50 10	3 10	53 10
10 – 8 = 2	10 – 8 = 2	10 – 8 = 2
50 + 2 = 52	3 + 2 = 5	53 + 2 = 55

Decompose and Subtract From Ten

These strategies deepen place value understandings in preparation for Module 3 and the application of those understandings to addition and subtraction in Modules 4 and 5. Listen to how the language of *make ten* and *take from ten* is foundational to the work of later modules:

Module 3: *"I have 10 tens, so I can make a hundred. It's just like I can make a ten when I have 10 ones."*

Module 5: *"When I solve 263 – 48, I take a ten from 6 tens to make 5 tens and 13 ones. Now, I am ready to subtract in the ones place" (pictured to the right)*.



Note that mastery of sums and differences within 100 is not to be expected in Module 1 but rather by Module 8. Because the amount of practice required by each student to achieve mastery prior to Grade 3 will vary, a motivating, differentiated fluency program needs to be established in these first 2 weeks to set the tone for the year.

In Grade 2 Module 1, Application Problems begin in Topic B. They contextualize learning as students apply strategies to solving simple *add to, take from, put together/take apart* problem types using the Read-Draw-Write, or RDW, process (**2.4C, 2.7C**). Application Problems may precede the Concept Development to act as the lead-in, allowing students to discover through problem-solving the logic and usefulness of a strategy before it is formally presented. Or, problems may follow the Concept Development so that students connect and apply new learning to real-world situations. At the beginning of Grade 2, problem-solving may begin more as a guided activity, with the goal being to move students to independent problem-solving, wherein they reason through the relationships embedded within the problem and choose an appropriate strategy to solve (MPS(C))

Notes on Pacing for Differentiation

It is not recommended to modify or omit any lessons in Module 1.

Focus Grade Level Standards

Number and Operations

The student applies mathematical process standards to develop and use strategies and methods for whole number computations in order to solve addition and subtraction problems with efficiency and accuracy.[1] The student is expected to:

2.4A recall basic facts to add and subtract within 20 with automaticity;

2.4B add up to four two-digit numbers and subtract two-digit numbers using mental strategies and algorithms based on knowledge of place value and properties of operations;

2.4C solve one-step and multi-step word problems involving addition and subtraction within 1,000 using a variety of strategies based on place value, including algorithms.

Algebraic Reasoning

The student applies mathematical process standards to identify and apply number patterns within properties of numbers and operations in order to describe relationships.[2] The student is expected to:

2.7C represent and solve addition and subtraction word problems where unknowns may be any one of the terms in the problem.

[1]From this point forward, fluency practice with addition and subtraction to 20 is part of the students' ongoing experience.
[2]From this point forward, fluency practice with addition and subtraction to 20 is part of the students' ongoing experience.

Foundational Standards

The student is expected to:

K.2E generate a set using concrete and pictorial models that represents a number that is more than, less than, and equal to a given number up to 20;

K.2F generate a number that is one more than or one less than another number up to at least 20;

K.2I compose and decompose numbers up to 10 with objects and pictures;

1.2B use objects, pictures, and expanded and standard forms to represent numbers up to 120 in more than one way as so many hundreds, so many tens, and so many ones;

1.3A use concrete and pictorial models to determine the sum of a multiple of 10 and a one-digit number in problems up to 99;

1.3D apply basic fact strategies to add and subtract within 20, including making 10 and decomposing a number leading to a 10;

1.3E explain strategies used to solve addition and subtraction problems up to 20 using spoken words, objects, pictorial models, and number sentences;

1.3F generate and solve problem situations when given a number sentence involving addition or subtraction of numbers within 20;

1.5C use relationships to determine the number that is 10 more and 10 less than a given number up to 120;

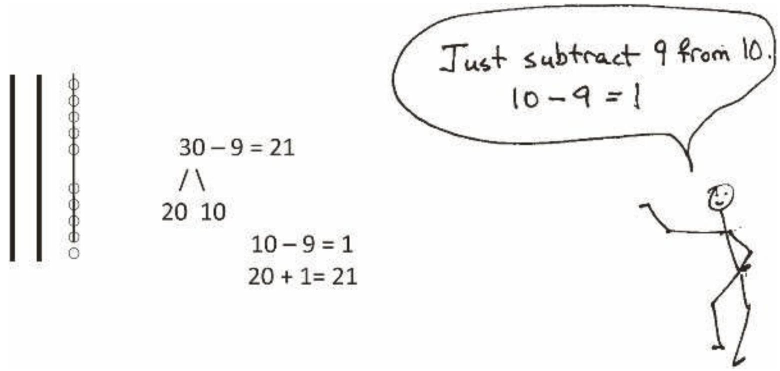
1.5G apply properties of operations to add and subtract two or three numbers.

Focus Mathematical Process Standards

The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

MPS(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

MPS(F) analyze mathematical relationships to connect and communicate mathematical ideas.



Overview of Module Topics and Lesson Objectives

TEKS	ELPS		Topics and Objectives	Days
2.4A **2.4B** K.2E K.2F K.2I 1.2A 1.2B 1.3D 1.3E 1.3F 1.5G	1.C 2.C 2.I 3.E 3.G 4.D 4.G	A	**Foundations for Fluency with Sums and Differences Within 100** Lesson 1: Practice making ten and adding to ten. Lesson 2: Practice making the next ten and adding to a multiple of ten.	2
2.4A **2.4B** **2.4C** **2.7C** 1.3A 1.3D 1.5C	1.C 1.F 1.G 2.E 2.I 3.F 3.G 4.D 4.G 5.A 5.B	B	**Initiating Fluency with Addition and Subtraction Within 100** Lesson 3: Add and subtract like units. Lesson 4: Make a ten to add within 20. Lesson 5: Make a ten to add within 100. Lesson 6: Subtract single-digit numbers from multiples of 10 within 100. Lesson 7: Take from ten within 20. Lesson 8: Take from ten within 100.	6
			End-of-Module Assessment: Topics A–B (assessment 1 day, return ½ day, remediation or further applications ½ day)	2
Total Number of Instructional Days				**10**

Terminology

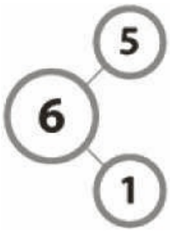
New or Recently Introduced Terms

- Make a ten (compose a unit of ten, e.g., 49 + 3 = 40 + 10 + 2)

Familiar Terms and Symbols[3]

- Addend (one of the numbers being added)
- A ten (a place value unit composed of 10 ones)
- Count on (count up from one addend to the total)
- Expression (e.g., 2 + 1, 13 – 6)
- Like units (e.g., frogs and frogs, ones and ones, tens and tens)
- Make ten and take from ten (e.g., 8 + 3 = 8 + 2 + 1 and 15 – 7 = 10 – 7 + 5 = 3 + 5)
- Number sentence (e.g., 2 + 3 = 5, 7 = 9 – 2, 10 + 2 = 9 + 3)
- Number bond (see image to the right)
- One (a place value unit, 10 of which may be composed to make a ten)
- Part (e.g., "What is the unknown part? 3 + ___ = 8")
- Partners to 10 (e.g., 10 and 0, 9 and 1, 8 and 2, 7 and 3, 6 and 4, 5 and 5)
- Say Ten counting (see the chart to the right)
- Ten plus facts (e.g., 10 + 3 = 13, 10 + 5 = 15, 10 + 8 = 18)
- Total (e.g., for 3 + 4 = 7 or 7 – 4 = 3, seven is the whole, or total)

Number Bond

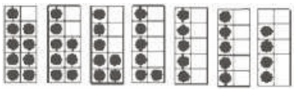


Regular	Say Ten
fifty-one	5 tens 1
sixty-seven	6 tens 7
seventy-five	7 tens 5
eighty-four	8 tens 4
ninety-five	9 tens 5

Suggested Tools and Representations

- 100-bead Rekenrek
- 5-group column
- Dice
- Hide Zero cards (Lesson 2 Template 1)
- Linking cubes
- Number bond
- Personal white boards
- Place value chart
- Quick ten (vertical line representing a unit of ten)
- Ten-frame cards (Lesson 1 Fluency Template 1)

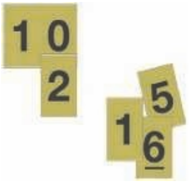
Ten-Frame Cards



5-Group Column

Rekenrek

Hide Zero Cards



Quick Ten and Ones

[3]These are terms and symbols students have seen previously.

The Value of Sprints in *Eureka Math*®

Myth: The purpose of Sprints is to help students learn how to solve math problems quickly.

Reality: **Sprints offer concentrated fluency practice on specific skills and concepts.**

A well-managed and carefully timed routine is used in a Sprint to create an environment where students are fully engaged and focused on the activity[4]. Students are not expected to complete all of the problems and should not be assessed on their speed. Instead, Sprints are intentionally designed to provide students with opportunities to strive for and measure their improvement from one Sprint to the next within an engaging and motivating environment.

Myth: Sprints require students to rely on rote memorization or rote procedure.

Reality: **Sprints build understanding and flexible problem solving.**

Sprints support procedural fluency, a critical component of mathematical proficiency[5], by fostering conceptual understanding and flexible problem solving. The problems in each Sprint are carefully selected and sequenced to help students recognize patterns and structures to solve subsequent, more complex problems.

$12 = 4 \times$ ____

$12 = 2 \times 2 \times$ ____

$12 = 3 \times 2 \times$ ____

For example, consider the sequence of problems shown. The first problem contains an unknown factor. The second problem intentionally decomposes the known factor in the first problem, 4, into 2 × 2. The third problem is a variation of the second problem with one given factor changed. This type of sequence allows students to solve the problems by flexibly using factual recall, pattern recognition, and numeracy strategies.

Myth: Sprints introduce new learning in a lesson.

Reality: **Sprints distribute practice over time.**

Sprints distribute practice over time, which leads to better retention of learning[6]. The mathematics in the Sprint may be related to the lesson but it is not used to introduce new learning.

Myth: Sprints use problems that aren't appropriate for some students.

Reality: **Sprints let all students practice at the level appropriate for them.**

Sprints allow students to focus on their own growth and to strive for their personal best. The problems are intentionally designed to progress in difficulty from simple to complex, and students are not expected to complete all of the problems. Instead, each student does their personal best based on their current automaticity with a given concept or skill.

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[4] Sagher, Yoram and M. Vali Siadat. "Building Study Skills in a College Mathematics Classroom." Research report, Richard J. Daley College, 1997. Education Resources Information Center (ED449834). https://eric.ed.gov/?id=ED449834.

[5] National Council of Teachers of Mathematics (NCTM). "Procedural Fluency in Mathematics: A Position of the National Council of Teachers of Mathematics." Accessed April 8, 2021. https://www.nctm.org/Standards-and-Positions/Position-Statements/Procedural-Fluency-in-Mathematics/. 2014.

[6] Brown, Peter, Henry L. Roediger III, and Mark A. McDaniel. *Make It Stick: The Science of Successful Learning.* Cambridge, MA: Harvard University Press. 2014.

Myth: Sprints should be a graded activity.

Reality: **Sprints are practice and formative assessments.**

Sprints are practice. They are not summative assessments. Sprints allow students to see their improvement from one Sprint to the next and provide teachers with a sense of each student's automaticity with a particular concept or skill. We strongly discourage grading Sprints.

Suggested Methods of Instructional Delivery

Directions for Administration of Sprints

Sprints are designed to develop fluency. They should be fun, adrenaline-rich activities that intentionally build energy and excitement. A fast pace is essential. During Sprint administration, teachers assume the role of athletic coaches. A rousing routine fuels students' motivation to do their personal best. Student recognition of increasing success is critical, and so every improvement is celebrated.

One Sprint has two parts with closely related problems on each. Students complete the two parts of the Sprint in quick succession with the goal of improving on the second part, even if only by one more.

With practice the following routine takes about 8 minutes.

Sprint A

Pass Sprint A out quickly, face down on student desks with instructions to not look at the problems until the signal is given. (Some Sprints include words. If necessary, prior to starting the Sprint, quickly review the words so that reading difficulty does not slow students down.)

T: You will have 60 seconds to do as many problems as you can.

T: I do not expect you to finish all of them. Just do as many as you can, your personal best. (If some students are likely to finish before time is up, assign a number to *count by* on the back.)

T: Take your mark! Get set! THINK! (When you say *THINK*, students turn their papers over and work furiously to finish as many problems as they can in 60 seconds. Time precisely.)

T: Stop! Circle the last problem you did. I will read just the answers. If you got it right, call out "Yes!" If you made a mistake, circle it. Ready?

T: (Energetically, rapid-fire call the first answer.)

S: Yes!

T: (Energetically, rapid-fire call the second answer.)

S: Yes!

Repeat to the end of Sprint A or until no one has any more correct. If need be, read the *count-by* answers in the same way the Sprint answers were read. Each number *counted by* on the back is considered a correct answer.

T: Fantastic! Now, write the number you got correct at the top of your page. This is your personal goal for Sprint B.

T: How many of you got 1 right? (All hands should go up.)

T: Keep your hand up until I say the number that is 1 more than the number you got right. So, if you got 14 correct, when I say 15 your hand goes down. Ready?

T: (Quickly.) How many got 2 correct? 3? 4? 5? (Continue until all hands are down.)

Optional routine, depending on whether or not the class needs more practice with Sprint A:

T: I'll give you one minute to do more problems on this half of the Sprint. If you finish, stand behind your chair. (As students work, the person who scored highest on Sprint A could pass out Sprint B.)

T: Stop! I will read just the answers. If you got it right, call out "Yes!" If you made a mistake, circle it. Ready? (Read the answers to the first half again as students stand.)

Movement

To keep the energy and fun going, always do a stretch or a movement game in between Sprints A and B. For example, the class might do jumping jacks while skip counting by 5 for about 1 minute. Feeling invigorated, students take their seats for Sprint B, ready to make every effort to complete more problems this time.

Sprint B

Pass Sprint B out quickly, face down on student desks with instructions not to look at the problems until the signal is given. (Repeat the procedure for Sprint A up through the show of hands for how many are right.)

T: Stand up if you got more correct on the second Sprint than on the first.

S: (Stand.)

T: Keep standing until I say the number that tells how many more you got right on Sprint B. So, if you got 3 more right on Sprint B than you did on Sprint A, when I say *3*, you sit down. Ready? (Call out numbers starting with 1. Students sit as the number by which they improved is called. Celebrate the students who improved most with a cheer.)

T: Well done! Now, take a moment to go back and correct your mistakes. Think about what patterns you noticed in today's Sprint.

T: How did the patterns help you get better at solving the problems?

T: Rally Robin your thinking with your partner for 1 minute. Go!

Rally Robin is a style of sharing in which partners trade information back and forth, one statement at a time per person, for about 1 minute. This is an especially valuable part of the routine for students who benefit from their friends' support to identify patterns and try new strategies.

Students may take Sprints home.

RDW or Read, Draw, Write (a Number Sentence and a Statement)

Mathematicians and teachers suggest a simple process applicable to all grades:

1. Read.
2. Draw and label.
3. Write a number sentence.
4. Write a word sentence (statement).

The more students participate in reasoning through problems with a systematic approach, the more they internalize those behaviors and thought processes.

- What do I see?
- Can I draw something?
- What conclusions can I make from my drawing?

Modeling with Interactive Questioning	Guided Practice	Independent Practice
The teacher models the whole process with interactive questioning, some choral response, and talk such as "What did Monique say, everyone?" After completing the problem, students might reflect with a partner on the steps they used to solve the problem. "Students, think back on what we did to solve this problem. What did we do first?" Students might then be given the same or a similar problem to solve for homework.	Each student has a copy of the question. Though guided by the teacher, they work independently at times and then come together again. Timing is important. Students might hear, "You have 2 minutes to do your drawing." Or, "Put your pencils down. Time to work together again." The Debrief might include selecting different student work to share.	The students are given a problem to solve and possibly a designated amount of time to solve it. The teacher circulates, supports, and thinks about which student work to show to support the mathematical objectives of the lesson. When sharing student work, students are encouraged to think about the work with questions such as, "What do you notice about Jeremy's work?" "What is the same about Jeremy's work and Sara's work?"

Personal White Boards

Materials Needed for Personal White Boards

1 heavy duty, clear sheet protector
1 piece of stiff red tag board 11″ × 8 ¼″
1 piece of stiff white tag board 11″ × 8 ¼″
1 3″ × 3″ piece of dark synthetic cloth for an eraser (e.g., felt)
1 low odor dry erase marker: fine point

Directions for Creating Personal White Boards

Cut the white and red tag to specifications. Slide into the sheet protector. Store the eraser on the red side. Store markers in a separate container to avoid stretching the sheet protector.

Frequently Asked Questions About Personal White Boards

Why is one side red and one white?

- The white side of the board is the "*paper*." Students generally write on it and if working individually, then turn the board over to signal to the teacher that they have completed their work. The teacher then says, "Show me your boards," when most of the class is ready.

What are some of the benefits of a personal white board?

- The teacher can respond quickly to gaps in student understandings and skills. "Let's do some of these on our personal boards until we have more mastery."
- Student can erase quickly so that they do not have to suffer the evidence of their mistake.
- They are motivating. Students love both the drill and thrill capability and the chance to do story problems with an engaging medium.
- Checking work gives the teacher instant feedback about student understanding.

