

Kenmore-Town of Tonawanda UFSD

We educate, prepare, and inspire all students to achieve their highest potential

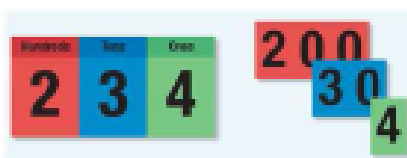


Grade 2 Module 4 Parent Handbook

The materials contained within this packet have been taken from the Great Minds curriculum Eureka Math.

Addition and Subtraction Within 200 with Word Problems to 100

In this 31-lesson module, students will work on fluency in addition and subtraction up to 100. They will also build conceptual understanding of adding and subtracting multi-digit numbers to 200, and will apply their skills when solving problems.



Building the number 234 with place value cards showing the following:

$$2 = 2 \text{ hundreds} = 200$$

$$3 = 3 \text{ tens} = 30$$

$$4 = 4 \text{ ones} = 4$$

$$\text{So } 234 = 200 + 30 + 4!$$

Key Vocabulary:

Minuend: A quantity or number from which another number is to be subtracted

Subtrahend: A quantity or number being subtracted from another

Difference: The solution to a subtraction problem

Place value: Referring to the unit value of each digit in a given number

Place Value Chart: (see reverse): A graphic organizer that students can use to see the coherence of place value and operations between different units.

$$\begin{array}{r} 125 \\ + 75 \\ \hline 100 \\ 90 \\ + 10 \\ \hline 200 \end{array} \quad \text{or} \quad \begin{array}{r} 125 \\ + 75 \\ \hline 10 \\ 90 \\ + 100 \\ \hline 200 \end{array}$$

This is a picture of the method known as “totals below”, in which students decompose multi-digit numbers into like place-value groups as they add.

What Came Before this Module:

Students expanded their understanding of unit and of place value by bundling ones, tens, and hundreds with sticks.

What Comes After this Module:

In Module 5, we will continue to strengthen and deepen our conceptual understanding of addition and subtraction, working with numbers up to 1000.

How you can help at home:

- Continue to ask how many ones, tens, and hundreds are in numbers that you and your student come across

- When possible, encourage your student to explain their mathematical thinking by drawing a diagram or picture that links to their addition and subtraction problems

Key Common Core Standards:

- Represent and solve problems involving addition and subtraction
- Use place value understanding and properties of operations to add and subtract, including:
 - Fluently add and subtract within 100
 - Add and subtract within 200, using concrete models or drawings and strategies based on place value, and explaining chosen strategies in writing

Place Value Chart Without Headings
(Used with labeled materials such as disks)

Hundreds	Tens	Ones

Place Value Chart with Headings
(Used with unlabeled materials such as base-ten blocks or bundles)

Spotlight on Math Models:

Place Value Charts

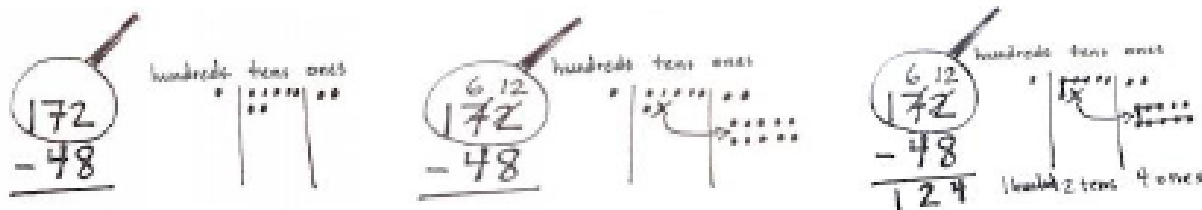
You will see this mathematical representation throughout the grades in *A Story of Units*.

A Story of Units has several key mathematical “models” that will be used throughout a student’s elementary years.

The place value chart is a graphic organizer that students can use to see the coherence of place value and operations between different units. It enables students to discover the value of each digit in a given number at the concrete level, as they represent numbers with place value disks or bundles. Use of the place value chart begins in Grade 1 as students learn about tens and ones, and continues through the use of decimals in Grade 5. The place value chart is a flexible tool.

Young students can place chips on the chart, and physically move them as they bundle and group numbers. Older students can quickly create their own place value charts to illustrate their thinking for a problem and show their understanding of more complex numbers. In second grade, students use the chart extensively as they work to build their understanding of numbers up to 1000, and will often be asked to use the chart to illustrate how to compose and decompose numbers.

Module 4 Sample Problem (Lesson 15): Model $172 - 48$ using the place value chart.



