Grade 2: Mission Overview

The table outlines the missions, lessons, and estimated duration of Grade 2 content on Zearn.

Mission	Title	Lessons	Weeks
1	Add and Subtract Friendly Numbers	8	2
2	Explore Length	10	2
3	Counting and Place Value	19	5
4	Add, Subtract, and Solve	29	7
5	Add and Subtract Big Numbers	20	5
6	Equal Groups	16	5
7	Length, Money, and Data	19	6
8	Shapes, Time, and Fractions	12	4
Totals		**133**	**36**

Note: Weeks are estimates based on 4 lessons completed per week. Actual time will vary by student.

Grade 2: Standards

The tables show where the new Grade 2 standards are covered on Zearn.

Operations & Algebraic Thinking

STANDARD	MISSION
2.OA.1	1, 4
2.OA.2	1
2.OA.3	6
2.OA.4	6

Numbers & Operations in Base 10

STANDARD	MISSION
2.NBT.1	3
2.NBT.2	3
2.NBT.3	3
2.NBT.4	3
2.NBT.5	1, 4, 7
2.NBT.6	4
2.NBT.7	4, 5
2.NBT.8	4, 5
2.NBT.9	4, 5

Measurement & Data

STANDARD	MISSION
2.MD.1	2, 7
2.MD.2	2, 7
2.MD.3	2, 7
2.MD.4	2, 7
2.MD.5	2, 7
2.MD.6	2, 7
2.MD.7	8
2.MD.8	7
2.MD.9	7
2.MD.10	7

Geometry

STANDARD	MISSION
2.G.1	8
2.G.2	6
2.G.3	8

Summary

Grade 2 mathematics is about:

1. Extending understanding of base-ten notation
2. Building fluency with addition and subtraction
3. Using standard units of measure
4. Describing and analyzing shapes

Key Areas of Focus for Grades K-2:

Addition and subtraction—concepts, skills, and problem solving

Required Fluency:

2.OA.6 Add and subtract within 20
2.NBT.5 Add and subtract within 100

Standards for Mathematical Practice:

MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

MP.3 Construct viable arguments and critique the reasoning of others.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

MP.6 Attend to precision.

MP.7 Look for and make use of structure.

MP.8 Look for and express regularity in repeated reasoning.

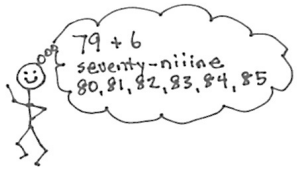
Mission 1

Add and Subtract Friendly Numbers

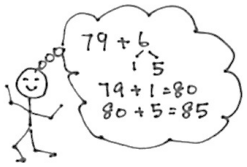
OVERVIEW

Mission 1 sets the foundation for students to master sums and differences to 20 (**2.OA.2**). 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.NBT.5**). In Grade 1, students worked extensively with numbers to gain fluency with sums and differences within 10 (**1.OA.5**) and became proficient in counting on (a Level 2 strategy). They also began to make easier problems to add and subtract within 20 and 100 by making ten and taking from ten (Level 3 strategies) (**1.OA.6, 1.NBT.4–6**).[1]

Level 2: Count on



Level 3: Make an easier problem



In Mission 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 Level 3 decomposition and composition methods:

- Decompositions of numbers within ten[2] (e.g., 0 + 7, 1 + 6, 2 + 5, and 3 + 4, all equal seven).
- Partners to ten[3](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[4] (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

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[1] *See Common Core Progressions Document, "K, Counting and Cardinality; K–5, Operations and Algebraic Thinking", pages 36 and 39.*
[2] *K.OA.3; 1.OA.6*
[3] *K.OA.4*
[4] *K.NBT.1; 1.NBT.2b*

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).

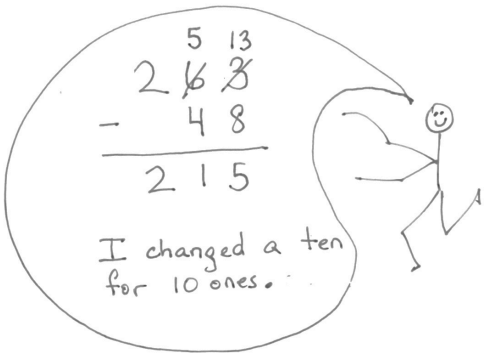
Lesson 6	Lesson 7	Lesson 8
60 – 8 = 52	13 – 8 = 5	63 – 8 = 55
/ \	/ \	/\
50 10	3 10	53 10
10 – 8 = 2	10 – 8 = 2	10 – 8 = 2
50 + 2 = 52	3 + 2 = 5	53 + 2 = 55

Decompose and Subtract From Ten

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

Mission 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."*

Mission 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 Mission 1 but rather by Mission 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 Mission 1, whole group word 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.OA.1**). Many word problems in this mission allow students the opportunity to discover through problem-solving

the logic and usefulness of a strategy before it is formally presented. 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 (MP.5).