What is the benefit of this personal white board over a commercially purchased dry erase board?

- It is much less expensive.
- Templates such as place value charts, number bond mats, hundreds boards, and number lines can be stored between the two pieces of tag for easy access and reuse.
- Worksheets, story problems, and other problem sets can be done without marking the paper so that students can work on the problems independently at another time.
- Strips with story problems, number lines, and arrays can be inserted and still have a full piece of paper on which to write.
- The red versus white side distinction clarifies expectations. When working collaboratively, there is no need to use the red side. When working independently, students know how to keep their work private.
- The sheet protector can be removed if necessary to project the work.

Scaffolds

The scaffolds integrated into *A Story of Units*® give alternatives for how students access information as well as express and demonstrate their learning. Strategically placed margin notes are provided within each lesson elaborating on the use of specific scaffolds at applicable times. They address many needs presented by English language learners, students with disabilities, students performing above grade level, and students performing below grade level. Many of the suggestions are organized by Universal Design for Learning (UDL) principles and are applicable to more than one population. To read more about the approach to differentiated instruction in *A Story of Units*, please refer to "How to Implement *A Story of Units*."

Self-Reflections

Directions for Using Student Self-Reflections

Giving students an opportunity to think and talk about their learning process and progress empowers them to take responsibility for their knowledge development. Self-reflections can be implemented at the end of every topic to encourage students to track their strategies and understanding of key concepts as they progress through the module. Students can refer to their completed Exit Tickets from each lesson within a topic as they reflect upon their learning of these concepts. In their reflections, students should evaluate the outcomes of their learning by writing about the concepts they feel secure with and those that will require more attention and focus. Students will use this knowledge to make actionable plans for improvement with the support of their teacher.

As students reflect on their learning within each topic, they can review previous reflections and discuss how their understanding has changed over time. Students can also use all of their reflections to analyze their overall learning experience for the entire module.

A self-reflection template is provided on the following page. The template is appropriate for use with students at all grade levels. Students can answer the questions on the template by using pictures, numbers, or words. Self-reflections are intended to be easily integrated into existing data-tracking structures used by teachers and students. The reflections can also be used to facilitate communication about a student's progress with the student's family.

Name ______________________________ Date ______________

Module __________ Topic __________

I learned:

5 I understand.

4

3

2

1 I need help.

Next steps:

I still have questions about:

Preparing to Teach a Module

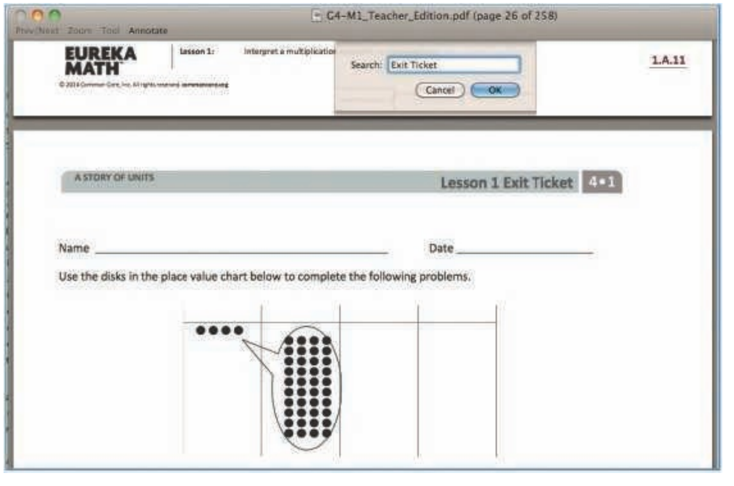
Preparation of lessons will be more effective and efficient if there has been an adequate analysis of the module first. Each module in *A Story of Units*® can be compared to a chapter in a book. How is the module moving the plot, the mathematics, forward? What new learning is taking place? How are the topics and objectives building on one another? The following is a suggested process for preparing to teach a module.

Step 1: Get a preview of the plot.

A: Read the Table of Contents. At a high level, what is the plot of the module? How does the story develop across the topics?

B: Preview the module's Exit Tickets[7] to see the trajectory of the module's mathematics and the nature of the work students are expected to be able to do.

Note: When studying a PDF file, enter "Exit Ticket" into the search feature to navigate from one Exit Ticket to the next.



Step 2: Dig into the details.

A: Dig into a careful reading of the Module Overview. While reading the narrative, *liberally* reference the lessons and Topic Overviews to clarify the meaning of the text—the lessons demonstrate the strategies, show how to use the models, clarify vocabulary, and build understanding of concepts. Consider searching the video gallery on *Eureka Math*'s website to watch demonstrations of the use of models and other teaching techniques.

B: Having thoroughly investigated the Module Overview, read through the chart entitled Overview of Module Topics and Lesson Objectives to further discern the plot of the module. How do the topics flow and tell a coherent story? How do the objectives move from simple to complex?

Step 3: Summarize the story.

Complete the Mid- and End-of-Module Assessments. Use the strategies and models presented in the module to explain the thinking involved. Again, liberally reference the work done in the lessons to see how students who are learning with the curriculum might respond.

[7]A more in-depth preview can be done by searching the Problem Sets rather than the Exit Tickets. Furthermore, this same process can be used to preview the coherence or flow of any component of the curriculum, such as Fluency Practice or Application Problems.

Preparing to Teach a Lesson

A three-step process is suggested to prepare a lesson. It is understood that at times teachers may need to make adjustments (customizations) to lessons to fit the time constraints and unique needs of their students. The recommended planning process is outlined below. Note: The ladder of Step 2 is a metaphor for the teaching sequence. The sequence can be seen not only at the macro level in the role that this lesson plays in the overall story, but also at the lesson level, where each rung in the ladder represents the next step in understanding or the next skill needed to reach the objective. To reach the objective, or the top of the ladder, all students must be able to access the first rung and each successive rung.

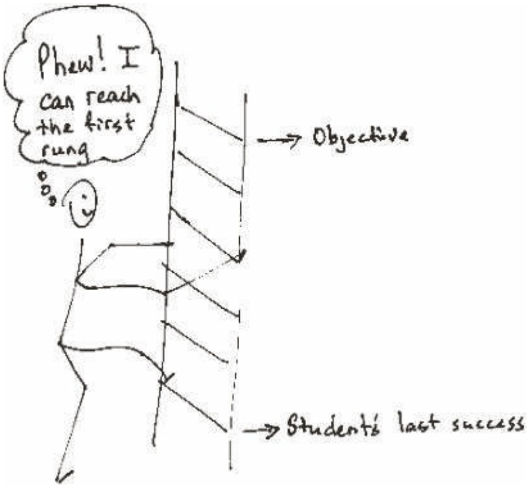
Step 1: Discern the plot.

A: Briefly review the module's Table of Contents, recalling the overall story of the module and analyzing the role of this lesson in the module.

B: Read the Topic Overview related to the lesson, and then review the Problem Set and Exit Ticket of each lesson in the topic.

C: Review the assessment following the topic, keeping in mind that assessments can be found midway through the module and at the end of the module.

Step 2: Find the ladder.



A: Complete the lesson's Problem Set.

B: Analyze and write notes on the new complexities of each problem as well as the sequences and progressions throughout problems (e.g., pictorial to abstract, smaller to larger numbers, single- to multi-step problems). The new complexities are the rungs of the ladder.

C: Anticipate where students might struggle, and write a note about the potential cause of the struggle.

D: Answer the Student Debrief questions, always anticipating how students will respond.

Step 3: Hone the lesson.

At times, the lesson and Problem Set are appropriate for all students and the day's schedule. At others, they may need customizing. If the decision is to customize based on either the needs of students or scheduling constraints, a suggestion is to decide upon and designate "Must Do" and "Could Do" problems.

A: Select "Must Do" problems from the Problem Set that meet the objective and provide a coherent experience for students; reference the ladder. The expectation is that the majority of the class will complete the "Must Do" problems within the allocated time. While choosing the "Must Do" problems, keep in mind the need for a balance of calculations, various word problem types, and work at both the pictorial and abstract levels.

B: "Must Do" problems might also include remedial work as necessary for the whole class, a small group, or individual students. Depending on anticipated difficulties, those problems might take different forms as shown in the chart below.

Anticipated Difficulty	"Must Do" Remedial Problem Suggestion
The first problem of the Problem Set is too challenging.	Write a short sequence of problems on the board that provides a ladder to Problem 1. Direct the class or small group to complete those first problems to empower them to begin the Problem Set. Consider labeling these problems "Zero Problems" since they are done prior to Problem 1.
There is too big of a jump in complexity between two problems.	Provide a problem or set of problems that creates a bridge between the two problems. Label them with the number of the problem they follow. For example, if the challenging jump is between Problems 2 and 3, consider labeling the bridging problems "Extra 2s."
Students lack fluency or foundational skills necessary for the lesson.	Before beginning the Problem Set, do a quick, engaging fluency exercise, such as a Rapid White Board Exchange, "Thrilling Drill," or Sprint. Before beginning any fluency activity for the first time, assess that students are poised for success with the easiest problem in the set.
More work is needed at the concrete or pictorial level.	Provide manipulatives or the opportunity to draw solution strategies. Especially in Kindergarten, at times the Problem Set or pencil and paper aspect might be completely excluded, allowing students to simply work with materials.
More work is needed at the abstract level.	Hone the Problem Set to reduce the amount of drawing as appropriate for certain students or the whole class.

C: "Could Do" problems are for students who work with greater fluency and understanding and can, therefore, complete more work within a given time frame. Adjust the Exit Ticket and Homework to reflect the "Must Do" problems or to address scheduling constraints.

D: At times, a particularly tricky problem might be designated as a "Challenge!" problem. This can be motivating, especially for advanced students. Consider creating the opportunity for students to share their "Challenge!" solutions with the class at a weekly session or on video.

E: Consider how to best use the vignettes of the Concept Development section of the lesson. Read through the vignettes, and highlight selected parts to be included in the delivery of instruction so that students can be independently successful on the assigned task.

F: Pay close attention to the questions chosen for the Student Debrief. Regularly ask students, "What was the lesson's learning goal today?" Help them articulate the goal.

Assessment Summary

Type	Administered	Format	Standards Addressed
End-of-Module Assessment Task	After Topic B	Constructed response with rubric	2.4A 2.4B 2.4C 2.7C

Teacher Edition

Eureka Math®
Grade 2
Module 2

TEKS EDITION

Special thanks go to the Gordon A. Cain Center and to the Department of Mathematics at Louisiana State University for their support in the development of *Eureka Math*.

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Published by Great Minds PBC
greatminds.org

Printed in the USA

1 2 3 4 5 6 7 8 9 10 XXX 25 24 23 22 21

ISBN 978-1-63642-848-2

Table of Contents

GRADE 2 • MODULE 2

Addition and Subtraction of Length Units

Grade 2 • Module 2

Addition and Subtraction of Length Units

OVERVIEW

In this 12-day Grade 2 module, students engage in activities designed to deepen their conceptual understanding of measurement and to relate addition and subtraction to length. Their work in Module 2 is exclusively with metric units in order to support place value concepts. Customary units are introduced in Module 7.

Topic A opens with students exploring concepts related to the centimeter ruler. In the first lesson, they are guided to connect measurement with physical units as they find the total number of length units by laying multiple copies of centimeter cubes (physical units) end to end along various objects. Through this, students discover that to get an accurate measurement, there must be no gaps or overlaps between consecutive length units.

Next, students measure by iterating with one physical unit, using the *mark and advance* technique, also known as *mark and move forward*. Students then repeat the process by laying both multiple copies and a single cube along a centimeter ruler. This helps students create a mental benchmark for the centimeter. It also helps them realize that the distance between 0 and 1 on the ruler indicates the amount of space already covered. Hence 0, not 1, marks the beginning of the total length. Students use this understanding to create their own centimeter rulers using a centimeter cube and the mark and advance technique. Topic A ends with students using their unit rulers to measure lengths (**2.9A, 2.9D**), thereby connecting measurement with a ruler.

Students build skill in measuring using centimeter rulers and meter sticks in Topic B. They learn to see that a length unit is not a cube, or a portion of a ruler (which has width), but is a segment of a line. By measuring a variety of objects, students build a bank of known measurements or benchmark lengths, such as a doorknob being a meter from the floor, or the width of a finger being a centimeter. Then, students learn to estimate length using knowledge of previously measured objects and benchmarks. This enables students to internalize the mental rulers of a centimeter or meter, empowering them to mentally iterate units relevant to measuring a given length (**2.9E**). The knowledge and experience signal that students are determining which tool is appropriate to make certain measurements (**2.9A, 2.9D**).

In Topic C, students measure and compare to determine how much longer one object is than another (**2.9A**). They also measure objects twice using different length units, both standard and non-standard, thereby developing their understanding of how the total measurement relates to the size of the length unit (**2.9B**). Repeated experience and explicit comparisons help students recognize that the smaller the length unit, the larger the number of units, and the larger the length unit, the smaller the number of units.

The module culminates as students relate addition and subtraction to length. They apply their conceptual understanding to choose appropriate tools and strategies, such as the ruler as a number line, benchmarks for estimation, and strip diagrams for comparison, to solve word problems (**2.2E, 2.2F, 2.9C, 2.9E**). The problems progress from concrete (i.e., measuring objects and using the ruler as a number line to add and subtract) to abstract (e.g., representing lengths with strip diagrams to solve *start unknown* and two-step problems).

Notes on Pacing for Differentiation

If pacing is a challenge, consider the following modifications and omissions. If students show conceptual understanding of iterated length units in Lesson 1, consider consolidating Lessons 2 and 3. If consolidated, students can apply the “mark and move forward” strategy to making a ruler.

Consider consolidating Lesson 4, which provides practice measuring the lengths of various objects using rulers and meter sticks, with Lesson 5, if a chart of benchmarks is created while measuring. Lesson 8 could be omitted unless students demonstrate a need to use the number line to solve addition and subtraction problems.

Focus Grade Level Standards

Number and Operations

The student applies mathematical process standards to understand how to represent and compare whole numbers, the relative position and magnitude of whole numbers, and relationships within the numeration system related to place value. The student is expected to:

2.2E locate the position of a given whole number on an open number line;

2.2F name the whole number that corresponds to a specific point on a number line.

Geometry and Measurement

The student applies mathematical process standards to select and use units to describe length, area, and time.[1] The student is expected to:

2.9A find the length of objects using concrete models for standard units of length;

2.9B describe the inverse relationship between the size of the unit and the number of units needed to equal the length of an object;

2.9C represent whole numbers as distances from any given location on a number line;

2.9D determine the length of an object to the nearest marked unit using rulers, yardsticks, meter sticks, or measuring tapes;

2.9E determine a solution to a problem involving length, including estimating lengths.

[1]Focus is on metric measurement in preparation for place value in Module 3. Customary measurement is addressed in Module 7.

Foundational Standards

The student is expected to:

1.7A	use measuring tools to measure the length of objects to reinforce the continuous nature of linear measurement;
1.7B	illustrate that the length of an object is the number of same-size units of length that, when laid end-to-end with no gaps or overlaps, reach from one end of the object to the other;
1.7D	describe a length to the nearest whole unit using a number and a unit.

Focus Mathematical Process Standards

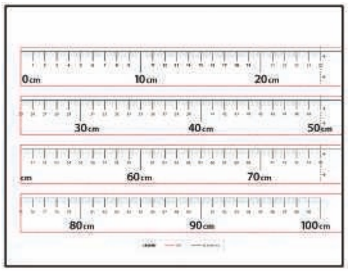
The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

MPS(C)	select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;
MPS(E)	create and use representations to organize, record, and communicate mathematical ideas;
MPS(F)	analyze mathematical relationships to connect and communicate mathematical ideas;
MPS(G)	display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

Overview of Module Topics and Lesson Objectives

TEKS	ELPS		Topics and Objectives	Days
2.9A **2.9D** 2.9B	1.C 1.E 2.E 2.I 3.E 3.F 4.G 5.B	A	**Understand Concepts About the Ruler** Lesson 1: Connect measurement with physical units by using multiple copies of the same physical unit to measure. Lesson 2: Use iteration with one physical unit to measure. Lesson 3: Apply concepts to create unit rulers and measure lengths using unit rulers.	3
2.9A **2.9D** **2.9E** 2.2E 2.2F	1.C 2.E 2.I 3.D 3.E 4.G 5.B	B	**Measure and Estimate Length Using Different Measurement Tools** Lesson 4: Measure various objects using centimeter rulers and meter sticks. Lesson 5: Develop estimation strategies by applying prior knowledge of length and using mental benchmarks.	2
2.9A **2.9B** **2.9D** 2.2E 2.2F	1.C 2.E 2.I 3.E 3.H 4.E 4.G 5.B	C	**Measure and Compare Lengths Using Different Length Units** Lesson 6: Measure and compare lengths using centimeters and meters. Lesson 7: Measure and compare lengths using standard metric length units and non-standard length units; relate measurement to unit size.	2
2.2E **2.2F** **2.9C** **2.9D** **2.9E**	1.C 1.F 2.C 2.G 2.I 3.C 3.E 4.G 4.I 5.B	D	**Relate Addition and Subtraction to Length** Lesson 8: Solve addition and subtraction word problems using the ruler as a number line. Lesson 9: Measure lengths of string using measurement tools, and use strip diagrams to represent and compare the lengths. Lesson 10: Apply conceptual understanding of measurement by solving two-step word problems.	3
			End-of-Module Assessment: Topics A–D (assessment ½ day, return ½ day, remediation or further applications 1 day)	2
Total Number of Instructional Days				**12**

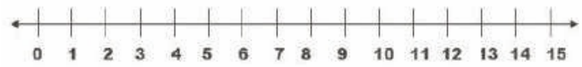
Terminology



Meter Strip

New or Recently Introduced Terms

- Benchmark (e.g., “round” numbers like multiples of 10)
- Endpoint (point where something begins or ends)
- Estimate (an approximation of a quantity or number)
- Hash mark (marks on a ruler or other measurement tool)
- Meter (standard unit of length in the metric system)
- Meter stick or strip (tool used to measure length)
- Number line
- Overlap (extend over, or cover partly)
- Ruler (tool used to measure length)



Number Line

Familiar Terms and Symbols[2]

- Centimeter (standard length unit within the metric system)
- Combine (join or put together)
- Compare (specifically using direct comparison)
- Difference (to find the difference between two numbers, subtract the smaller number from the greater number)
- Height (vertical distance measurement from bottom to top)
- Length (distance measurement from end to end; in a rectangular shape, length can be used to describe any of the four sides)
- Length unit (e.g., centimeters, inches)

Suggested Tools and Representations

- Centimeter cubes
- Centimeter rulers
- Large and small paper clips
- Meter sticks
- Paper meter strips (Lesson 6 Template)
- Personal white boards
- Strip diagram

[2]These are terms and symbols students have used or seen previously.