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., $39 + \square = 62$, 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.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**).

The image shows three different strategies for solving the subtraction problem $62 - 39$:

- Strategy 1 (Counting up):** A thought bubble says "I can count up thinking $39 + \square = 62$. Add 1, 2 tens, 2 ones. $39 + 23 = 62$ ". Below it is a number line from 39 to 62 with jumps of 10, 10, 1, and 1.
- Strategy 2 (Adding 1 to both):** A thought bubble says "I can add 1 to both. $63 - 40$ is easy! 23!". Below it are two boxes containing the numbers 62 and 39.
- Strategy 3 (Compensation):** A thought bubble says "I can just do 4 tens less. But it's 39 so it won't be 22 but 23, one more. $62 - 40 = 22 + 1 = 23$ ". Below it is a number line from 22 to 62 with jumps of 10, 10, 10, and 10, and a small jump of 1 from 22 to 23.

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	Pictorial		Abstract	
Place value disks	Place value chart with labeled disks		Chip model	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) work (**2.NBT.9**).

$$\begin{array}{r} 124 \\ + 38 \\ \hline 12 \\ 50 \\ + 100 \\ \hline 162 \end{array}$$

Totals below

New groups below

$$\begin{array}{r} 124 \\ + 38 \\ \hline 162 \end{array}$$


I see 12 tens, 5 tens and 1 hundred in 2 different ways. 12 tens is 1 ten and 2 tens. That's the big difference.





Let me show you with my Hide Zero Cards.

$$\begin{array}{r} 50 + 10 = 60 \\ 100 + 60 = 160 \end{array}$$

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)



**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., $13 + 2 = 15$, $22 - 14 = \underline{\quad}$, $10 - \underline{\quad} = 8$).
- **Number sentence (also addition or subtraction sentence):** A statement that is true or false and, therefore, contains no unknowns (e.g., $21 > 7$, $3 + 2 = 5$).

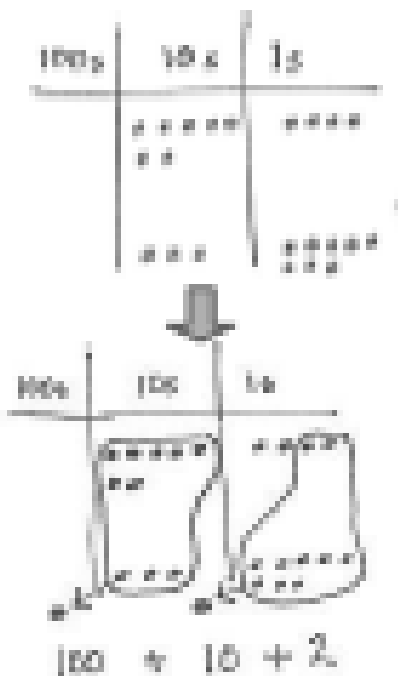
- New groups below (show newly composed units on the line below the appropriate place in the addition algorithm, pictured on previous page)
- Simplifying strategy (e.g., to solve $299 + 6$, think $299 + 1 + 5 = 300 + 5 = 305$)
- Totals below (pictured on previous page)

Familiar Terms and Symbols

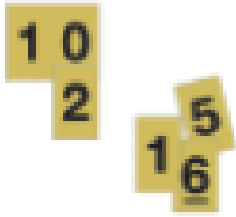
- Addend
- Addition
- Bundle, unbundle, regroup, rename, change (compose or decompose a 10 or 100)
- Difference
- Hundreds place (referring to place value)
- Place value (referring to the unit value of each digit in a given number)
- Subtraction
- Units of ones, tens, hundreds, thousands (referring to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

Tools and Representations

- Arrow notation (arrow way)
- Chip model

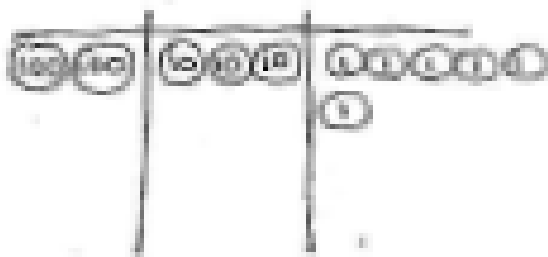


- Hide Zero cards

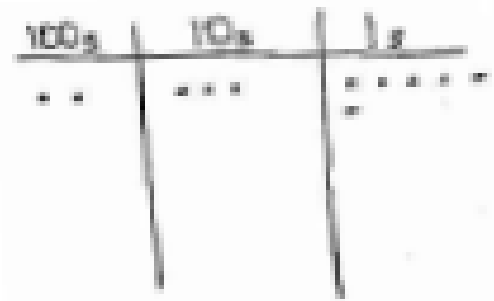


- Number bond
- Personal white boards
- Place value chart (Template in Lesson 1)
- Place value disk sets (19 ones, 19 tens, 18 hundreds, 1 one thousand per set)
- Rekenrek
- Tape diagram

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

Grade 2 Module 4 Topic A

Sums and Difference Within 100

Focus Standards:

- 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.
- 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.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.)