Mission 2

Explore Length

OVERVIEW

In this Grade 2 mission, students engage in activities designed to deepen their conceptual understanding of measurement and to relate addition and subtraction to length. Their work in Mission 2 is exclusively with metric units in order to support place value concepts. Customary units are introduced in Mission 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.MD.1**), 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[5] of a centimeter or meter, empowering them to mentally iterate units relevant to measuring a given length (**2.MD.3**). The knowledge and experience signal that students are determining which tool is appropriate to make certain measurements (**2.MD.1**).

In **Topic C**, students measure and compare to determine how much longer one object is than another (**2.MD.4**). 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.MD.2**). 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 **mission 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 tape diagrams for comparison, to solve word problems (**2.MD.5**, **2.MD.6**). 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

[5] *See Common Core Progressions Document, "K–5, Geometric Measurement," page 14.*

with tape diagrams to solve *start unknown* and two-step problems).

Mission 3

Counting and Place Value

OVERVIEW

In this Grade 2 mission, 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 Mission 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.NBT.1**). A number in Grade 1 generally consisted of two different units, tens and ones. Now, in Grade 2, a number generally consists of three units: hundreds, tens, and ones (**2.NBT.1**). The bundled units are organized by separating them largest to smallest, ordered from left to right. Over the course of the mission, 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.NBT.3**).

Furthermore, in this mission instruction includes a great deal of counting: by ones, tens, and hundreds (**2.NBT.2**). 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.NBT.4**).

In this mission, the place value story has advanced. Along with changing 10 ones for 1 ten, students now also change 10 tens for 1 hundred. This changing leads to the use of counting strategies to solve word problems (**2.OA.1**). In the next mission, 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 Mission 4 (**2.NBT.8**).

How is this mission'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 (Grade 3 OA standards), 3 fourths or 3 units of one-fourth (Grade 3 NF standards). Learning that 12 tens = 120 leads to an understanding of 12 tenths = 1.2, 4 thirds = $\frac{4}{3}$ = $1\frac{1}{3}$, 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 (Grade 3 NBT standards) to meaningful understanding of all operations with base ten whole numbers (Grade 4 NBT standards) and to understanding place value's extension into decimal fractions and operations (Grade 5 NBT standards).

Mission 4

Add, Subtract, and Solve

OVERVIEW

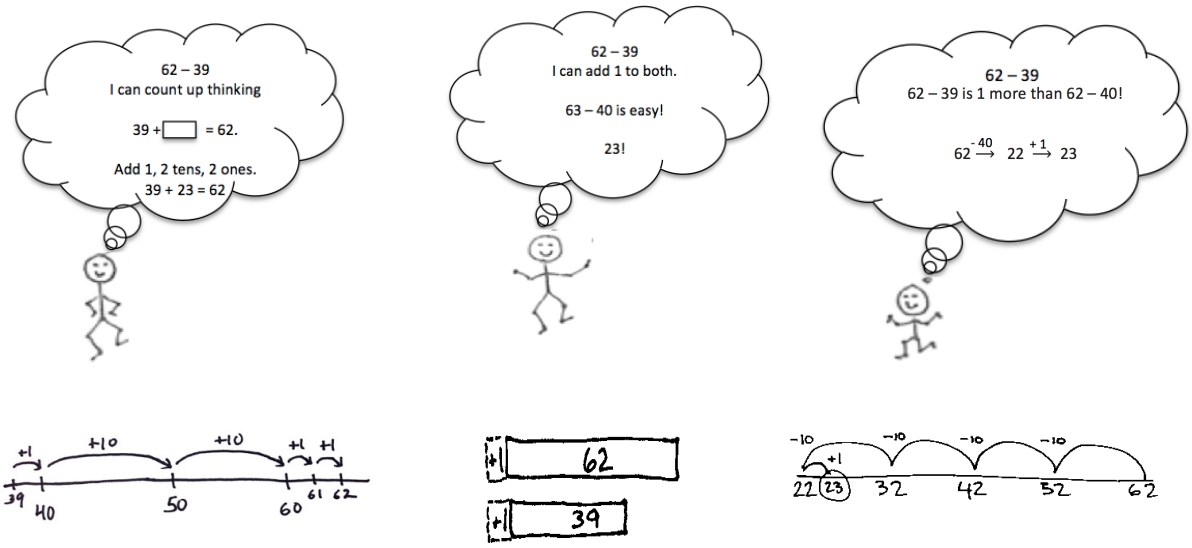
In Mission 3, students were immersed in the base ten system as they built a strong foundation of place value understanding through a concrete to pictorial to abstract approach. They bundled groups of 10 and saw that 10 like units could be bundled to produce a new unit that is ten times as large. They progressed from seeing 10 ones as 1 ten (**1.NBT.2a**) to understanding 10 tens as 1 hundred (**2.NBT.2**). Mission 4 builds on that place value understanding, which enables students to compose and decompose place value units to add and subtract within 200.