Scaffolds

The scaffolds integrated into *A Story of Units*® give alternatives for how students access information as well as express and demonstrate their learning. Strategically placed margin notes are provided within each lesson elaborating on the use of specific scaffolds at applicable times. They address many needs presented by English language learners, students with disabilities, students performing above grade level, and students performing below grade level. Many of the suggestions are organized by Universal Design for Learning (UDL) principles and are applicable to more than one population. To read more about the approach to differentiated instruction in *A Story of Units*, please refer to "How to Implement *A Story of Units*."

Assessment Summary

Type	Administered	Format	Standards Addressed
End-of-Module Assessment Task	After Topic D	Constructed response with rubric	2.2E 2.2F 2.9A 2.9B 2.9C 2.9D 2.9E

Teacher Edition

Eureka Math®
Grade 2
Module 3

TEKS EDITION

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Published by Great Minds PBC
greatminds.org

Printed in the USA

1 2 3 4 5 6 7 8 9 10 XXX 25 24 23 22 21

ISBN 978-1-63642-849-9

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Table of Contents

GRADE 2 • MODULE 3

Place Value, Counting, and Comparison of Numbers to 1,200

Grade 2 • Module 3

Place Value, Counting, and Comparison of Numbers to 1,200

OVERVIEW

In Module 2, students added and subtracted measurement units within 100 (**2.9E, 2.2F, 2.9C**), a meaningful application of their work from Module 1 (**2.4A, 2.4B**) and a powerful bridge to the base ten units of Grade 2.

In this 24-day Grade 2 module, students expand their skill with and understanding of units by bundling ones, tens, and hundreds up to a thousand with straws. Unlike the length of 10 centimeters in Module 2, these bundles are discrete sets. One unit can be grabbed and counted just like a banana—1 hundred, 2 hundred, 3 hundred, etc. (**2.2A**). A number in Grade 1 generally consisted of two different units, tens and ones. Now, in Grade 2, a number generally consists of four units: thousands, hundreds, tens, and ones (**2.2A**). The bundled units are organized by separating them largest to smallest, ordered from left to right. Over the course of the module, instruction moves from physical bundles that show the proportionality of the units to non-proportional place value disks and to numerals on the place value chart (**2.2B**).

Furthermore, in this module instruction includes a great deal of counting: by ones, tens, and hundreds (**2.2C**). Counting up using the centimeter tape or a classroom number line shows movement from left to right as the numbers increase. Counting up on the place value chart shows movement from right to left as the numbers increase. For example, as 10 ones are renamed as 1 ten, the larger unit is housed in the place directly to the left. The goal is for students to move back and forth fluidly between these two models, the number line and the place value chart, using them to either to rename units and compare numbers (**2.2C, 2.2D, 2.2E**).

In this module, the place value story has advanced. Along with changing 10 ones for 1 ten, students now also change 10 tens for 1 hundred and 10 hundreds for 1 thousand. This changing leads to the use of counting strategies to solve word problems (**2.4C, 2.7C**). In the next module, this change leads to mental math and the formal algorithms for addition and subtraction. Comparison extends into finding 100 more and 100 less, 10 more and 10 less, etc. Just as in Grade 1, *more* and *less* translate into formal addition and subtraction at the onset of Module 4 (**2.7B**).

How is this module's learning foundational to later grades? Understanding 3 tens or 3 units of 10 leads to an understanding of 3 fours or 3 units or groups of four, 3 fourths or 3 units of one-fourth. Learning that 12 tens = 120 and 12 hundreds = 1,200 leads to an understanding of 12 tenths = 1.2,4 thirds = 4/3 = 1 1/3, or even 4 threes = 12. Counting up and down by ones, tens, and hundreds with both the number line and place value chart is essential from Grade 3 forward for rounding and mental math to meaningful understanding of all operations with base ten whole numbers and to understanding place value's extension into decimal fractions and operations.

Notes on Pacing for Differentiation

If pacing is a challenge, consider the following modifications and omissions. Omit the Application Problem in Lesson 7 in order to give more time to practice the multiple segments in the Concept Development.

Reduce the Concept Development of Lesson 9 by omitting the empty number line. Instead, have students draw the bills used to count up from one amount to the next as was done in Lesson 3 but with bundles. If the empty number line is omitted in Lesson 9, then the component following the Problem Set of Lesson 13, "Estimating Numbers on the Empty Number Line," should also be omitted along with related questions from the Debrief and Problem 2 of the Exit Ticket. Consider using the empty number line as an extension.

Omit Lesson 10, and use it instead as an extension for early finishers or as a center activity during a different time of day (e.g., RTI time, economics, morning work, or problem of the week).

Reduce Lesson 11 by omitting the use of Dienes blocks in the Concept Development. Distribute bills instead. Omit the discussion about the difference between modeling with the blocks and the bills. Have students only model with bills and place value disks in the Problem Set.

Omit, or move to morning work, the Application Problems in Lessons 12 and 14 to allow more time for the Concept Developments. Consolidate Lessons 17 and 18, or perhaps use Lesson 18 as an activity for centers to allow students continued practice comparing numbers when represented in different forms.

Consider using Lesson 21 as either a center activity or morning work.

Focus Grade Level Standards

Number and Operations

The student applies mathematical process standards to understand how to represent and compare whole numbers, the relative position and magnitude of whole numbers, and relationships within the numeration system related to place value. The student is expected to:

2.2A use concrete and pictorial models to compose and decompose numbers up to 1,200 in more than one way as a sum of so many thousands, hundreds, tens, and ones;

2.2B use standard, word, and expanded forms to represent numbers up to 1,200;

2.2C generate a number that is greater than or less than a given whole number up to 1,200;

2.2D use place value to compare and order whole numbers up to 1,200 using comparative language, numbers, and symbols (>, <, or =);

2.2E locate the position of a given whole number on an open number line.

Algebraic Reasoning

The student applies mathematical process standards to identify and apply number patterns within properties of numbers and operations in order to describe relationships.

The student is expected to:

2.7B use an understanding of place value to determine the number that is 10 or 100 more or less than a given number up to 1,200;

2.7C represent and solve addition and subtraction word problems where unknowns may be any one of the terms in the problem.

Foundational Standards

The student is expected to:

1.2B use objects, pictures, and expanded and standard forms to represent numbers up to 120 in more than one way as so many hundreds, so many tens, and so many ones;

1.2E use place value to compare whole numbers up to 120 using comparative language;

1.2F order whole numbers up to 120 using place value and open number lines;

1.2G represent the comparison of two numbers to 100 using the symbols >, <, or =.

Focus Mathematical Process Standards

The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

MPS(E) create and use representations to organize, record, and communicate mathematical ideas;

MPS(F) analyze mathematical relationships to connect and communicate mathematical ideas;

MPS(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

Overview of Module Topics and Lesson Objectives

TEKS	ELPS		Topics and Objectives	Days
2.2A	1.C 2.E 2.I 3.E 4.B 4.G	A	**Forming Base Ten Units of Ten, a Hundred, and a Thousand** Lesson 1: Bundle and count ones, tens, and hundreds to 1,200.	1
2.2C **2.7C** 2.2A 2.4C	1.B 1.C 2.E 2.I 3.E 4.G 5.B	B	**Understanding Place Value Units of One, Ten, and Hundred** Lesson 2: Count up and down between 100 and 220 using ones and tens. Lesson 3: Count up and down between 90 and 1,200 using ones, tens, and hundreds.	2
2.2B 2.2A 2.2C	1.C 1.F 2.E 2.I 3.E 4.B 4.G 5.B	C	**Numbers to 1,200 in Unit, Standard, Expanded, and Word Forms** Lesson 4: Write base ten three-digit numbers in unit form; show the value of each digit. Lesson 5: Write base ten numbers in expanded form. Lesson 6: Write, read, and relate base ten numbers in all forms.	3
2.2A **2.2B** **2.2C** 2.7B	1.C 1.D 2.E 2.I 3.C 3.E 3.G 4.G	D	**Modeling Base Ten Numbers Within 1,200 with Money** Lesson 7: Count the total value of \$1, \$10, and \$100 bills up to \$1,200. Lesson 8: Count from \$10 to \$1,200 on the place value chart and the empty number line. Lesson 9: Explore \$1,000. How many \$10 bills can we change for a thousand dollar bill?	3
			Mid-Module Assessment: Topics A–D (assessment ½ day, return ½ day, remediation or further applications 1 day)	2

TEKS	ELPS		Topics and Objectives	Days
2.2A **2.2B** **2.2C** **2.2D** **2.2E**	1.C 1.E 2.E 2.I 3.E 3.H 4.B 4.G 5.B	E	**Modeling Numbers Up to 1,200 with Place Value Disks** Lesson 10: Count the total value of ones, tens, and hundreds with place value disks. Lesson 11: Change 10 ones for 1 ten, 10 tens for 1 hundred, and 10 hundreds for 1 thousand. Lesson 12: Read and write numbers up to 1,200 after modeling with place value disks. Lesson 13: Model numbers with more than 9 ones or 9 tens; write in expanded, unit, standard, and word forms. Lesson 14: Explore a situation with more than 9 groups of ten.	5
2.2C **2.2D** **2.2E**	1.C 2.E 2.I 3.E 3.F 3.G 4.C 4.G	F	**Comparing Numbers to 1,200** Lesson 15: Compare numbers to 1,200 with <, >, and =. Lesson 16: Compare numbers to 1,200 with <, >, and = when there are more than 9 ones, 9 tens, or 9 hundreds. Lesson 17: Order numbers in different forms. (Optional)	3
2.2A **2.2B** **2.2C** **2.7B** 2.7C	1.C 1.D 2.E 2.I 3.E 3.H 4.G 5.B	G	**Finding 1, 10, and 100 More or Less than a Number** Lesson 18: Model and use language to tell about 1 more and 1 less, 10 more and 10 less, and 100 more and 100 less. Lesson 19: Model 1 more and 1 less, 10 more and 10 less, and 100 more and 100 less when changing the hundreds place. Lesson 20: Complete a pattern counting up and down.	3
			End-of-Module Assessment: Topics A–G (assessment ½ day, return ½ day, remediation or further applications 1 day)	2
Total Number of Instructional Days				**24**

Terminology

New or Recently Introduced Terms

- Base ten numerals (e.g., a thousand is 10 hundreds, a hundred is 10 tens, starting in Grade 3 a one is 10 tenths, etc.)
- Expanded form (e.g., 500 + 70 + 6)
- Hundreds place (e.g., the 5 in 576 is in the hundreds place)
- (1,000)
- Place value or number disk (pictured)
- Standard form (e.g., 576)
- Thousands place (e.g., the 1 in 1,130 is in the thousands place)
- Unit form (e.g., 5 hundreds 7 tens 6 ones)
- Word form (e.g., five hundred seventy-six)

Unit form modeled with place value disks:
7 hundreds 2 tens 6 ones = 72 tens 6 ones

Familiar Terms and Symbols[1]

- =, <, > (equal, less than, greater than)
- Altogether (e.g., 59 centimeters and 17 centimeters; altogether there are 76 centimeters)
- Bundling, grouping (putting smaller units together to make a larger one, e.g., putting 10 ones together to make a ten or 10 tens together to make a hundred)
- How many more/less (the difference between quantities)
- How much more/less (the difference between quantities)
- More than/less than (e.g., 576 is more than 76; 76 is less than 576)
- Number sentence (an equation or inequality that has a true or false value and contains no unknowns, e.g., 3 + 2 = 5)
- Ones place (e.g., the 6 in 576 is in the ones place)
- Place value (the unitary values of the digits in numbers)
- Renaming, changing (instead of *carrying* or *borrowing,* e.g., a group of 10 ones is renamed a ten when the ones are bundled and moved from the ones to the tens place; if using $1 bills, they may be changed for a $10 bill when there are enough)
- Tens place (e.g., the 7 in 576 is in the tens place)
- Units of ones, tens, hundreds, one thousand (a single one and groups of 10s, 100s, and 1,000)

[1]These are terms and symbols students have seen previously.

Suggested Tools and Representations

- 2 boxes of 1,000 straws per class of 25
- Clock number line (details in Lesson 1 Fluency Practice)
- Dice, 1 per pair
- Dienes blocks
- Hide Zero cards (also known as place value cards) showing numbers 1–5, 10–50, and 100—500 (1 small set per student) (Lesson 4 Template 1))
- Meter strip (Lesson 1 Template)
- Number spelling activity sheet (Lesson 6 Activity Sheet)
- Personal white boards
- Place value box (details in Lesson 4 Concept Development)
- Place value cards to 1,000, 1 large teacher set
- Place value disks: suggested minimum of one set per pair (18 ones, 18 tens, 18 hundreds, and 1 one thousand)
- Play money: $1, $5, $10, and $100 bills (10 ones, 1 five, 12 tens, and 10 hundreds per pair), and a single set of 16 pennies, 13 dimes
- Rubber bands, 16 per pair
- Small plastic bags (small resealable bags)

Place Value Disks


Unlabeled Hundreds Place Value Chart
(use with number disks)

Scaffolds

The scaffolds integrated into *A Story of Units®* give alternatives for how students access information as well as express and demonstrate their learning. Strategically placed margin notes are provided within each lesson elaborating on the use of specific scaffolds at applicable times. They address many needs presented by English language learners, students with disabilities, students performing above grade level, and students performing below grade level. Many of the suggestions are organized by Universal Design for Learning (UDL) principles and are applicable to more than one population.

Assessment Summary

Type	Administered	Format	Standards Addressed
Mid-Module Assessment Task	After Topic D	Constructed response with rubric	2.2A 2.2B 2.2C 2.7C
End-of-Module Assessment Task	After Topic G	Constructed response with rubric	2.2A 2.2B 2.2C 2.2D 2.2E

Teacher Edition

Eureka Math®
Grade 2
Module 4

TEKS EDITION

Special thanks go to the Gordon A. Cain Center and to the Department of Mathematics at Louisiana State University for their support in the development of *Eureka Math*.

Great Minds® is the creator of *Eureka Math®*, *Wit & Wisdom®*, *Alexandria Plan*™, and *PhD Science®*.

