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GRADE 2 • MODULE 4

Addition and Subtraction Within 200 with Word Problems to 100

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Grade 2 • Module 4

Addition and Subtraction Within 200 with Word Problems to 100

OVERVIEW

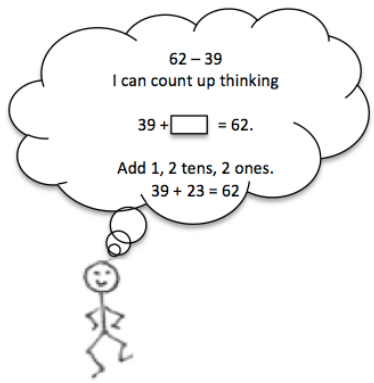
In Module 3, students were immersed in the base ten system as they built a strong foundation of place value understanding through a concrete to pictorial to abstract approach. They bundled groups of 10 and saw that 10 like units could be bundled to produce a new unit that is ten times as large. They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

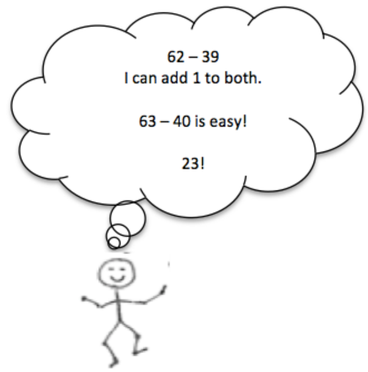
Module 4 is devoted to three major areas of work. The first two are building fluency in two-digit addition and subtraction within 100 (**2.NBT.5**) and applying that fluency to one- and two-step word problems of varying types within 100 (**2.OA.1**). Students' increasing fluency with calculations within 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.[1] 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 Module 5.

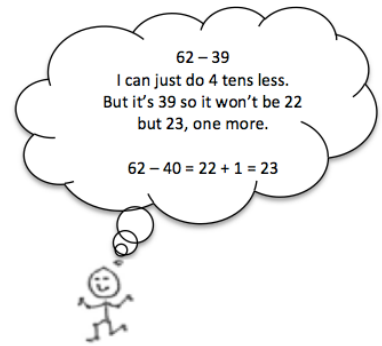
The final lessons of Module 3 (finding 1 more, 1 less, 10 more, 10 less) transitioned into mental addition and subtraction of 1 and 10 (**2.NBT.8**). In Topic A of Module 4, students work with place value strategies to fluently add and subtract within 100 (**2.NBT.5**). They mentally add and subtract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

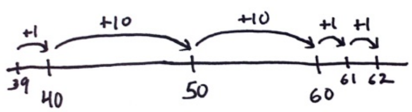
This knowledge is then extended and used to solve problems. For example, students might count on by ones and tens, e.g., 39 + ☐ = 62, so 40, 50, 60, 61, 62. They might use compensation, adding the same amount to the subtrahend as to the minuend to make a multiple of ten, e.g., 62 – 39 = 63 – 40. They 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**).

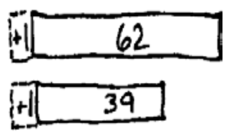
[1] See the Progression document "Operations and Algebraic Thinking," p. 18, for the specific types and the rationale.

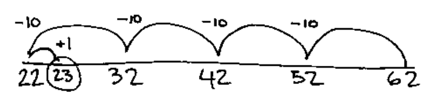






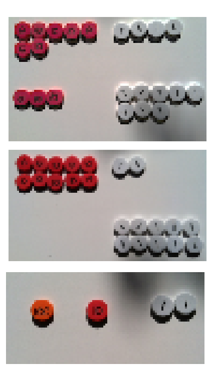






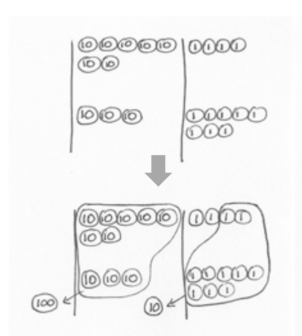
Topic A's strategies lead naturally to work with the algorithms for addition (Topic B) and subtraction (Topic C). Note that the vertical form is used to describe the written numbers, where the algorithm is used to describe the cyclical process of making a larger or smaller unit. In these two topics, 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-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.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

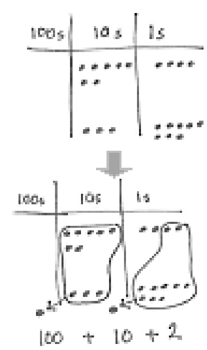


Place value disks

Pictorial



Place value chart with labeled disks



Chip model

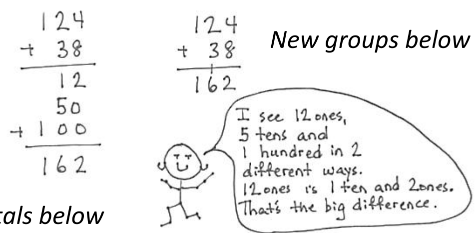
Abstract

New groups below

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.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 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 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**).