Instructional Days Recommended: 5

In Topic A, students build upon their understanding of the base ten system and their prior knowledge of place value strategies presented in Module 3. In Lesson 1, students relate 10 more and 10 less and 1 more and 1 less to addition and subtraction. They recognize that they must add and subtract like units and that the digit in the tens place changes when adding and subtracting 10, just as the digit in the ones place changes when adding or subtracting 1. Students see numbers in terms of place value units; $54 - 10$ is 5 tens 4 ones minus 1 ten. Additionally, they learn to record the addition and subtraction of multiples of 10 using arrow notation.

$$33 + 12$$

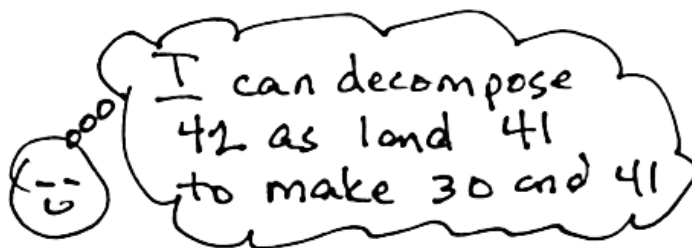
$$33 \xrightarrow{+10} 43 \xrightarrow{+1} 44 \xrightarrow{+1} 45$$

In Lesson 2, students apply place value understanding to add and subtract multiples of 10 before counting on by tens. For example, when adding 20 to 43, they may count 53, 63. Students also develop flexibility in using related addition problems. For example, to solve $92 - 60$, one student might think 9 tens $-$ 6 tens is 3 tens, plus 2 is 32, while another starts at 60, adds on 3 tens and then 2 ones to reach 92, so 32.

In Lessons 3 and 4, students continue to add and subtract multiples of 10 with the added complexity of some ones. Problems are intentionally chosen so that the ones digit is close to a multiple of 10 (e.g., 38, 39, 41). This prompts students to discover and use relationships between the numbers to develop a variety of simplifying strategies they can use to solve. For example, students might reason mentally that for $29 + 42$ they can make a multiple of 10 and count on to solve. They use number bonds to decompose 42 as 1 and 41 to make $30 + 41 = 71$ (as shown in the example below).

$$\begin{array}{r} + 42 \\ 1 \\ \hline 1 \quad 41 \\ \hline \end{array} = 30 + 41$$

$$= 72$$



Students also learn to use arrow notation (the arrow way) to record their mental math and to show change in numbers as they work with them. First, students add a multiple of 10, then count on 2 to make 71 (as shown at right). This avoids common misconceptions arising from using the equal sign to record such computation (e.g., erroneously recording $29 + 40 = 69 + 2 = 71$).

$$\xrightarrow{+40} 69 \xrightarrow{+2} 71$$

Similarly, students use number bonds to make a multiple of 10 when subtracting (as shown below). After students subtract $30 - 29$, they add $41 + 1$ to make 42.

The ease of subtracting a multiple of 10 is highlighted again, as students learn the strategy of compensation for subtraction. For example, in $71 - 29$, the same amount, 1, can be added (or subtracted) to both numbers to create the equivalent problem that involves no renaming (as shown below).

$71 - 29 = 41 + 1$
 $= 42$

I can decompose 71 as 41 and 30 since 30 is just a little bigger than 29.

$29 = 72 - 30$
 $= 42$

If I add the same amount to both numbers, the difference stays the same!

Topic A closes with a lesson that focuses on one- and two-step word problems within 100. Students apply their place value reasoning, mental strategies, and understanding of renaming to negotiate different problem types with unknowns in various positions. The lesson begins with guided practice and transitions to students solving problems on their own or with others, independent of teacher direction. Students are encouraged to be flexible in their thinking and to use multiple strategies in solving problems. For example, students might use tape diagrams to solve word problems, relating the diagrams to a situation equation

(e.g., $\underline{\quad} - 36 = 60$) and rewriting it as a solution equation (e.g., $60 + 36 = \underline{\quad}$), thus illustrating the relationship between operations and using this relationship to check their work. Or, students might use arrow notation and count on. Discussion ensues as each problem is solved, with students sharing strategies, analyzing the efficiency of each, defending their work, and/or critiquing or supporting the work of their peers.