Published by Great Minds PBC
greatminds.org

Printed in the USA

1 2 3 4 5 6 7 8 9 10 XXX 25 24 23 22 21

ISBN 978-1-63642-850-5

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GRADE 2 • MODULE 4

Addition and Subtraction Within 200 with Word Problems to 100

Grade 2 • Module 4

Addition and Subtraction Within 200 with Word Problems to 100

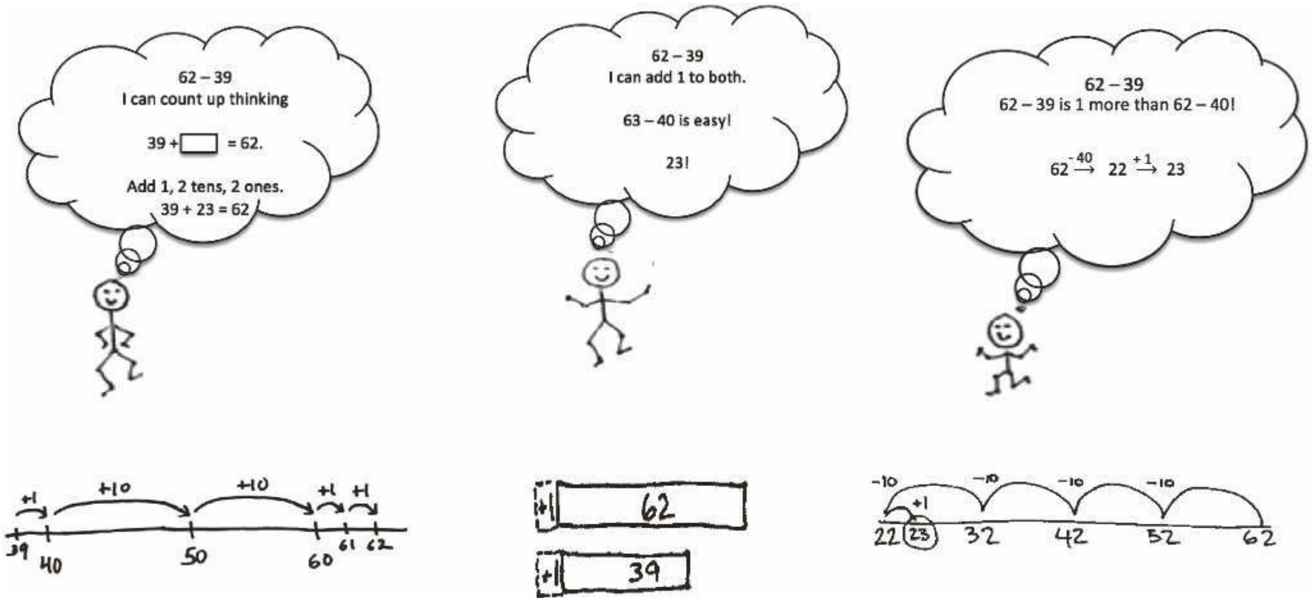
OVERVIEW

In Module 3, students were immersed in the base ten system as they built a strong foundation of place value understanding through a concrete to pictorial to abstract approach. They bundled groups of 10 and saw that 10 like units could be bundled to produce a new unit that is ten times as large. They progressed from seeing 10 ones as 1 ten (**1.2A, 1.2B**) to understanding 10 tens as 1 hundred (**2.2C**). Module 4 builds on that place value understanding, which enables students to compose and decompose place value units to add and subtract within 200.

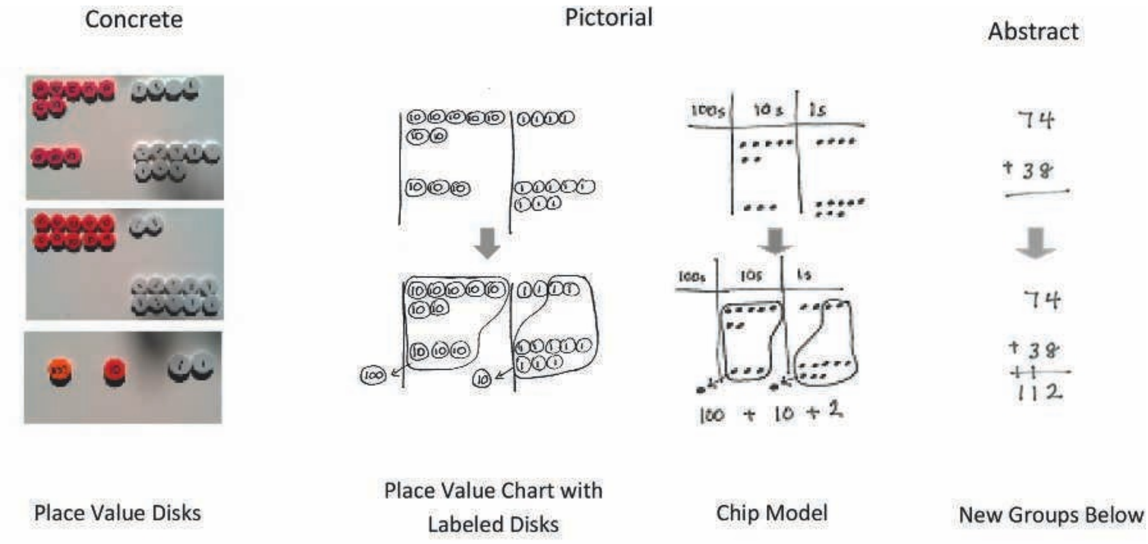
Module 4 is devoted to three major areas of work. The first two are building fluency in two-digit addition and subtraction within 100 (**2.4B**) and applying that fluency to one- and two-step word problems of varying types within 100 (**2.4C, 2.7C**). Students' increasing fluency with calculations within 100 allows for word problems to transition from being mere contexts for calculation into opportunities for students to see and analyze the relationships between quantities. Daily Application Problems and specific lessons in Topics A, C, and F provide students with guided and independent practice as they solve a variety of problem types, including more complex comparison problems. Note that most two-step problems involve single-digit addends and do not involve the most difficult comparison problem types. The third major area of work is developing students' conceptual understanding of addition and subtraction of multi-digit numbers within 200 (**2.4C, 2.4D**) as a foundation for work with addition and subtraction within 1,000 in Module 5.

The final lessons of Module 3 (finding 1 more, 1 less, 10 more, 10 less) transition into mental addition and subtraction of 1 and 10 (**2.7B**). In Topic A of Module 4, students work with place value strategies to fluently add and subtract within 100 (**2.4B**). They mentally add and subtract 100 in Topics D and E, as well as during fluency activities throughout the module, as they did in Module 3.

This knowledge is then extended and used to solve and create problems (**2.4D**). For example, students might count on by ones and tens (e.g., $39 + \square = 62$, so 40, 50, 60, 61, 62). They might use compensation, adding the same amount to the subtrahend as to the minuend to make a multiple of ten (e.g., $62 - 39 = 63 - 40$). They might add or subtract a multiple of 10 and adjust the solution as necessary (e.g., $62 - 39$ is 4 tens less than 62 but 1 more) (**2.4B**). Students explain why these strategies work using place value language, properties of addition and subtraction, and models such as the number line (**2.4C**).



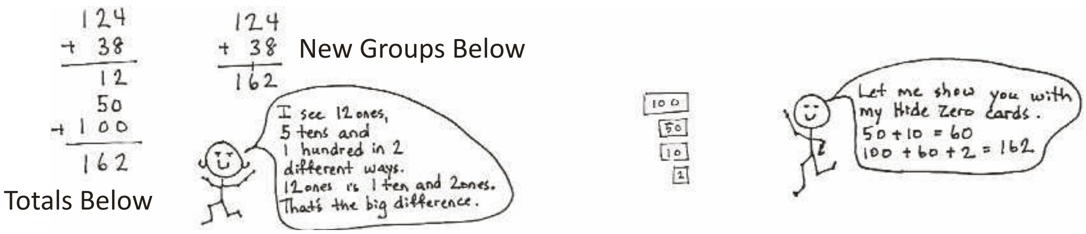
Topic A's strategies lead naturally to work with the algorithms for addition (Topic B) and subtraction (Topic C). Note that the vertical form is used to describe the written numbers, where the algorithm is used to describe the cyclical process of making a larger or smaller unit. In these two topics, students represent place value strategies with place value disks and math drawings (see images with strategy names below). Students work with composing 1 ten from 10 ones or decomposing 1 ten as 10 ones (with minuends within 100). After the Mid-Module Assessment, students continue working with manipulatives and math drawings to make sense of problems in which they compose or decompose twice. Topic D focuses on addition, with the new complexity of composing 1 hundred from 10 tens within 200 in problems with up to four addends (**2.4B**). Subtraction in Topic E involves subtracting when decomposing 1 hundred for 10 tens and 1 ten for 10 ones (**2.4B**).



Throughout the module, manipulatives and math drawings allow students to see numbers in terms of place value units and serve as a reminder that students must add like units (e.g., knowing that 74 + 38 is 7 tens + 3 tens and 4 ones + 8 ones).

In Module 4, the focus is often on computational strategies with bare numbers (i.e., no context) so that total attention is given to understanding the value of each digit within a number, as well as why the algorithm works. Students use the place value chart as an organizer. Simultaneous use of a vertical form and a place value chart allows students to better recognize both the value of numbers when they are not on the place value chart and like units. The same is true when students make math drawings and use place value language to relate each step of the drawing to the vertical form (**2.4B**). The different representations serve to solidify the understanding of the composition and decomposition of units, moving from concrete to pictorial to abstract. Throughout the work, students are encouraged to explain their actions and analyses and to use the relationship between addition and subtraction to check their work (**2.4B**).

Throughout the module, students are encouraged to be flexible in their thinking and to use multiple strategies in solving problems, including the use of drawings such as strip diagrams, which they relate to equations. In Topic F, students are introduced to the totals below method (pictured below to the far left) and are challenged to explain why both it and the new groups below method (also pictured below to the left) work (**2.4B**).



The Mid-Module Assessment follows Topic C, and the End-of-Module Assessment follows Topic F.

Notes on Pacing for Differentiation

If pacing is a challenge, consider the following modifications and omissions. Consider pacing more quickly the lessons that follow Topic A in Module 4 as students readily grasp renaming different hundreds, tens, and ones. Spend additional instructional minutes with word problems, unknowns in different places (e.g., 27 + ____ = 350 or 281 = ____ − 99), and mental math. Note that this same adjustment in pacing can also be made in looking ahead to the lessons that follow Topic A in Module 5.

Consider omitting Lessons 29 and 30. Instead, introduce the concept of "Totals Below" in Lesson 21. Continue to embed "Totals Below" in the Concept Development or in the Debrief of subsequent lessons.

Focus Grade Level Standards

Number and Operations

The student applies mathematical process standards to develop and use strategies and methods for whole number computations in order to solve addition and subtraction problems with efficiency and accuracy.[1] The student is expected to:

2.4B add up to four two-digit numbers and subtract two-digit numbers using mental strategies and algorithms based on knowledge of place value and properties of operations;

2.4C solve one-step and multi-step word problems involving addition and subtraction within 1,000 using a variety of strategies based on place value, including algorithms;

2.4D generate and solve problem situations for a given mathematical number sentence involving addition and subtraction of whole numbers within 1,000.

Algebraic Reasoning

The student applies mathematical process standards to identify and apply number patterns within properties of numbers and operations in order to describe relationships. The student is expected to:

2.7B use an understanding of place value to determine the number that is 10 or 100 more or less than a given number up to 1,200;

2.7C represent and solve addition and subtraction word problems where unknowns may be any one of the terms in the problem.

[1]In this module, work is limited to within 200. This work is extended to numbers within 1,000 in the next module.

Foundational Standards

The student is expected to:

- **1.2B** use objects, pictures, and expanded and standard forms to represent numbers up to 120 in more than one way as so many hundreds, so many tens, and so many ones;
- **1.3A** use concrete and pictorial models to determine the sum of a multiple of 10 and a one-digit number in problems up to 99;
- **1.3B** use objects and pictorial models to solve word problems involving joining, separating, and comparing sets within 20 and unknowns as any one of the terms in the problem such as 2 + 4 = [ ]; 3 + [ ] = 7; and 5 = [ ] – 3;
- **1.3D** apply basic fact strategies to add and subtract within 20, including making 10 and decomposing a number leading to a 10;
- **1.5D** represent word problems involving addition and subtraction of whole numbers up to 20 using concrete and pictorial models and number sentences;
- **2.2A** use concrete and pictorial models to compose and decompose numbers up to 1,200 in more than one way as a sum of so many thousands, hundreds, tens, and ones;
- **2.2B** use standard, word, and expanded forms to represent numbers up to 1,200;
- **2.2C** generate a number that is greater than or less than a given whole number up to 1,200;
- **2.4A** recall basic facts to add and subtract within 20 with automaticity.

Focus Mathematical Process Standards

The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

- **MPS(A)** apply mathematics to problems arising in everyday life, society, and the workplace;
- **MPS(B)** use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;
- **MPS(D)** communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
- **MPS(E)** create and use representations to organize, record, and communicate mathematical ideas;
- **MPS(F)** analyze mathematical relationships to connect and communicate mathematical ideas;
- **MPS(G)** display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

Overview of Module Topics and Lesson Objectives

TEKS	ELPS		Topics and Objectives	Days
2.4B **2.4C** **2.7B** **2.7C** 2.2A 2.2C 2.4A	1.A 1.H 2.E 2.I 3.D 3.H 4.B 5.B	A	**Sums and Differences Within 100** Lesson 1: Relate 1 more, 1 less, 10 more, and 10 less to addition and subtraction of 1 and 10. Lesson 2: Add and subtract multiples of 10 including counting on to subtract. Lessons 3–4: Add and subtract multiples of 10 and some ones within 100. Lesson 5: Solve one- and two-step word problems within 100 using strategies based on place value.	5
2.4B **2.4C** 2.4A 2.7C	2.C 2.E 2.G 2.I 3.E 3.H 4.B 5.G	B	**Strategies for Composing a Ten** Lesson 6: Use manipulatives to represent the composition of 10 ones as 1 ten with two-digit addends. Lesson 7: Relate addition using manipulatives to a written vertical method. Lesson 8: Use math drawings to represent the composition and relate drawings to a written method. Lessons 9–10: Use math drawings to represent the composition when adding a two-digit to a three-digit addend.	5
2.4B **2.4C** **2.4D** **2.7C** 2.4A	1.H 2.C 2.E 2.G 2.I 3.E 3.F 4.B 5.G	C	**Strategies for Decomposing a Ten** Lesson 11: Represent subtraction with and without the decomposition of 1 ten as 10 ones with manipulatives. Lesson 12: Relate manipulative representations to a written method. Lesson 13: Use math drawings to represent subtraction with and without decomposition and relate drawings to a written method. Lessons 14–15: Represent subtraction with and without the decomposition when there is a three-digit minuend. Lesson 16: Solve and create one- and two-step word problems within 100 using strategies based on place value.	6
			Mid-Module Assessment: Topics A–C (assessment ½ day, return ½ day, remediation or further applications 1 day)	2

TEKS	ELPS	Topics and Objectives		Days
2.4B **2.7B** 2.2A 2.4A 2.4C 2.4D	1.H 2.E 2.I 3.C 3.D 3.E 3.H 4.B 5.G	D	**Strategies for Composing Tens and Hundreds** Lesson 17: Use mental strategies to relate compositions of 10 tens as 1 hundred to 10 ones as 1 ten. Lesson 18: Use manipulatives to represent additions with two compositions. Lesson 19: Relate manipulative representations to a written method. Lessons 20–21: Use math drawings to represent additions with up to two compositions and relate drawings to a written method. Lesson 22: Solve additions with up to four addends with totals within 200 with and without two compositions of larger units.	6
2.4B 2.4A	1.C 1.H 2.E 2.I 3.E 3.H 4.B 4.G 5.G	E	**Strategies for Decomposing Tens and Hundreds** Lesson 23: Use number bonds to break apart three-digit minuends and subtract from the hundred. Lesson 24: Use manipulatives to represent subtraction with decompositions of 1 hundred as 10 tens and 1 ten as 10 ones. Lesson 25: Relate manipulative representations to a written method. Lesson 26: Use math drawings to represent subtraction with up to two decompositions and relate drawings to a written method. Lessons 27–28: Subtract from 200 and from numbers with zeros in the tens place.	6
2.4B **2.4C** **2.4D** **2.7C**	1.C 1.F 1.H 2.F 3.E 3.H 4.B 5.G	F	**Student Explanations of Written Methods** Lesson 29: Use and explain the totals below method using words, math drawings, and numbers. Lesson 30: Compare totals below to new groups below as written methods. Lesson 31: Solve and create two-step word problems within 100.	3
			End-of-Module Assessment: Topics A–F (assessment ½ day, return ½ day, remediation or further applications 1 day)	2
Total Number of Instructional Days				**35**

Terminology

New or Recently Introduced Terms

- Algorithm (a step-by-step procedure to solve a particular type of problem)
- Compose (e.g., to make 1 larger unit from 10 smaller units)
- Decompose (e.g., to break 1 larger unit into 10 smaller units)
- Equation (two expressions with an equal sign between them; that is, an equation is a statement that two expressions are equal; however, there is no guarantee that the statement is true)
- New groups below (show newly composed units on the line below the appropriate place in the addition algorithm, pictured above on page 4)
- Simplifying strategy (e.g., to solve 299 + 6, think 299 + 1 + 5 = 300 + 5 = 305)
- Totals below (pictured above on page 4)

NOTES ON *EXPRESSION, EQUATION,* AND *NUMBER SENTENCE*:

Grade 2 lessons use the following terms based on the descriptions below.

- **Expression:** A statement that has no equal sign but can be evaluated to a number (e.g., 2 + 1, 13 − 6).
- **Equation:** A statement that two expressions are equal (e.g., 13 + 2 = 15, 22 − 14 = ___, 10 − ___ = 8).
- **Number sentence** (also addition or subtraction sentence): A statement that is true or false and, therefore, contains no unknowns (e.g., 21 > 7, 3 + 2 = 5).

Familiar Terms and Symbols[2]

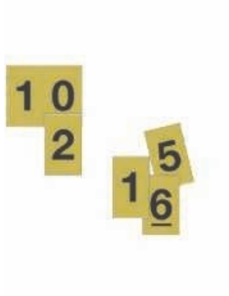
- Addend
- Addition
- Bundle, unbundle, regroup, rename, change (compose or decompose a 10 or 100)
- Difference
- Hundreds place (referring to place value)
- Place value (referring to the unit value of each digit in a given number)
- Subtraction
- Units of ones, tens, hundreds, thousands (referring to place value; 10 ones is the same as 1 unit of ten)

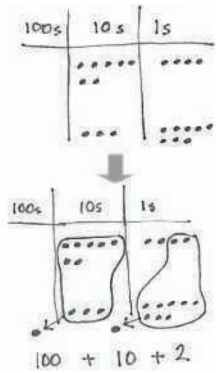
[2]These are terms and symbols students have used or seen previously.