New groups below

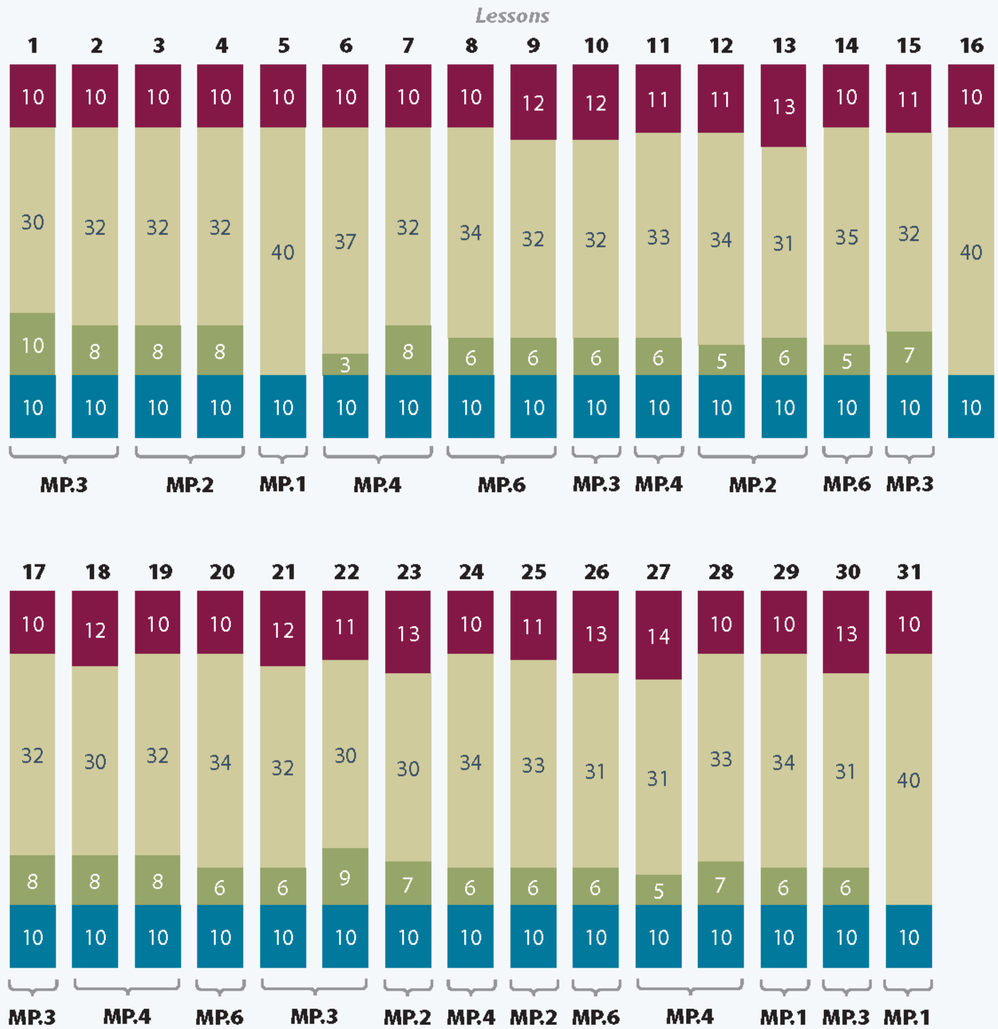
Totals below

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

Distribution of Instructional Minutes

This diagram represents a suggested distribution of instructional minutes based on the emphasis of particular lesson components in different lessons throughout the module.

- Fluency Practice
- Concept Development
- Application Problems
- Student Debrief



MP = Mathematical Practice

Focus Grade Level Standards

Represent and solve problems involving addition and subtraction.

2.OA.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

Use place value understanding and properties of operations to add and subtract.[2]

2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

2.NBT.6 Add up to four two-digit numbers using strategies based on place value and properties of operations.

2.NBT.7 Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method. Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.

2.NBT.8 Mentally add 10 or 100 to a given number 100–900, and mentally subtract 10 or 100 from a given number 100–900.

2.NBT.9 Explain why addition and subtraction strategies work, using place value and the properties of operations. (Explanations may be supported by drawings or objects.)

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

Foundational Standards

1.OA.1 Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.

1.OA.3 Apply properties of operations as strategies to add and subtract. (Students need not use formal terms for these properties.) *Examples: If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known. (Commutative property of addition.) To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2 + 10 = 12. (Associative property of addition.)*

1.OA.4 Understand subtraction as an unknown-addend problem. *For example, subtract 10 – 8 by finding the number that makes 10 when added to 8.*

1.NBT.2 Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases:

a. 10 can be thought of as a bundle of ten ones – called a "ten."

b. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones.

c. The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).

1.NBT.4 Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten.