The strategies taught in Topic A are designed to build fluency and develop students' conceptual understanding of addition and subtraction using properties of operations and place value reasoning. This sets the stage for composing and decomposing a ten in Topics B and C.

**The sample homework responses contained in this manual are intended to provide insight into the skills expected of students and instructional strategies used in Eureka Math.*

Lesson 1

Objective: Relate 1 more, 1 less, 10 more, and 10 less to addition and subtraction of 1 and 10.

Homework Key

- 38
 - 47
 - 36
 - 27
 - 48
 - 30
 - 35
 - 39
 - 1 less
 - 10 more
- 46, 47; +1
 - 34, 14; -10
 - 54, 64; +10
 - 44, 41; -1
 - 64, 54, 24; -10
 - 40, 39; -1
- True
 - False
 - False
 - False
- 60; 51; blue
 - Problem solved using the arrow way; 48

Homework Samples

1. Complete each *more* or *less* statement.

- 1 more than 37 is 38.
- 10 more than 37 is 47.
- 1 less than 37 is 36.
- 10 less than 37 is 27.
- 58 is 10 more than 48.
- 29 is 1 less than 30.
- 35 is 10 less than 45.
- 39 is 1 more than 38.
- 49 is 1 less than 50.
- 32 is 10 more than 22.

2. Complete each pattern and write the rule.

- 44, 45, 46, 47, 48 Rule: +1 (1 more)
- 44, 34, 24, 14, 4 Rule: -10 (10 less)

Lesson 1 (continued)

4. Below is a chart of balloons at the county fair.

Color of Balloons	Number of Balloons
Red	59
Yellow	61
Green	65
Blue	59 + 1 = 60
Pink	51

Blue = Red + 1

Pink = Yellow - 10
= 61 - 10 = 51

a. Use the following to complete the chart and answer the question.

- The fair has 1 more blue than red balloons.
- There are 10 fewer pink than yellow balloons.

Are there more blue or pink balloons?

There are more Blue Balloons.

b. If 1 red balloon pops and 10 red balloons fly away, how many red balloons are left? Use the arrow way to show your work.

$$59 \xrightarrow{-1} 58 \xrightarrow{-10} 48$$

There are 48 red balloons left.

Lesson 2

Objective: Add and subtract multiples of 10 including counting on to subtract.

Homework Key

1.
 - a. 5, 50; 5, 4, 54
 - b. 9, 90; 9, 9, 99
 - c. 68; 48; 98
 - d. 55; 85; 35
 - e. 10; 30; 70
 - f. 40; 50; 80
2.
 - a. $63 > 53$
 - b. $68 = 68$
 - c. $79 > 69$
 - d. $74 > 69$
 - e. $91 < 98$
 - f. $85 < 86$
3.
 - a. 4, 40; 3, 3, 33
 - b. 3, 30; 3, 9, 39
 - c. 35, 45, 35
 - d. 50, 30, 60
 - e. 20, 20, 30
4.
 - a. 38
 - b. 76
 - c. 68
 - d. 14
5. 28; arrow way will vary.

Homework Sample

1. Solve using place value strategies. Use scrap paper to show the arrow way or number bonds, or just use mental math, and record your answers.

<p>a. 2 tens + 3 tens = <u>5</u> tens $20 + 30 = 50$ $24 + 30 = 50 + 4 = 54$ $\overset{2}{2} \overset{4}{4}$ 2 tens 4 ones + 3 tens = <u>5</u> tens <u>4</u> ones $24 + 30 = 54$</p>	<p>b. 5 tens + 4 tens = <u>9</u> tens $50 + 40 = 90$ $59 \xrightarrow{+10} 99$ 5 tens 9 ones + 4 tens = <u>9</u> tens <u>9</u> ones $59 + 40 = 99$</p>
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c. $28 + 40 = 68$	$18 + 30 = 48$	$60 + 38 = 98$ $60 + 38 = 90 + 8$ $30 \quad 8 = 38$ $30 \quad 8 = 38$
d. $30 + 25 = 55$	$35 + 50 = 85$	$15 + 20 = 35$
e. $37 + 10 = 47$	$30 + 27 = 57$	$17 + 70 = 87$
f. $40 + 22 = 62$	$29 + 50 = 79$	$11 + 80 = 91$
$22 \xrightarrow{+40} 62$	$29 \xrightarrow{+50} 79$	$11 \xrightarrow{+80} 91$

Lesson 3 - 4

Objective: Add and subtract multiples of 10 and some ones within 100.