Suggested Tools and Representations

- Arrow notation (arrow way)
- Chip model (pictured)
- Hide Zero cards (pictured)
- Number bond
- Personal white boards
- Place value chart (Template in Lesson 1)
- Place value disk sets (19 ones, 19 tens, 18 hundreds, 1 one thousand per set)
- Rekenrek
- Strip diagram

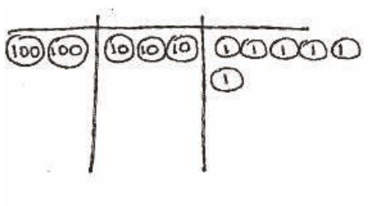
Hide Zero cards



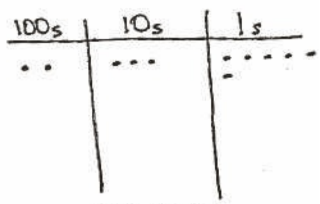


Chip Model

Note: Students work through a progression of models to represent the addition and subtraction algorithm. Following the use of actual place value disks, students learn to draw the disks to represent numbers. This model provides an added level of support in that students write the value on each disk (see image below left). Because the value is on the disk, there is no need to label the place value chart. Next, students learn the chip model, drawing dots on a labeled place value chart (see image below right). While still pictorial, this model is more abstract because the value of the chip derives from its placement on the chart.



Place Value Disk Drawing



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Assessment Summary

Type	Administered	Format	Standards Addressed
Mid-Module Assessment Task	After Topic C	Constructed response with rubric	2.4B 2.4C 2.4D 2.7B 2.7C
End-of-Module Assessment Task	After Topic F	Constructed response with rubric	2.4B 2.4C 2.4D 2.7B 2.7C

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Published by Great Minds PBC
greatminds.org

Printed in the USA

1 2 3 4 5 6 7 8 9 10 XXX 25 24 23 22 21

ISBN 978-1-63642-851-2

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GRADE 2 • MODULE 5

Addition and Subtraction Within 1,000 with Word Problems Within 1,000

Grade 2 • Module 5

Addition and Subtraction Within 1,000 with Word Problems Within 1,000

OVERVIEW

In Module 4, students developed addition and subtraction fluency within 100 and began developing conceptual understanding of the standard algorithm by means of place value strategies. In Module 5, students build upon their mastery of renaming place value units and extend their work with conceptual understanding of the addition and subtraction algorithms to numbers within 1,000, always with the option of modeling with materials or drawings. Throughout the module, students continue to focus on strengthening and deepening conceptual understanding and fluency.

Topic A focuses on place value strategies to add and subtract within 1,000 (**2.4B**). Students relate *100 more* and *100 less* to addition and subtraction of 100 (**2.7B**). They add and subtract multiples of 100, including counting on to subtract (e.g., for 650 – 300, they start at 300 and think, "300 more gets me to 600, and 50 more gets me to 650, so … 350"). Students also use simplifying strategies for addition and subtraction. They extend the make a ten strategy to make a hundred, mentally decomposing one addend to make a hundred with the other (e.g., 299 + 6 becomes 299 + 1 + 5, or 300 + 5, which equals 305) and use compensation to subtract from three-digit numbers (e.g., for 376 – 59, add 1 to each, 377 – 60 = 317). The topic ends with students sharing and critiquing solution strategies for addition and subtraction problems. Throughout the topic, students use place value language and properties of operations to explain why their strategies work (**2.4B**).

In Topics B and C, students continue to build on Module 4's work, now composing and decomposing tens and hundreds within 1,000 (**2.4B**). As each topic begins, students relate manipulative representations to the algorithm and then transition to creating math drawings in place of the manipulatives. As always, students use place value reasoning and properties of operations to explain their work.

Throughout Module 5, students maintain addition and subtraction fluency within 100 as they use these skills during their daily application work to solve one- and two-step word problems of all types (**2.4C, 2.4D**). The Application Problem precedes fluency activities in most lessons of Module 5 because this work with smaller numbers does not flow directly into the Concept Development. The focus of the Concept Development is adding and subtracting within 1,000: using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction, and relating strategies to a written method (**2.4B**). Note that a written method can include number bonds, chip models, arrow notation, the algorithm, or strip diagrams. Many students will need to record these strategies to solve correctly. The lessons are designed to provide ample time for discussions that center on student reasoning, explaining why their addition and subtraction strategies work (**2.4B**). For example, students may use the relationship between addition and subtraction to demonstrate why their subtraction solution is correct.

The module culminates with Topic D, wherein students synthesize their understanding of addition and subtraction strategies and choose which strategy is most efficient for given problems. They defend their choices using place value language and their understanding of the properties of operations (**2.4B**).

Note that, beginning in Topic C, and for the remainder of the year, each day's Fluency Practice includes an opportunity for review and mastery of the sums and differences with totals through 20 by means of the Fluency Practice Sets or Sprints.

The Mid-Module Assessment follows Topic B. The End-of-Module Assessment follows Topic D.

Notes on Pacing for Differentiation

If pacing is a challenge, consider the following modifications. The lessons that follow Topic A in Module 5 could be paced more quickly as students readily grasp the concepts.

Focus Grade Level Standards

Number and Operations

The student applies mathematical process standards to develop and use strategies and methods for whole number computations in order to solve addition and subtraction problems with efficiency and accuracy. The student is expected to:

- **2.4B** add up to four two-digit numbers and subtract two-digit numbers using mental strategies and algorithms based on knowledge of place value and properties of operations;
- **2.4C** solve one-step and multi-step word problems involving addition and subtraction within 1,000 using a variety of strategies based on place value, including algorithms;
- **2.4D** generate and solve problem situations for a given mathematical number sentence involving addition and subtraction of whole numbers within 1,000.

Algebraic Reasoning

The student applies mathematical process standards to identify and apply number patterns within properties of numbers and operations in order to describe relationships. The student is expected to:

- **2.7B** use an understanding of place value to determine the number that is 10 or 100 more or less than a given number up to 1,200.

Foundational Standards

The student is expected to:

1.3D apply basic fact strategies to add and subtract within 20, including making 10 and decomposing a number leading to a 10;

1.5C use relationships to determine the number that is 10 more and 10 less than a given number up to 120;

2.2A use concrete and pictorial models to compose and decompose numbers up to 1,200 in more than one way as a sum of so many thousands, hundreds, tens, and ones;

2.2B use standard, word, and expanded forms to represent numbers up to 1,200;

2.2C generate a number that is greater than or less than a given whole number up to 1,200;

2.4A recall basic facts to add and subtract within 20 with automaticity.

Focus Mathematical Process Standards

The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

MPS(E) create and use representations to organize, record, and communicate mathematical ideas;

MPS(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

Overview of Module Topics and Lesson Objectives

TEKS	ELPS	Topics and Objectives			Days
2.4B **2.7B** 2.2A 2.2C 2.4C	1.C 1.H 2.E 2.G 2.I 3.E 3.F 4.B 5.G	A	**Strategies for Adding and Subtracting Within 1,000**		7
			Lesson 1:	Relate 10 more, 10 less, 100 more, and 100 less to addition and subtraction of 10 and 100.	
			Lesson 2:	Add and subtract multiples of 100, including counting on to subtract.	
			Lesson 3:	Add multiples of 100 and some tens within 1,000.	
			Lesson 4:	Subtract multiples of 100 and some tens within 1,000.	
			Lesson 5:	Use the associative property to make a hundred in one addend.	
			Lesson 6:	Use the associative property to subtract from three-digit numbers and verify solutions with addition.	
			Lesson 7:	Share and critique solution strategies for varied addition and subtraction problems within 1,000.	
2.4B	1.C 1.H 2.I 3.E 3.H 4.B 5.G	B	**Strategies for Composing Tens and Hundreds Within 1,000**		5
			Lessons 8–9:	Relate manipulative representations to the addition algorithm.	
			Lessons 10–11:	Use math drawings to represent additions with up to two compositions and relate drawings to the addition algorithm.	
			Lesson 12:	Choose and explain solution strategies and record with a written addition method.	
			Mid-Module Assessment: Topics A–B (assessment 1/2 day, return 1/2 day, remediation or further applications 1 day)		2

TEKS	ELPS		Topics and Objectives	Days
2.4B	1.C 1.D 1.E 1.H 2.G 2.I 3.H 4.B 5.G	C	**Strategies for Decomposing Tens and Hundreds Within 1,000** Lesson 13: Relate manipulative representations to the subtraction algorithm, and use addition to explain why the subtraction method works. Lessons 14–15: Use math drawings to represent subtraction with up to two decompositions, relate drawings to the algorithm, and use addition to explain why the subtraction method works. Lessons 16–17: Subtract from multiples of 100 and from numbers with zero in the tens place. Lesson 18: Apply and explain alternate methods for subtracting from multiples of 100 and from numbers with zero in the tens place.	6
2.4B **2.4C** **2.4D** 2.7B	1.H 3.D 3.G 4.C 5.C 5.D 5.E 5.G	D	**Student Explanations for Choice of Solution Methods** Lesson 19: Choose and explain solution strategies and record with a written addition or subtraction method. Lesson 20: Solve and generate multi-step word problems.	2
			End-of-Module Assessment: Topics A–D (assessment 1/2 day, return 1/2 day, remediation or further applications 1 day)	2
Total Number of Instructional Days				**24**

Terminology

New or Recently Introduced Terms

- Compensation (simplifying strategy where students add or subtract the same amount to or from both numbers to create an equivalent, but simpler, problem)

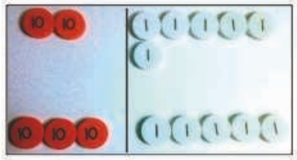
Familiar Terms and Symbols[1]

- Addend
- Addition
- Algorithm
- Bundle
- Compose

[1]These are terms and symbols students have seen previously.

- Decompose
- Difference
- Equation
- New groups below
- Number bond
- Place value
- Place value chart (pictured to the right)
- Place value or number disk (pictured to the right)
- Rename
- Simplifying strategy
- Subtraction
- Strip diagram
- Total
- Unbundle
- Units of ones, tens, hundreds

Place Value Disks



Place Value Chart Without Headings
(use with place value disks)

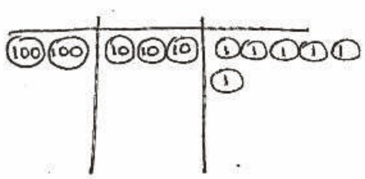
Place Value Chart with Headings
(use with numbers and chips)

hundreds	tens	ones
7	2	6

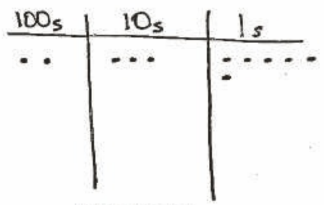
Suggested Tools and Representations

- Arrow notation, arrow way
- Chip model (pictured below)
- Hide Zero cards
- Number bond
- Personal white boards
- Place value charts (pictured above to the right)
- Place value disk sets (19 ones, 19 tens, 10 hundreds, 1 one thousand per set)
- Strip diagram

Note: Students work through a progression of models to represent the addition and subtraction algorithm. Following the use of actual place value disks, students learn to draw the disks to represent numbers. This model provides an added level of support in that students write the value on each disk (pictured below to the left). Because the value is on the disk, there is no need to label the place value chart. Next, students learn the chip model, drawing dots on a labeled place value chart (pictured below to the right). While still pictorial, this model is more abstract because the value of the chip derives from its placement on the chart.



Place Value Disk Drawing



Chip Model

Scaffolds

The scaffolds integrated into *A Story of Units*® give alternatives for how students access information as well as express and demonstrate their learning. Strategically placed margin notes are provided within each lesson elaborating on the use of specific scaffolds at applicable times. They address many needs presented by English language learners, students with disabilities, students performing above grade level, and students performing below grade level. Many of the suggestions are organized by Universal Design for Learning (UDL) principles and are applicable to more than one population.

Assessment Summary

Type	Administered	Format	Standards Addressed
Mid-Module Assessment Task	After Topic B	Constructed response with rubric	2.4B 2.7B
End-of-Module Assessment Task	After Topic D	Constructed response with rubric	2.4B 2.4C 2.4D 2.7B

Topic A

Strategies for Adding and Subtracting Within 1,000

2.4B, 2.7B, 2.2A, 2.2C, 2.4C

Focus Standards:	**2.4B**	Add up to four two-digit numbers and subtract two-digit numbers using mental strategies and algorithms based on knowledge of place value and properties of operations.
	2.7B	Use an understanding of place value to determine the number that is 10 or 100 more or less than a given number up to 1,200.
Instructional Days:	7	
Coherence -Links from:	G1–M6	Place Value to 120, Comparison, Understanding Income and Addition and Subtraction to 100
-Links to:	G3–M2	Place Value and Problem Solving with Units of Measure

In Topic A, students practice the simplifying strategies they learned in Module 4 but with numbers up to 1,000. They are asked to consider which strategy is most efficient for each problem they encounter.

In Lesson 1, students relate *100 more, 100 less, 10 more,* and *10 less* to addition and subtraction. They recognize that they must still add and subtract like units and that the digit in the hundreds place changes when adding and subtracting 100, just as the digit in the tens place changes when adding or subtracting 10. Students see numbers in terms of place value units: 290 – 100 is 2 hundreds 9 tens minus 1 hundred. They learn to record the addition and subtraction of multiples of 100 using arrow notation (i.e., the arrow way).

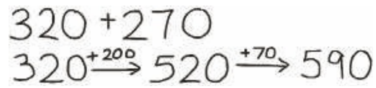
In Lesson 2, students add and subtract multiples of 100 by counting on by hundreds. For example, when adding 200 to 320, they may count up from 320: 420, 520. Students also develop flexibility in terms of using related addition problems. For example, to solve 519 – 200, one student might think, "5 hundreds minus 2 hundreds is 3 hundreds, plus 19 is 319," while another starts at 200, adds on 19, and then 3 hundreds to reach 519, so 319.

$$320 + 200$$

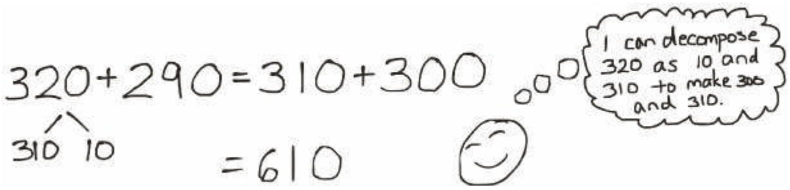
$$320 \xrightarrow{+100} 420 \xrightarrow{+100} 520$$

In Lessons 3 and 4, students continue to add and subtract multiples of 100 with the added complexity of some tens. Problems are chosen so that, at first, the tens digit is close to a multiple of 100 (e.g., 190, 290, 380) to make it easier to form the next hundred by decomposing addends. This prompts students to analyze and use relationships between numbers to develop a variety of simplifying strategies.

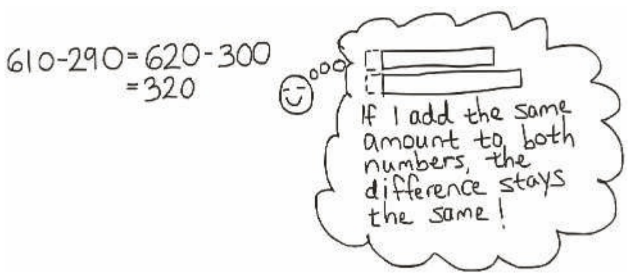
Students also use arrow notation to record their mental math. First, they add a multiple of 100, and then they count on by multiples of 10 to find the total (as shown to the right). Lesson 3 focuses on addition, while Lesson 4 emphasizes related strategies for subtraction.



In Lesson 5, students apply the use of number bonds to decompose larger numbers, just as they did with numbers within 100. For example, when solving 320 + 290, they can break 320 into 10 and 310 to make 310 + 300 = 610 (as shown below), just as they would have decomposed to add 32 and 29 in Module 4. They realize the problem can be conceived as 32 tens + 29 tens. Note that arrow notation can also be used to solve 320 + 290 by first adding 200, then 80, and then 10, or by adding 300, and then subtracting 10. Students work with problems, such as 298 + 137, using a number bond to decompose 137 into 2 and 135, thus creating the equivalent but simpler equation 300 + 135 = 435.



In Lesson 6, the ease of subtracting a multiple of 100 is highlighted again as students extend their work from Module 4 using compensation (i.e., the associative property) for subtraction. Students may add or subtract a multiple of 10 to make an equivalent problem that involves no renaming. For example, when subtracting 610 – 290, the same number, 10, can be added to both numbers to create a multiple of 100 (as shown below). Students also solve problems such as 451 – 195, adding 5 to both the minuend and subtrahend to make 456 – 200.



Topic A closes with Lesson 7, which provides students the opportunity to solidify their new skills. They confront a variety of problems, solve them, and then share their solution strategies. Through spirited discussion, students critique the work of their peers while deepening their understanding of various strategies.