Mission 4 is devoted to three major areas of work. The first two are building fluency in two-digit addition and subtraction within 100 (**2.NBT.5**) and applying that fluency to one- and two-step word problems of varying types within 100 (**2.OA.1**). 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.[6] The third major area of work is developing students' conceptual understanding of addition and subtraction of multi-digit numbers within 200 (**2.NBT.7**, **2.NBT.9**) as a foundation for work with addition and subtraction within 1,000 in Mission 5.

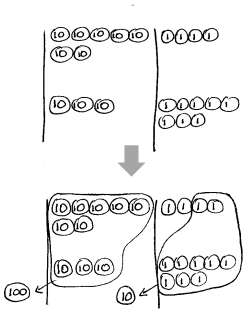
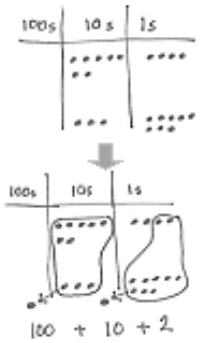
The final lessons of Mission 3 (finding 1 more, 1 less, 10 more, 10 less) transition into mental addition and subtraction of 1 and 10 (**2.NBT.8**). In Topic A of Mission 4, students work with place value strategies to fluently add and subtract within 100 (**2.NBT.5**). They mentally add and subtract 100 in Topics D and E, as well as during fluency activities throughout the mission, as they did in Mission 3.

This knowledge is then extended and used to solve problems. For example, students might count on by ones and tens (e.g., 39 + ☐ = 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.NBT.5**). Students explain why these strategies work using place value language, properties of addition and subtraction, and models such as the number line (**2.NBT.9**).

[6] *See Common Core Progressions Document, "K, Counting and Cardinality; K–5, Operations and Algebraic Thinking", page 18, for the specific types and the rationale.*



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-Mission 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.NBT.6, 2.NBT.7**). Subtraction in **Topic E** involves subtracting when decomposing 1 hundred for 10 tens and 1 ten for 10 ones (**2.NBT.7**).

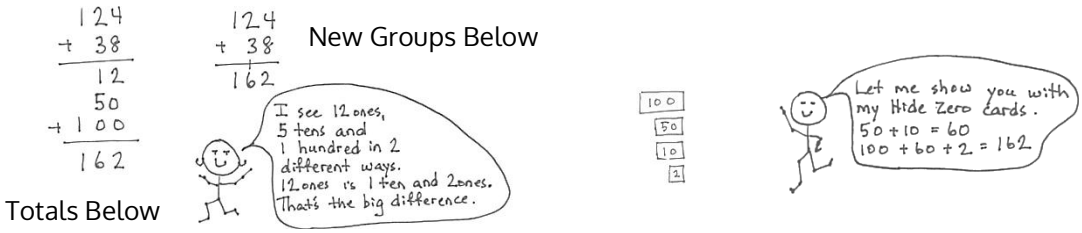
Concrete	Pictorial		Abstract
			
Place Value Disks	Place Value Chart with Labeled Disks	Chip Model	New Groups Below

Throughout the mission, 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 Mission 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.NBT.7**). 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.NBT.9**).

Throughout the mission, students are encouraged to be flexible in their thinking and to use multiple strategies in solving problems, including the use of drawings such as tape 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.NBT.9**).



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

Mission 5

Add and Subtract Big Numbers

OVERVIEW

In Mission 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 Mission 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 mission, 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.NBT.7**). Students relate *100 more* and *100 less* to addition and subtraction of 100 (**2.NBT.8**). 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.NBT.9**).

In **Topics B and C**, students continue to build on Mission 4's work, now composing and decomposing tens and hundreds within 1,000 (**2.NBT.7**). 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 Mission 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.NBT.5**, **2.OA.1**). The focus of the lesson 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.NBT.7**). Note that a written method can include number bonds, chip models, arrow notation, the algorithm, or tape 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.NBT.9**). For example, students may use the relationship between addition and subtraction to demonstrate why their subtraction solution is correct.

The mission 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.NBT.9**).

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 Core Fluency Practice Sets during whole group time or Sprints during Independent Digital Lessons.