2.NBT.1 Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases:

a. 100 can be thought of as a bundle of ten tens – called a "hundred."

b. The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).

2.NBT.2 Count within 1000; skip-count by 5s, 10s, and 100s.

2.NBT.3 Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.

Focus Standards for Mathematical Practice

MP.1 **Make sense of problems and persevere in solving them.** Students solve two-step word problems and are challenged to make sense of more complex relationships within situations. They flexibly solve problems with a variety of strategies at their disposal, sometimes finding many ways to solve the same problem.

MP.2 **Reason abstractly and quantitatively.** Students reason abstractly when they represent two-step problems and harder problem types with drawings such as tape diagrams and when they relate those drawings to equations. As the module progresses, students move back and forth between concrete, pictorial, and abstract work to make sense of quantities and their relationships in problem situations.

MP.3 **Construct viable arguments and critique the reasoning of others.** Students construct viable arguments when they use place value reasoning and properties of operations to explain why their addition and subtraction strategies work and when they use that reasoning to justify their choice of strategies in solving problems. They critique the reasoning of others when they use those same concepts to disprove or support the work of their peers.

MP.4 **Model with mathematics.** Students model with mathematics when they write equations to solve two-step word problems, make math drawings when solving a vertical algorithm, or when they draw place value charts and disks to represent numbers.

MP.6 **Attend to precision.** Students attend to precision when they label their math drawings and models with specific place value units. They calculate accurately and efficiently when adding numbers within 200 and when using the relationship between addition and subtraction to check their work.

Overview of Module Topics and Lesson Objectives

Standards		Topics and Objectives	Days
2.OA.1 **2.NBT.5** **2.NBT.8** **2.NBT.9**	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.NBT.7 **2.NBT.9** 2.OA.1 2.NBT.5	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.OA.1 **2.NBT.7** **2.NBT.9** 2.NBT.5	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 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

Standards	Topics and Objectives			Days
2.NBT.6 2.NBT.7 2.NBT.8 2.NBT.9	D	**Strategies for Composing Tens and Hundreds**		6
		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.	
2.NBT.7 2.NBT.9	E	**Strategies for Decomposing Tens and Hundreds**		6
		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.	
2.OA.1 2.NBT.7 2.NBT.9	F	**Student Explanations of Written Methods**		3
		Lesson 29:	Use and explain the totals below written method using words, math drawings, and numbers.	
		Lesson 30:	Compare totals below to new groups below as written methods.	
		Lesson 31:	Solve two-step word problems within 100.	
		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 iv)
- Simplifying strategy (e.g., to solve 299 + 6, think 299 + 1 + 5 = 300 + 5 = 305)
- Totals below (pictured above on page iv)

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[3]

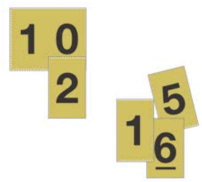
- Addend
- Addition
- Bundle, unbundle, regroup, rename, change (compose or decompose a 10 or 100)
- Difference
- Hundreds place (referring to place value)
- Place value (referring to the unit value of each digit in a given number)
- Subtraction
- Units of ones, tens, hundreds, thousands (referring to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

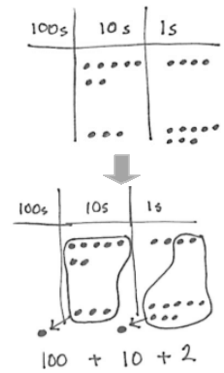
[3] These are terms and symbols students have used or seen previously.

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
- Tape diagram

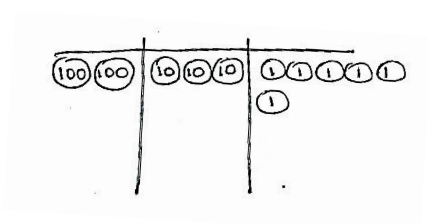
Hide Zero cards



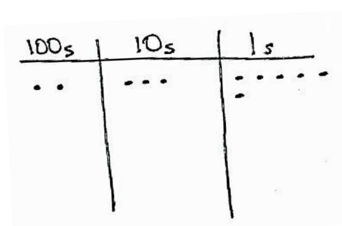


Chip model

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



Chip model

Scaffolds[4]

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*."

[4]Students with disabilities may require Braille, large print, audio, or special digital files. Please visit the website www.p12.nysed.gov/specialed/aim for specific information on how to obtain student materials that satisfy the National Instructional Materials Accessibility Standard (NIMAS) format.

Assessment Summary

Type	Administered	Format	Standards Addressed
Mid-Module Assessment Task	After Topic C	Constructed response with rubric	2.OA.1 2.NBT.5 2.NBT.7 2.NBT.8 2.NBT.9
End-of-Module Assessment Task	After Topic F	Constructed response with rubric	2.OA.1 2.NBT.5 2.NBT.6 2.NBT.7 2.NBT.8 2.NBT.9