The strategies taught in Topic A are designed to develop students' conceptual understanding of addition and subtraction using models, drawings, properties of operations, and strategies based on place value. At the same time, students relate these strategies to written methods such as arrow notation and number bonds. This sets the stage for flexible thinking as students move into composing and decomposing units in Topics B and C.

A Teaching Sequence Toward Mastery of Strategies for Adding and Subtracting Within 1,000	
Objective 1:	**Relate 10 more, 10 less, 100 more, and 100 less to addition and subtraction of 10 and 100. (Lesson 1)**
Objective 2:	**Add and subtract multiples of 100, including counting on to subtract. (Lesson 2)**
Objective 3:	**Add multiples of 100 and some tens within 1,000. (Lesson 3)**
Objective 4:	**Subtract multiples of 100 and some tens within 1,000. (Lesson 4)**
Objective 5:	**Use the associative property to make a hundred in one addend. (Lesson 5)**
Objective 6:	**Use the associative property to subtract from three-digit numbers and verify solutions with addition. (Lesson 6)**
Objective 7:	**Share and critique solution strategies for varied addition and subtraction problems within 1,000. (Lesson 7)**

Teacher Edition

Eureka Math® Grade 2 Module 6

TEKS EDITION

Special thanks go to the Gordon A. Cain Center and to the Department of Mathematics at Louisiana State University for their support in the development of *Eureka Math*.

Great Minds® is the creator of *Eureka Math®*, *Wit & Wisdom®*, *Alexandria Plan™*, and *PhD Science®*.

Published by Great Minds PBC
greatminds.org

Printed in the USA

1 2 3 4 5 6 7 8 9 10 XXX 25 24 23 22 21

ISBN 978-1-63642-852-9

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GRADE 2 • MODULE 6

Foundations of Multiplication, Division, and Area

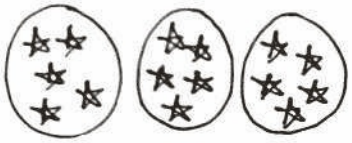
Grade 2 • Module 6

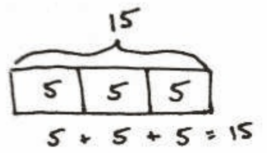
Foundations of Multiplication, Division, and Area

OVERVIEW

Grade 2 Module 6 lays the conceptual foundation for multiplication and division in Grade 3 and for the idea that numbers other than 1, 10, and 100 can serve as units.

In Topic A, students begin by making equal groups using concrete materials, learning to manipulate a given number of objects to create equal groups (e.g., given 15 objects, they create 3 groups of 5 or 5 groups of 3), and progress to pictorial representations where they may begin by circling a group of 5 stars, adding 5 more, and then adding 5 more. They determine the total and relate their drawings to the corresponding repeated addition equation (pictured below). Students calculate the repeated addition sums by adding on to the previous addends, step-by-step, or by grouping the addends into pairs and adding. By the end of Topic A, students draw abstract strip diagrams to represent the total and to show the number in each group as a new unit (pictured below). Hence, they begin their experience toward understanding that any unit may be counted (e.g., 3 dogs, 3 tens, or even 3 fives). This is the bridge between Grades 2 and 3. Grade 2 focuses on the manipulation of place value units, whereas Grade 3 focuses on the manipulation of numbers 1 through 10 as units.





In Topic B, students organize the equal groups created in Topic A into arrays, wherein either a row or column is seen as the new unit being counted. They use manipulatives to compose up to 5 by 5 arrays one row or one column at a time and express the total via repeated addition equations (**2.6A**). For example, students might arrange one column of 5 counters, then another, and then another to compose an array of 3 columns of 5, or 15 counters. As they compose and decompose arrays, students create different number sentences yielding the same total (e.g., 5 + 5 + 5 = 15 and 3 + 3 + 3 + 3 + 3 = 15). They find the total number of objects in each array by counting on from left to right. "Three plus 3 is 6. Six plus 3 is 9. Nine plus 3 is 12." As Topic B progresses, students move to the pictorial level to represent arrays and to distinguish rows from columns by separating equal groups horizontally and vertically (e.g., 3 columns of 5 or 5 rows of 3). Then, they use same-size square tiles, moving them closer together in preparation for composing rectangles in Topic C. Topic B concludes with students using strip diagrams to represent array situations and the RDW process to solve word problems.

In Topic C, students build upon their work with arrays to develop the spatial reasoning skills they need to begin to conceptualize area as the amount of two-dimensional surface that is contained within a plane figure. They come to understand that area is the space that can be tiled with unit squares without gaps or overlaps (**2.9F**). They compare rectangles tiled with like units and notice different side lengths but equal areas.

Topic D focuses on doubles and even numbers (**2.7A**), thus setting the stage for the multiplication table of two in Grade 3. As students progress through the lessons, they learn the following interpretations of even numbers:

1. A number that occurs when skip-counting by twos is even: 2, 4, 6, 8, …
2. When objects are paired up with none left unpaired, the number is even.
3. A number that is twice a whole number (doubles) is even.
4. A number whose last digit is 0, 2, 4, 6, or 8 is even.

Armed with an understanding of the term *even*, students learn that any whole number that is not even is called *odd* and that when 1 is added to or subtracted from an even number, the resulting number is odd.[1]

Initially, students arrange pairs into two rows and realize that an even number is the sum of two equal addends, or a repeated sum of twos. They then write number sentences to express the even number (e.g., 2 rows of 7 can be expressed as 7 + 7 = 14 or as 2 + 2 + 2 + 2 + 2 + 2 + 2 = 14) (**2.7A**). Next, students pair objects to make groups of two with none left over, thus discovering one means of determining whether a group of objects (up to 20) has an even or odd number of members. Finally, students learn that any number up to 20 whose last digit is 0, 2, 4, 6, or 8 is even. After gaining a firm understanding of even numbers, students learn that all other whole numbers are odd. They use the previously learned rules and patterns to identify larger numbers as even or odd and to defend their reasoning. The module concludes with an investigation of what happens when we add two even numbers, two odd numbers, or an odd number with an even number, and the relationship of these pairings to repeated addition (e.g., 3 + 3 is even, but 3 + 3 + 3 is odd).

The Mid-Module Assessment follows Topic B. The End-of-Module Assessment follows Topic D.

Notes on Pacing for Differentiation

If pacing is a challenge, consider consolidating Lessons 1 and 2. Omit Lessons 3, 8, and 11. Use Lesson 3's Problem Set and Homework as a center activity for early finishers or for a future date when additional review homework is needed. Consider moving Lesson 16, which guides students through a tessellation project with 1-inch tiles, to art class.

[1]See *Elementary Mathematics for Teachers* by Scott Baldridge and Thomas Parker.

Focus Grade Level Standards

Number and Operations

The student applies mathematical process standards to connect repeated addition and subtraction to multiplication and division situations that involve equal groupings and shares. The student is expected to:

2.6A model, create, and describe contextual multiplication situations in which equivalent sets of concrete objects are joined;

2.6B model, create, and describe contextual division situations in which a set of concrete objects is separated into equivalent sets.

Algebraic Reasoning

The student applies mathematical process standards to identify and apply number patterns within properties of numbers and operations in order to describe relationships. The student is expected to:

2.7A determine whether a number up to 40 is even or odd using pairings of objects to represent the number.

Geometry and Measurement

The student applies mathematical process standards to select and use units to describe length, area, and time. The student is expected to:

2.9F use concrete models of square units to find the area of a rectangle by covering it with no gaps or overlaps, counting to find the total number of square units, and describing the measurement using a number and the unit.[2]

Foundational Standards

The student is expected to:

1.5E understand that the equal sign represents a relationship where expressions on each side of the equal sign represent the same value(s);

2.2C generate a number that is greater than or less than a given whole number up to 1,200;

2.4B add up to four two-digit numbers and subtract two-digit numbers using mental strategies and algorithms based on knowledge of place value and properties of operations.

Focus Mathematical Process Standards

The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

MPS(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

MPS(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

[2] 2.9F is included in this module because the array model is so important to the foundation for multiplication. The balance of this cluster is addressed in Module 8.

Overview of Module Topics and Lesson Objectives

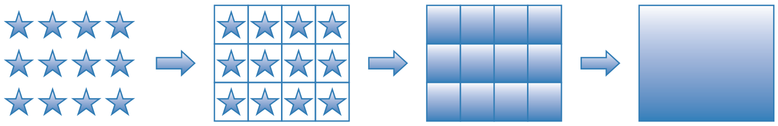
TEKS	ELPS		Topics and Objectives	Days
2.6A 2.4B	1.C 1.H 2.C 2.E 2.I 3.E 4.D	A	**Formation of Equal Groups** Lesson 1: Use manipulatives to create equal groups. Lessons 2–3: Use math drawings to represent equal groups, and relate to repeated addition. Lesson 4: Represent equal groups with strip diagrams, and relate to repeated addition.	4
2.6A 2.4C 2.4D	1.C 2.B 2.C 2.E 2.G 2.I 3.A 3.E 3.F 4.G 4.K 5.G	B	**Arrays and Equal Groups** Lesson 5: Compose arrays from rows and columns, and count to find the total using objects. Lesson 6: Decompose arrays into rows and columns, and relate to repeated addition. Lesson 7: Represent arrays and distinguish rows and columns using math drawings. Lesson 8: Create arrays using square tiles with gaps. Lesson 9: Solve word problems involving addition of equal groups in rows and columns.	5
			Mid-Module Assessment: Topics A–B (assessment ½ day, return ½ day, remediation or further applications 1 day)	2
2.6A **2.6B** **2.9F** 2.8E	1.C 1.E 2.B 2.E 2.I 3.A 3.E 3.H 3.J 4.B 5.F	C	**Rectangular Arrays as a Foundation for Multiplication and Division** Lessons 10–11: Use square tiles to compose a rectangle, and relate to the array model. Lesson 12: Understand area as an attribute of plane figures. Lesson 13: Decompose and recompose shapes to compare areas. Lesson 14: Model tiling with centimeter and inch unit squares as a strategy to measure area. Lesson 15: Use math drawings to partition a rectangle with square tiles, and relate to repeated addition. Lesson 16: Use grid paper to create designs to develop spatial structuring.	7

TEKS	ELPS	Topics and Objectives		Days
2.7A	1.A 1.C 2.B 2.E 2.I 3.A 3.D 3.E 4.B 5.G	D	**The Meaning of Even and Odd Numbers** Lesson 17: Relate doubles to even numbers, and write number sentences to express the sums. Lesson 18: Pair objects and skip-count to relate to even numbers. Lesson 19: Investigate the pattern of even numbers: 0, 2, 4, 6, and 8 in the ones place, and relate to odd numbers. Lesson 20: Use rectangular arrays to investigate odd and even numbers.	4
			End-of-Module Assessment: Topics A–D (assessment ½ day, return ½ day, remediation or further applications 1 day)	2
Total Number of Instructional Days				**24**

Terminology

New or Recently Introduced Terms

- Area (the amount of two-dimensional space in a bounded region)
- Area model (a model for multiplication that relates rectangular arrays to area)



- Array (an arrangement of objects in rows and columns)
- Columns (the vertical groups in a rectangular array)
- Even number (a whole number whose last digit is 0, 2, 4, 6, or 8)
- Odd number (any number that is not even)
- Repeated addition (e.g., 2 + 2 + 2)
- Rows (the horizontal groups in a rectangular array)
- Square unit (a unit of area—specifically square centimeters, inches, feet, and meters)
- Tessellation (tiling of a plane using one or more geometric shapes with no overlaps and no gaps)
- Tile (to cover a region without gaps or overlaps)
- Unit square (e.g., given a length unit, it is a 1 unit by 1 unit square)
- Whole number (e.g., 0, 1, 2, 3, …)

Familiar Terms and Symbols[3]

- Addends
- Doubles
- Equation
- Number path
- Number sentence
- Pair
- Rectangle
- Skip-counting
- Square
- Strip diagram
- Sum
- Total
- Unit

Suggested Tools and Representations

- Counters
- Number bond
- Number path
- Personal white board
- Rectangular array
- Square tiles

Scaffolds

The scaffolds integrated into *A Story of Units*® give alternatives for how students access information as well as express and demonstrate their learning. Strategically placed margin notes are provided within each lesson elaborating on the use of specific scaffolds at applicable times. They address many needs presented by English language learners, students with disabilities, students performing above grade level, and students performing below grade level. Many of the suggestions are organized by Universal Design for Learning (UDL) principles and are applicable to more than one population.

[3]These are terms and symbols students have seen previously.

Assessment Summary

Type	Administered	Format	Standards Addressed
Mid-Module Assessment Task	After Topic B	Constructed response with rubric	2.6A
End-of-Module Assessment Task	After Topic D	Constructed response with rubric	2.6A 2.6B 2.7A 2.9F

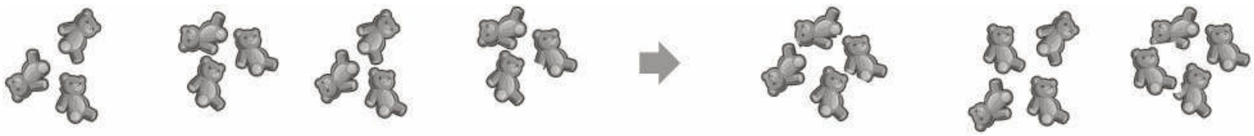
Topic A

Formation of Equal Groups

2.6A, 2.4B

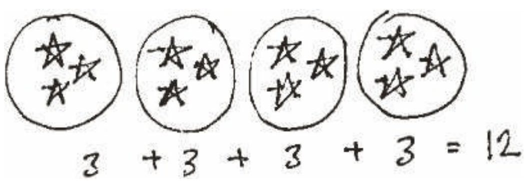
Focus Standard:		2.6A	Model, create, and describe contextual multiplication situations in which equivalent sets of concrete objects are joined.
Instructional Days:		4	
Coherence	**-Links from:**	G2–M3	Place Value, Counting, and Comparison of Numbers to 1,200
	-Links to:	G3–M1	Properties of Multiplication and Division and Solving Problems with Units of 2–5 and 10

Topic A begins at the concrete level as students use objects to create equal groups, providing a foundation for the construction of arrays in Topic B. In Lesson 1, for example, students are given 12 counters, such as teddy bears, pebbles, or beans, and they are asked to put them into groups of 3, thereby creating 4 equal groups of 3 objects.



Students then see that they can manipulate the same number of counters to make 3 equal groups of 4 objects. Finally, they are presented with unequal groups and challenged to make them equal.

Lessons 2 and 3 move to the pictorial level, introducing math drawings to represent equal groups. In Lesson 2, students are asked to show groups: "Show me 3 stars, now 3 more. Add 3 more, now 3 more than that." They then determine the total number of stars and write the corresponding repeated addition number sentence as shown to the right (**2.6A**).



Lesson 3 extends this understanding as students look for and practice a more efficient way to add by bundling. They calculate repeated addition sums by grouping the addends into pairs and then adding. For example, for 4 groups of 3, students might say, "I bundled 2 pairs of three to make sixes, so 6 + 6 = 12." If there is an odd number of addends (e.g., 5 groups of 3), students group them into pairs and then add on the remaining quantity such that (3 + 3) + (3 + 3) = 6 + 6 = 12, and then, 12 + 3 = 15. As students work with equal groups, they begin to see that they are adding units of 3.

This concept transitions into Lesson 4, where students understand that numbers other than 1, 10, and 100 can serve as units. At a more abstract level than Lesson 3, students represent the total of a given number of units with strip diagrams or using repeated addition (e.g., 2 + 2 + 2 + 2 = 8). This concept serves as a bridge to Topic B, wherein either a row or column of an array can be seen as the unit being counted—the foundation for building rectangular arrays (**2.6A**).

A Teaching Sequence Toward Mastery of Formation of Equal Groups	
Objective 1:	**Use manipulatives to create equal groups. (Lesson 1)**
Objective 2:	**Use math drawings to represent equal groups, and relate to repeated addition. (Lessons 2–3)**
Objective 3:	**Represent equal groups with strip diagrams, and relate to repeated addition. (Lesson 4)**

Teacher Edition

Eureka Math® Grade 2 Module 7

TEKS EDITION

Special thanks go to the Gordon A. Cain Center and to the Department of Mathematics at Louisiana State University for their support in the development of *Eureka Math*.

Great Minds® is the creator of *Eureka Math®*, *Wit & Wisdom®*, *Alexandria Plan™*, and *PhD Science®*.

Published by Great Minds PBC
greatminds.org

Printed in the USA

1 2 3 4 5 6 7 8 9 10 XXX 25 24 23 22 21

ISBN 978-1-63642-853-6

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GRADE 2 • MODULE 7

Problem Solving with Length, Money, and Data

Grade 2 • Module 7

Problem Solving with Length, Money, and Data

OVERVIEW

Module 7 presents an opportunity for students to practice addition and subtraction strategies within 100 and problem-solving skills as they learn to work with various types of units within the contexts of length, money, and data. Students represent categorical and measurement data using picture graphs and bar graphs. They revisit measuring and estimating length from Module 2 but now use both metric and customary units.