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

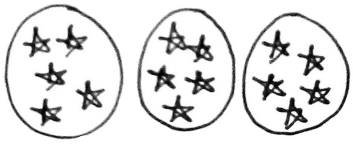
Mission 6

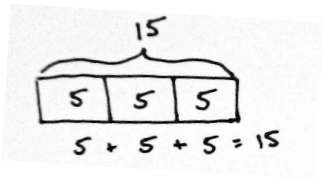
Equal Groups

OVERVIEW

Grade 2 Mission 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 tape 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.OA.4**). 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 tape 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 in preparation for Grade 3's area content. They use same-size squares to tile a rectangle with no gaps or overlaps and then count to find the total number of squares that make up the rectangle (**2.G.2**). After composing rectangles, students partition, or decompose, rectangles. First, they decompose rectangles made of square tiles. Next, they use scissors to cut apart paper rectangles. Finally, they draw and iterate a square unit. In doing so, students begin to see the row or the column as a composite of multiple squares or as a single entity, or

unit, which is, in turn, part of the larger rectangle. Students further develop spatial structuring skills by copying and creating drawings on grid paper. Note that the concept of a square unit begins in Grade 3 and is not assessed in Grade 2. Throughout the topic, students relate repeated addition to the model. They are encouraged to think flexibly and to consider the many ways to construct or partition a given array. Students are not multiplying or dividing in Grade 2; rather, this topic lays the foundation for the relationship between the two operations. As equal parts can be composed to form a whole, likewise, a whole can be decomposed into equal parts.

Topic D focuses on doubles and even numbers (**2.OA.3**), 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.[7]

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.OA.3**). 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 mission 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-Mission Assessment follows Topic B. The End-of-Mission Assessment follows Topic D.

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

Mission 7

Length, Money, and Data

OVERVIEW

Mission 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, bar graphs, and line plots. They revisit measuring and estimating length from Mission 2 but now use both metric and customary units.

Mission 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.MD.10**). 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.MD.10**), 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.NBT.5**, **2.MD.8**) 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,[8] they use drawings and equations to represent the unknown in various situations. The opening problems throughout this mission 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.NBT.5**).

After the Mid-Mission Assessment, **Topic C** reviews the measurement concepts and skills presented in Mission 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 Mission 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.MD.1**), applying important concepts such as the understanding that the zero point on a ruler is the beginning of the total length and the

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

number on a ruler means the distance covered by that number of length units.

In **Topic D**, 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 Mission 2 (**2.MD.1**). 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.MD.3**).

In addition, in Topic D, 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.MD.2**). As in Topic C, students recognize, for example, that the smaller the length unit, the more iterations are necessary to cover a given distance. Topic D concludes with students measuring to determine how much longer one object is than another (**2.MD.4**). 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 D students used rulers to compare lengths, in **Topic E**, students use drawings (e.g., tape diagrams and number bonds) and equations with an unknown to represent addition and subtraction word problems (**2.MD.5**). Once they have a solid conceptual understanding of length, students are ready to represent whole numbers as lengths on a number line (**2.MD.6**) and apply their knowledge of the ruler to a number line diagram. In Topic E, 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.

Topic F follows naturally, with students generating measurement data and representing it with a line plot (**2.MD.9**). Students position data along a horizontal scale with whole number markings, drawn as a number line diagram (**2.MD.6**). Since students are working with length, the scale on their line plots corresponds to the scale on their rulers. After generating measurement data, students create line plots from different data sets, and then they discuss and interpret the results.

The Mid-Mission Assessment follows Topic B, and the End-of-Mission Assessment follows Topic F.

Mission 8

Shapes, Time, and Fractions

OVERVIEW

In Mission 8, the final mission 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.G.1**) to recognize and draw categories of polygons with specified attributes: the number of sides, corners, and angles (**2.G.1**). For example, students see that a rectangle has four straight sides, four right angles, and opposite sides with equal length. Students then relate the square, a special rectangle, to the cube by building a cube from six congruent squares. They describe the cube in terms of its attributes, counting the number of edges, faces, and corners (**2.G.1**). Once students are able to describe and analyze polygons and the cube 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.G.3**).

Next, in **Topic C**, students decompose circles and rectangles into equal parts and describe them as halves (a half of), thirds (a third of), and fourths (a fourth of) or quarters (**2.G.3**). 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. Finally, students decompose a rectangle into four parts that have equal areas but different shapes (**2.G.3**).

The mission 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 (**2.G.3**, **2.MD.7**) 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.NBT.5**, **2.NBT.6**), or 45 minutes. They also use their understanding of skip-counting by fives and tens to tell time on an analog clock (**2.NBT.2**). Finally, students apply their learning by calculating time intervals of hours and half hours and close the year by determining the time interval in days until they become third graders.

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