Module 7 opens with students representing and interpreting categorical data. In Grade 1, students learned to organize and represent data with up to three categories. Now, in Grade 2, students build upon this understanding by drawing both picture and bar graphs (**2.10A, 2.10B, 2.10C, 2.10D**). First, they record category counts in a table, solving problems based on the information in the table. Next, they draw picture graphs in which each picture represents one object. Finally, they represent the same data set in the form of a bar graph, where one axis names the categories and the other shows a single-unit count scale. Students use the information to solve *put together, take apart,* and *compare* problems (**2.10A, 2.10B, 2.10C, 2.10D**), making connections to finding sums and differences on a number line diagram. In the final lesson of Topic A, students display money data in the form of a bar graph, thus establishing a connection to word problems with coins in Topic B.

In Topic B, students work with the most popular units of all: bills and coins. Students apply their knowledge of coin values, place value strategies, and the properties of operations to solve addition and subtraction word problems (**2.4A, 2.4B, 2.5A, 2.5B**) to find the total value of a group of coins or bills. Next, they use coins to find multiple ways to represent the same quantity, sometimes using the fewest number of coins. Students then focus on the decomposition of a dollar, where they see that this unit behaves like all others they have seen before (e.g., 100 ones = 1 hundred, 100 cm = 1 m). Students learn how to make change from one dollar using counting on, simplifying strategies (e.g., number bonds), and the relationship between addition and subtraction. As students use coins or bills to solve addition and subtraction word problems within 100,[1] they use drawings and equations to represent the unknown in various situations. The Application Problems throughout this module include solving two-step word problems involving two-digit money amounts (e.g., $28 + $47 or 28¢ + 47¢), as students use this new context to increase fluency with addition and subtraction within 100 (**2.4A, 2.4B, 2.4C**).

In Topic C, students are introduced to financial literacy concepts. Students solve story problems about saving and spending in order to understand how money accumulates over time (**2.11A, 2.11B**). Understanding the difference between a deposit and a withdrawal is taught in relation to saving and spending money (**2.11C**). Next, students learn to differentiate between consumers and producers. Students explore the concept of consumers and producers as they calculate the cost of producing an item (**2.11F**). Finally, students learn about the benefits and costs of lending and borrowing (**2.11D, 2.11E**).

[1]Totals are limited to within 100 cents, or 1 dollar, when working with coins, and 100 dollars when working with bills.

After the Mid-Module Assessment, Topic D reviews the measurement concepts and skills presented in Module 2, now with a focus on customary units. Students deepen their understanding of a *length unit* as they lay one-inch square tiles end-to-end to create simple inch rulers, just as they created centimeter rulers in Module 2. They see again that the smaller the unit, the more iterations are necessary to cover a given distance. Students measure the length of various objects with their new unit rulers (**2.9A, 2.9D**), applying important concepts such as the understanding that the zero point on a ruler is the beginning of the total length and the number on a ruler means the distance covered by that number of length units.

In Topic E, students apply their measurement skills and knowledge of the ruler to measure a variety of objects using the appropriate measurement tools, such as inch rulers and yardsticks, just as they measured with centimeter rulers, meter sticks, and meter tapes in Module 2 (**2.9A, 2.9D**). Students thereby add to their bank of benchmark lengths, such as an inch being the distance across a quarter. By doing so, students develop mental images of an inch, a foot, or a yard, which empowers them to estimate a given length (**2.9E**).

In addition, in Topic E, students measure objects using both metric and customary length units, thereby developing an understanding of how the number of units needed depends upon the size of the unit chosen (**2.9B**). As in Topic D, students recognize, for example, that the smaller the length unit, the more iterations are necessary to cover a given distance. Topic E concludes with students measuring to determine how much longer one object is than another (**2.9A**). Students use addition and subtraction to compare two lengths, subtracting the length of the shorter object from the length of the longer object to determine the difference (e.g., 40 in – 35 in = 5 in, or 35 in + _____ = 40 in).

Whereas in Topic E students used rulers to compare lengths, in Topic F, students use drawings (e.g., strip diagrams and number bonds) and equations with an unknown to represent addition and subtraction word problems (**2.9E**). Once they have a solid conceptual understanding of length, students are ready to represent whole numbers as lengths on a number line (**2.2E, 2.2F, 2.9C**) and apply their knowledge of the ruler to a number line diagram. In Topic F, they are asked to identify unknown numbers on a number line by using place value, reference points (e.g., 5, 10, 25, and 50), and the distance between points. Students are also asked to represent two-digit sums and differences using the number line as a measurement model for combining and comparing lengths.

The Mid-Module Assessment follows Topic C, and the End-of-Module Assessment follows Topic F.

Notes on Pacing for Differentiation

If pacing is a challenge, consider consolidating Lessons 1 and 2, Lessons 3 and 4, Lessons 11 and 12, and Lessons 17 and 18.

Focus Grade Level Standards

Number and Operations

The student applies mathematical process standards to understand how to represent and compare whole numbers, the relative position and magnitude of whole numbers, and relationships within the numeration system related to place value. The student is expected to:

2.2E locate the position of a given whole number on an open number line;

2.2F name the whole number that corresponds to a specific point on a number line.

Number and Operations

The student applies mathematical process standards to develop and use strategies and methods for whole number computations in order to solve addition and subtraction problems with efficiency and accuracy. The student is expected to:

2.4A recall basic facts to add and subtract within 20 with automaticity;

2.4B add up to four two-digit numbers and subtract two-digit numbers using mental strategies and algorithms based on knowledge of place value and properties of operations;

2.4C solve one-step and multi-step word problems involving addition and subtraction within 1,000 using a variety of strategies based on place value, including algorithms.

Number and Operations

The student applies mathematical process standards to determine the value of coins in order to solve monetary transactions. The student is expected to:

2.5A determine the value of a collection of coins up to one dollar;

2.5B use the cent symbol, dollar sign, and the decimal point to name the value of a collection of coins.

Geometry and Measurement

The student applies mathematical process standards to select and use units to describe length, area, and time. The student is expected to:

2.9A find the length of objects using concrete models for standard units of length;

2.9B describe the inverse relationship between the size of the unit and the number of units needed to equal the length of an object;

2.9C represent whole numbers as distances from any given location on a number line;

2.9D determine the length of an object to the nearest marked unit using rulers, yardsticks, meter sticks, or measuring tapes;

2.9E determine a solution to a problem involving length, including estimating lengths.

Data Analysis

The student applies mathematical process standards to organize data to make it useful for interpreting information and solving problems. The student is expected to:

2.10A explain that the length of a bar in a bar graph or the number of pictures in a pictograph represents the number of data points for a given category;

2.10B organize a collection of data with up to four categories using pictographs and bar graphs with intervals of one or more;

2.10C write and solve one-step word problems involving addition or subtraction using data represented within pictographs and bar graphs with intervals of one;

2.10D draw conclusions and make predictions from information in a graph.

Personal Financial Literacy

The student applies mathematical process standards to manage one's financial resources effectively for lifetime financial security. The student is expected to:

2.11A calculate how money saved can accumulate into a larger amount over time;

2.11B explain that saving is an alternative to spending;

2.11C distinguish between a deposit and a withdrawal;

2.11D identify examples of borrowing and distinguish between responsible and irresponsible borrowing;

2.11E identify examples of lending and use concepts of benefits and costs to evaluate lending decisions;

2.11F differentiate between producers and consumers and calculate the cost to produce a simple item.

Foundational Standards

The student is expected to:

1.7A use measuring tools to measure the length of objects to reinforce the continuous nature of linear measurement;

1.7B illustrate that the length of an object is the number of same-size units of length that, when laid end-to-end with no gaps or overlaps, reach from one end of the object to the other;

1.7D describe a length to the nearest whole unit using a number and a unit;

1.8A collect, sort, and organize data in up to three categories using models/representations such as tally marks or T-charts;

1.8B use data to create picture and bar-type graphs;

1.8C draw conclusions and generate and answer questions using information from picture and bar-type graphs;

1.9B identify income as a means of obtaining goods and services, oftentimes making choices between wants and needs;

1.9C distinguish between spending and saving;

2.2C generate a number that is greater than or less than a given whole number up to 1,200;

2.2D use place value to compare and order whole numbers up to 1,200 using comparative language, numbers, and symbols (>, <, or =);

2.7C represent and solve addition and subtraction word problems where unknowns may be any one of the terms in the problem.

Focus Mathematical Process Standards

The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

MPS(A) apply mathematics to problems arising in everyday life, society, and the workplace;

MPS(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

MPS(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

MPS(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

MPS(E) create and use representations to organize, record, and communicate mathematical ideas;

MPS(F) analyze mathematical relationships to connect and communicate mathematical ideas.

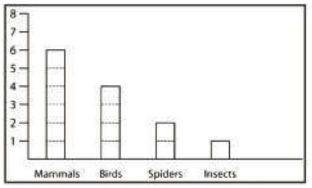
Overview of Module Topics and Lesson Objectives

TEKS	ELPS		Topics and Objectives	Days
2.10A **2.10B** **2.10C** **2.10D** 2.2E 2.2F 2.9C	1.C 1.D 1.H 2.E 3.C 3.E 3.F 4.J 5.F	A	**Problem Solving with Categorical Data** Lesson 1: Sort and record data into a table using up to four categories; use category counts to solve word problems. Lesson 2: Draw and label a picture graph to represent data with up to four categories. Lesson 3: Draw and label a bar graph to represent data; relate the count scale to the number line. Lesson 4: Draw a bar graph to represent a given data set. Lesson 5: Solve word problems using data presented in a bar graph.	5
2.4A **2.4B** **2.4C** **2.5A** **2.5B** 2.2C	1.A 1.C 1.H 2.A 2.E 2.I 3.B 3.C 3.G 3.I 4.F 4.H 5.G	B	**Problem Solving with Coins and Bills** Lesson 6: Recognize the value of coins and count up to find their total value. Lesson 7: Solve word problems involving the total value of a group of coins. Lesson 8: Solve word problems involving the total value of a group of bills. Lesson 9: Solve word problems involving different combinations of coins with the same total value. Lesson 10: Use the fewest number of coins to make a given value. Lesson 11: Use different strategies to make $1 or make change from $1. Lesson 12: Solve word problems involving different ways to make change from $1. Lesson 13: Solve two-step word problems involving dollars or cents with totals within $100 or $1.	8
2.11A **2.11B** **2.11C** **2.11D** **2.11E** **2.11F** 2.4C	1.C 2.B 2.C 2.E 3.A 3.D 3.E 3.F 4.G 5.G	C	**Problem Solving with Financial Literacy** Lesson 14: Solve problems related to saving and spending. Lesson 15: Understand the difference between consumers and producers. Lesson 16: Understand the difference between borrowing and lending.	3

TEKS	ELPS		Topics and Objectives	Days
			Mid-Module Assessment: Topics A–C (assessment 1 day, return 1 day, remediation or further applications 1 day)	3
2.9A **2.9D**	1.C 1.D 2.C 3.E 3.F 4.D 5.G	D	**Creating an Inch Ruler** Lesson 17: Connect measurement with physical units by using iteration with an inch tile to measure. Lesson 18: Apply concepts to create inch rulers; measure lengths using inch rulers.	2
2.9A **2.9B** **2.9D** **2.9E**	1.F 2.E 2.G 2.I 3.C 3.E 3.H 4.J 5.G	E	**Measuring and Estimating Length Using Customary and Metric Units** Lesson 19: Measure various objects using inch rulers and yardsticks. Lesson 20: Develop estimation strategies by applying prior knowledge of length and using mental benchmarks. Lesson 21: Measure an object twice using different length units and compare; relate measurement to unit size. Lesson 22: Measure to compare the differences in lengths using inches, feet, and yards.	4
2.2E **2.2F** **2.9C** **2.9E** 2.2C 2.2D 2.4A 2.4B	1.C 1.H 2.E 2.H 2.I 3.H 4.G 5.G	F	**Problem Solving with Customary and Metric Units** Lesson 23: Solve two-digit addition and subtraction word problems involving length by using strip diagrams and writing equations to represent the problem. Lesson 24: Identify unknown numbers on a number line diagram by using the distance between numbers and reference points. Lesson 25: Represent two-digit sums and differences involving length by using the ruler as a number line.	3
			End-of-Module Assessment: Topics A–F (assessment 1 day, return 1 day, remediation or further applications 1 day)	3
Total Number of Instructional Days				**31**

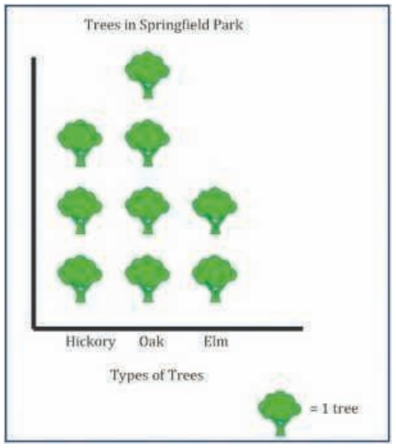
Terminology

New or Recently Introduced Terms



Bar Graph

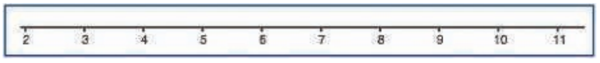
- Bar graph (pictured to the right)
- Borrow (to take and use something that belongs to someone else with the intention of returning it)
- Category (a group of people or things sharing a common characteristic; e.g., bananas are in the fruit category)
- Consumer (person who buys a product or a service)
- Data (a set of facts or pieces of information)
- Degree (unit used to measure temperature, e.g., degrees Fahrenheit)
- Deposit (money put into the bank)
- Foot (ft, a unit of length equal to 12 inches)
- Inch (in, a unit of length)
- Legend (the notation on a graph explaining what symbols represent)
- Lend (to give someone the use of something with the understanding that it will be returned)
- Picture graph (a representation of data like a bar graph, using pictures instead of bars—pictured to the right)
- Producer (person who makes products or provides services)
- Scale (a number line used to indicate the various quantities represented in a bar graph—pictured below to the right)
- Survey (collecting data by asking a question and recording responses)
- Symbol (a picture that represents something else)
- Table (a representation of data using rows and columns)
- Thermometer (a tool used to measure temperature)
- Withdrawal (money taken out of an account)
- Yard (yd, a unit of length equal to 36 inches or 3 feet)



Picture Graph

Familiar Terms and Symbols[2]

- Benchmark number (e.g., numbers like the multiples of 10)
- Centimeter (cm, a unit of length measure)
- Cents (e.g., 5¢)
- Coins (e.g., penny, nickel, dime, and quarter)
- Compare
- Compose
- Decompose



Scale

[2]These are terms and symbols students have seen previously.

- Difference
- Dollars (e.g., $2)
- Endpoint
- Equation
- Estimation (an approximation of the value of a quantity or number)
- Hash mark (the marks on a ruler or other measurement tool)
- Height
- Length
- Length unit
- Meter (m, a unit of length measure)
- Meter strip, meter stick
- Number bond
- Number line (a line marked at evenly spaced intervals)
- Overlap (to extend over or cover partly)
- Ruler
- Strip diagram
- Tally mark
- Unit
- Value

Suggested Tools and Representations

- Bar graph (representation of data)
- Centimeter cube
- Centimeter ruler
- Dice
- Grid paper
- Inch and centimeter ruler
- Inch tiles
- Measuring tape
- Meter stick
- Money (i.e., dollars, coins)
- Number bond
- Number line
- Personal white board
- Picture graph
- Strip diagram
- Table
- Yardstick

Scaffolds

The scaffolds integrated into *A Story of Units*® give alternatives for how students access information as well as express and demonstrate their learning. Strategically placed margin notes are provided within each lesson elaborating on the use of specific scaffolds at applicable times. They address many needs presented by English language learners, students with disabilities, students performing above grade level, and students performing below grade level. Many of the suggestions are organized by Universal Design for Learning (UDL) principles and are applicable to more than one population.

Assessment Summary

Type	Administered	Format	Standards Addressed
Mid-Module Assessment Task	After Topic C	Constructed response with rubric	2.4A 2.4B 2.4C 2.5A 2.5B 2.10A 2.10B 2.10C 2.10D 2.11A 2.11B 2.11C 2.11E
End-of-Module Assessment Task	After Topic F	Constructed response with rubric	2.2E 2.2F 2.4A 2.4B 2.4C 2.5A 2.5B 2.9A 2.9B 2.9C 2.9D 2.9E

Teacher Edition

Eureka Math® Grade 2 Module 8

TEKS EDITION

Special thanks go to the Gordon A. Cain Center and to the Department of Mathematics at Louisiana State University for their support in the development of *Eureka Math*.

Great Minds® is the creator of *Eureka Math®*, *Wit & Wisdom®*, *Alexandria Plan™*, and *PhD Science®*.

Published by Great Minds PBC
greatminds.org

Printed in the USA

1 2 3 4 5 6 7 8 9 10 XXX 25 24 23 22 21

ISBN 978-1-63642-854-3

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GRADE 2 • MODULE 8

Time, Shapes, and Fractions as Equal Parts of Shapes

Grade 2 • Module 8

Time, Shapes, and Fractions as Equal Parts of Shapes

OVERVIEW

In Module 8, the final module of the year, students extend their understanding of part–whole relationships through the lens of geometry. As students compose and decompose shapes, they begin to develop an understanding of unit fractions as equal parts of a whole.

In Topic A, students build on their prior knowledge of a shape's defining attributes (**1.6A, 1.6B, 1.6D**) to recognize and draw categories of polygons with specified attributes: the number of sides, vertices, and angles (**2.8A, 2.8C**). For example, students see that a rectangle has four straight sides, four right angles, and opposite sides with equal length. Students then relate two-dimensional shapes to three-dimensional shapes. They describe three-dimensional shapes in terms of their attributes, counting the number of edges, faces, and vertices (**2.8B**). Once students are able to describe and analyze polygons and solids according to their attributes in Topic A, they are ready to combine shapes and build composite shapes in Topic B.

Topic B opens with students using a tangram, a set of seven shapes that compose a square, to create a new shape. Students see that they can arrange two-dimensional shapes to create a new whole, or composite, shape, which can become part of an even larger whole. As students progress through the topic, they build and partition shapes by combining two or more smaller shapes and relating the parts to the whole. For example, they use different pattern blocks to show that a regular hexagon might be composed of two trapezoids or three rhombuses. One might say, "This hexagon is made from two identical trapezoids, or two equal parts." This allows for interpreting equal shares of a whole as a fraction as students name the equal parts *halves*, *thirds*, or *fourths* (**2.8E**). Although thirds and sixths are explored, these fractional units are not assessed.

Next, in Topic C, students decompose circles and rectangles into equal parts and describe them as halves (a half of), fourths (a fourth of) or quarters, and eighths (an eighth of) (**2.3A, 2.8E**). For example, students see that a circle can be partitioned into four quarter-circles, or parts, which can be described as fourths. They learn to describe the whole by the number of equal parts. For example, one whole circle is composed of 4 fourths. In this topic, students count beyond 1 in fractional units. For example, they count 1 half, 2 halves, 3 halves. This is to show that the counting sequence does not change. What can change is what we count: the unit. Finally, students decompose a rectangle into four parts that have equal areas but different shapes (**2.3A, 2.3C, 2.3D, 2.8E**).

The module closes with Topic D, where students apply their understanding of partitioning the whole into halves and fourths to tell time to the nearest five minutes and then the nearest minute (**2.9G**) using both analog and digital clocks. They construct simple clocks and see the relationship to partitioning a circle into quarters and halves, thereby decomposing 60 minutes. For example, 3 fourths of the circle can be interpreted as 3 intervals of 15 minutes; that is, 15 + 15 + 15 = 45 (**2.4B**), or 45 minutes. They also use their understanding of skip-counting by fives and tens to tell time on an analog clock (**2.9G**).

The Mid-Module Assessment follows Topic B. The End-of-Module Assessment follows Topic D.

Notes on Pacing for Differentiation

If pacing is a challenge, consider consolidating Lessons 9 and 10.

Focus Grade Level Standards

Number and Operations

The student applies mathematical process standards to recognize and represent fractional units and communicates how they are used to name parts of a whole. The student is expected to:

2.3A partition objects into equal parts and name the parts, including halves, fourths, and eighths, using words;

2.3B explain that the more fractional parts used to make a whole, the smaller the part; and the fewer the fractional parts, the larger the part;

2.3C use concrete models to count fractional parts beyond one whole using words and recognize how many parts it takes to equal one whole;

2.3D identify examples and non-examples of halves, fourths, and eighths.

Geometry and Measurement

The student applies mathematical process standards to analyze attributes of two-dimensional shapes and three-dimensional solids to develop generalizations about their properties. The student is expected to:

2.8A create two-dimensional shapes based on given attributes, including number of sides and vertices;

2.8B classify and sort three-dimensional solids including spheres, cones, cylinders, rectangular prisms (including cubes as special rectangular prisms) and triangular prisms, based on attributes using formal geometric language;

2.8C classify and sort polygons with 12 or fewer sides according to attributes, including identifying the number of sides and number of vertices;

2.8D compose two-dimensional shapes and three-dimensional solids with given properties or attributes;

2.8E decompose two-dimensional shapes such as cutting out a square from a rectangle, dividing a shape in half, or partitioning a rectangle into identical triangles and identify the resulting geometric parts.

Geometry and Measurement

The student applies mathematical process standards to select and use units to describe length, area, and time. The student is expected to:

2.9G read and write time to the nearest one-minute increment using analog and digital clocks and distinguish between a.m. and p.m.

Foundational Standards

The student is expected to:

1.6A classify and sort regular and irregular two-dimensional shapes based on attributes using informal geometric language;

1.6B distinguish between attributes that define a two-dimensional or three-dimensional figure and attributes that do not define the shape;

1.6C create two-dimensional figures, including circles, triangles, rectangles, and squares, as special rectangles, rhombuses, and hexagons;

1.6D identify two-dimensional shapes, including circles, triangles, rectangles, and squares, as special rectangles, rhombuses, and hexagons and describe their attributes using formal geometric language;

1.6E identify three-dimensional solids, including spheres, cones, cylinders, rectangular prisms (including cubes), and triangular prisms, and describe their attributes using formal geometric language;

1.6F compose two-dimensional shapes by joining two, three, or four figures to produce a target shape in more than one way if possible;

1.6G partition two-dimensional figures into two and four fair shares or equal parts and describe the parts using words;

1.6H identify examples and non-examples of halves and fourths;

1.7E tell time to the hour and half hour using analog and digital clocks;

2.2C generate a number that is greater than or less than a given whole number up to 1,200;

2.4A recall basic facts to add and subtract within 20 with automaticity;

2.4B add up to four two-digit numbers and subtract two-digit numbers using mental strategies and algorithms based on knowledge of place value and properties of operations;

2.9A find the length of objects using concrete models for standard units of length;

2.9D determine the length of an object to the nearest marked unit using rulers, yardsticks, meter sticks, or measuring tapes.

Focus Mathematical Process Standards

The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

MPS(A) apply mathematics to problems arising in everyday life, society, and the workplace;

MPS(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

MPS(E) create and use representations to organize, record, and communicate mathematical ideas;

MPS(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

Overview of Module Topics and Lesson Objectives

TEKS	ELPS	Topics and Objectives			Days
2.8A **2.8B** **2.8C** 2.9A 2.9B	1.A 1.C 1.E 2.C 2.D 2.E 3.E 3.J 4.A 4.F 5.G	A	**Attributes of Geometric Shapes**		5
			Lesson 1:	Describe two-dimensional shapes based on attributes.	
			Lesson 2:	Build, identify, and analyze two-dimensional shapes with specified attributes.	
			Lesson 3:	Use attributes to draw different polygons including triangles, quadrilaterals, pentagons, and hexagons.	
			Lesson 4:	Use attributes to identify and draw different quadrilaterals including rectangles, rhombuses, parallelograms, and trapezoids.	
			Lesson 5:	Classify and sort three-dimensional shapes by their attributes.	
2.3A **2.8D** **2.8E** 2.3C 2.3D 2.8A 2.8C	2.E 3.C 3.E 3.J 4.B	B	**Composite Shapes and Fraction Concepts**		3
			Lesson 6:	Combine shapes to create a composite shape; create a new shape from composite shapes.	
			Lessons 7–8:	Interpret equal shares in composite shapes as halves, thirds, and fourths.	
			Mid-Module Assessment: Topics A–B (assessment ½ day, return ½ day, remediation or further applications 1 day)		2
2.3A **2.3B** **2.3C** **2.3D** **2.8E** 2.8A 2.8C	1.A 1.F 2.C 2.E 2.I 3.E 4.F	C	**Fractions of Circles and Rectangles**		3
			Lessons 9:	Partition circles and rectangles into equal parts, and describe those parts as halves, thirds, or fourths.	
			Lesson 10:	Partition circles and rectangles into equal parts, and describe those parts as halves, fourths, and eighths.	
			Lesson 11:	Use concrete models to count fractional parts beyond one whole.	
2.3A **2.8E** **2.9G** 2.2C 2.4A 2.4B	1.C 1.H 2.I 3.C 3.E 3.H 3.J	D	**Application of Fractions to Tell Time**		5
			Lesson 12:	Construct a paper clock by partitioning a circle into halves and quarters, and tell time to the half hour or quarter hour.	
			Lesson 13:	Tell time to the nearest five minutes.	
			Lesson 14:	Tell time to the nearest five minutes; relate *a.m.* and *p.m.* to time of day.	

TEKS	ELPS	Topics and Objectives		Days
	4.F 4.G		Lesson 15: Relate skip counting by fives on the clock and telling time to a continuous measurement model, the number line. Lesson 16: Count by fives and ones on the number line as a strategy to tell time to the nearest minute on the clock.	
			End-of-Module Assessment: Topics A–D (assessment ½ day, return ½ day, remediation or further applications 1 day)	2
Total Number of Instructional Days				**20**

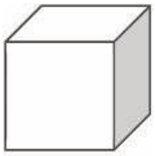
Terminology

New or Recently Introduced Terms

- a.m./p.m.
- Analog clock
- Angle (e.g., a figure formed by the corner of a polygon)
- Base (the surface a solid object stands on)
- Congruent (exactly the same)
- Decagon (a polygon with ten sides and ten vertices)
- Heptagon (a polygon with seven sides and seven vertices)
- Nonagon (a polygon with nine sides and nine vertices)
- Octagon (a polygon with eight sides and eight vertices)
- Parallel (used to describe opposite sides of a parallelogram, e.g., “These sides are parallel because if they kept on going, they’d never intersect!”)
- Parallelogram (a quadrilateral with both pairs of opposite sides parallel)
- Partition (used in reference to partitioning rectangles, e.g. “Let’s partition this rectangle to make an array” or “Let’s partition this tape to show the money that was spent and the money that was left. Which part will be longer?”)
- Pentagon (a two-dimensional figure enclosed by five straight sides and five angles)
- Polygon (a closed figure with three or more straight sides, e.g., triangle, quadrilateral, pentagon, hexagon)
- Quadrilateral (a four-sided polygon, e.g., square, rhombus, rectangle, parallelogram, trapezoid)
- Quarter past, quarter to
- Right angle (e.g., a square corner)
- Third of (shapes), thirds (three equal shares)
- Whole (used in reference to fractions, e.g., 2 halves make 1 whole, and 3 thirds make 1 whole)

Familiar Terms and Symbols[1]

- Attributes (the characteristics of an object such as number of sides, angles, or faces)
- Cone (a three-dimensional solid with a circular base and a curved surface that tapers to a point)
- Cube (a three-dimensional shape composed of six squares)
- Cylinder (a three-dimensional solid with a curved surface and 2 congruent circular bases)
- Digital clock
- Edge (a line segment where two faces meet)
- Face (a two-dimensional side of a three-dimensional shape)
- Fourth of (shapes), fourths (four equal shares)
- Half hour (an interval of time lasting 30 minutes)
- Half of (shapes), halves (two equal shares)
- Half past (an expression for 30 minutes past a given hour)
- Hour (a unit for measuring time, equivalent to 60 minutes or 1/24 of a day)
- Minute (a unit for measuring time, equivalent to 60 seconds or 1/60 of an hour)
- O'clock (used to indicate time to a precise hour with no additional minutes)
- Quarter of (shapes), quarters (four equal shares)
- Rectangular prism (a prism with 2 identical rectangular bases)
- Solid (a three-dimensional object)
- Sphere (a three-dimensional object shaped like a ball)
- Tangram (a special set of puzzle pieces with five triangles and two quadrilaterals that compose a square)
- Triangular prism (a prism with 2 identical triangular bases)
- Two-dimensional shapes (familiar prior to Grade 2):
  - Circle
  - Half-circle
  - Hexagon (a two-dimensional figure enclosed by six straight sides and six angles)
  - Quarter-circle
  - Rectangle (a two-dimensional figure enclosed by four straight sides and four right angles)
  - Rhombus (a two-dimensional figure enclosed by four straight sides of the same length)
  - Square (a rectangle with four sides of the same length)
  - Trapezoid (a two-dimensional figure enclosed by four straight sides with exactly one pair of parallel sides)
  - Triangle (a two-dimensional figure enclosed by three straight sides and three angles)
- Vertex/Vertices (a point where two or more line segments meet; a corner)


Cube

[1]These are terms and symbols students have seen previously.

Suggested Tools and Representations

- Cube: a three-dimensional shape (real-world examples such as a die, alphabet blocks, or a box)
- Geoboards
- Large instructional geared clock
- Pattern blocks
- Personal white boards
- Rulers or straightedges
- Spaghetti
- Student clocks, preferably those with gears that can provide the appropriate hour-hand alignment
- Tangrams
- Toothpicks

Scaffolds

The scaffolds integrated into *A Story of Units*® give alternatives for how students access information as well as express and demonstrate their learning. Strategically placed margin notes are provided within each lesson elaborating on the use of specific scaffolds at applicable times. They address many needs presented by English language learners, students with disabilities, students performing above grade level, and students performing below grade level. Many of the suggestions are organized by Universal Design for Learning (UDL) principles and are applicable to more than one population.

Assessment Summary

Type	Administered	Format	Standards Addressed
Mid-Module Assessment Task	After Topic B	Constructed response with rubric	2.3A 2.3C 2.3D 2.8A 2.8B 2.8C 2.8D 2.8E
End-of-Module Assessment Task	After Topic D	Constructed response with rubric	2.3A 2.3B 2.3C 2.3D 2.8C 2.8E 2.9G

Topic A

Attributes of Geometric Shapes

2.8A, 28B, 2.8C, 2.9A, 2.9B

Focus Standards:		2.8A	Create two-dimensional shapes based on given attributes, including number of sides and vertices.
		2.8B	Classify and sort three-dimensional solids including spheres, cones, cylinders, rectangular prisms (including cubes as special rectangular prisms) and triangular prisms, based on attributes using formal geometric language.
		2.8C	Classify and sort polygons with 12 or fewer sides according to attributes, including identifying the number of sides and number of vertices.
Instructional Days:		5	
Coherence	**-Links from:**	G1-M5	Identifying, Composing, and Partitioning Shapes
	-Links to:	G3-M7	Geometry and Measurement Word Problems

In Module 8, students continue to develop their geometric thinking from Grade 1, progressing from a descriptive to an analytic level of thinking where they can recognize and characterize shapes by their attributes and properties.

In Lesson 1 of Topic A, students describe various two-dimensional shapes according to specified attributes, such as the number of sides or angles (**2.8C**). The names of the shapes are intentionally omitted in this lesson in order to encourage students to use precise language in their descriptions. Students must attend to a shape's defining attributes in order to describe the difference between shapes. For example, rather than describing a shape as a quadrilateral, students describe it as a shape having four sides and four angles. In this lesson, students come to see the corner of a polygon as an angle and the point where the sides of the angle meets the vertex. In Lesson 4, the right angle is introduced as a square angle. After students name the attributes of shapes, they use geoboards to create a shape given its attributes.

In Lesson 2, students build various polygons as they name them based on attributes. Using uncooked spaghetti of various lengths, they build a triangle, quadrilateral, pentagon, hexagon, heptagon, octagon, nonagon, and decagon (**2.8A**), adding another piece of spaghetti for each construction. They then identify a collection of various polygons, both exemplars and variants of shapes (as shown below), including those with sides of unequal length. As they analyze shapes, the students expand their bank of mental images associated with names of shapes. Hence, this task serves to broaden, rather than limit, their understanding and to clarify common misconceptions about shapes.

Now that they have created, manipulated, and named shapes, students are ready to draw their own in Lesson 3. This lesson focuses on the four categories of polygons that students built in Lesson 2: triangles, quadrilaterals, pentagons, and hexagons. After the teacher-guided portion of the lesson, students use a ruler to draw straight lines and to create their own shapes, before trading with a partner. Partners take turns naming and analyzing shapes according to their attributes.

In Lesson 4, students use various attributes (e.g., side length, parallel lines, right angles) to identify different quadrilaterals. Along with recognizing trapezoids and rhombuses, seen in Grade 1, students are introduced to parallelograms. They learn to recognize parallel sides and square corners and to name quadrilaterals based on these attributes. For example, students might be questioned and guided as follows: "Draw a quadrilateral with both pairs of opposite sides parallel. We call this a parallelogram." Next, "Now, draw a quadrilateral with both pairs of opposite sides parallel and four square angles. We call this a rectangle." Then, the teacher might continue with, "Can you draw another quadrilateral that also has opposite sides parallel, but this time use your ruler to show that all sides are equal? We call this a rhombus." While students learn the various names of shapes, the emphasis remains on analyzing shapes based on their varied attributes. In doing so, students begin to notice the similarities and differences between various quadrilaterals.

Finally, in Lesson 5, students focus solely on three-dimensional solids. They classify and sort solids as they discuss attributes using academic language (**2.8B**).

A Teaching Sequence Toward Mastery of Attributes of Geometric Shapes

Objective 1: Describe two-dimensional shapes based on attributes.
(Lesson 1)

Objective 2: Build, identify, and analyze two-dimensional shapes with specified attributes.
(Lesson 2)

Objective 3: Use attributes to draw different polygons including triangles, quadrilaterals, pentagons, and hexagons.
(Lesson 3)

Objective 4: Use attributes to identify and draw different quadrilaterals including rectangles, rhombuses, parallelograms, and trapezoids.
(Lesson 4)

Objective 5: Classify and sort three-dimensional shapes by their attributes.
(Lesson 5)