Homework Key (Lesson 3)

1. Solved using the arrow way

a. Answers provided.

b. 96, 97, 95

c. 28, 27, 29

d. 37, 36, 38

3. \$45

4. a. 43 cm

b. Yes

b. 36, 35, 37

c. 77, 78, 76

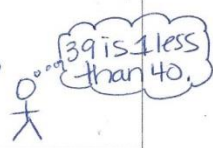
d. 92, 93, 91

e. 37, 36, 38

f. 78, 79, 77

Homework Sample

1. Solve using the arrow way. The first set is done for you.

<p>a.</p> $67 + 20 = \underline{87}$ $67 \xrightarrow{+20} \underline{87}$ $67 + 21 = \underline{88}$ $67 \xrightarrow{+20} \underline{87} \xrightarrow{+1} \underline{88}$ $67 + 19 = \underline{86}$ $67 \xrightarrow{+20} \underline{87} \xrightarrow{-1} \underline{86}$	<p>b.</p> $56 + 40 = \underline{96}$ $56 \xrightarrow{+40} \underline{96}$ $56 + 41 = \underline{97}$ $56 \xrightarrow{+40} \underline{96} \xrightarrow{+1} \underline{97}$ $56 + 39 = \underline{95}$ $56 \xrightarrow{+40} \underline{96} \xrightarrow{-1} \underline{95}$ <p>39 is 1 less than 40.</p> 
<p>c.</p> $68 - 40 = \underline{28}$ $68 \xrightarrow{-40} \underline{28}$ $68 - 41 = \underline{27}$ $68 \xrightarrow{-40} \underline{28} \xrightarrow{-1} \underline{27}$ $68 - 39 = \underline{29}$ $68 \xrightarrow{-40} \underline{28} \xrightarrow{+1} \underline{29}$	<p>d.</p> $87 - 50 = \underline{37}$ $87 \xrightarrow{-50} \underline{37}$ $87 - 51 = \underline{36}$ $87 \xrightarrow{-50} \underline{37} \xrightarrow{-1} \underline{36}$ $87 - 49 = \underline{38}$ $87 \xrightarrow{-50} \underline{37} \xrightarrow{+1} \underline{38}$

Lesson 4

Homework Key

1. Tape diagram drawn and labeled

a. $17 - 9 = 18 - 10 = 8$

b. $33 - 19 = 34 - 20 = 14$

c. $60 - 29 = 61 - 30 = 31$

d. $56 - 38 = 58 - 40 = 18$

2. Number bond drawn

a. $28 + 43 = 30 + 41 = 71$

b. $49 + 26 = 50 + 25 = 75$

c. $43 + 19 = 42 + 20 = 62$

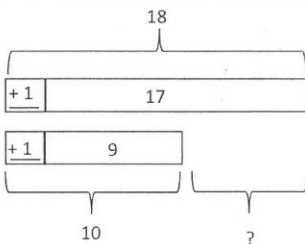
d. $67 + 28 = 65 + 30 = 95$

3. Drawings will vary; 35 oranges.

Homework Sample

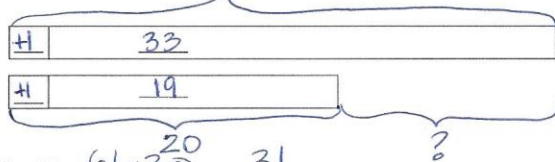
1. Solve. Draw and label a tape diagram to subtract 10, 20, 30, 40, etc.

a. $17 - 9 = \underline{18 - 10} = \underline{8}$

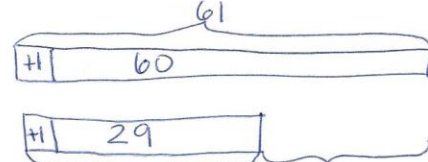


If I add the same amount to both numbers, the difference stays the same.

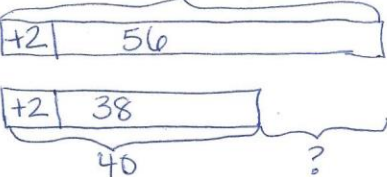
b. $33 - 19 = \underline{34 - 20} = \underline{14}$



c. $60 - 29 = \underline{61 - 30} = \underline{31}$



d. $56 - 38 = \underline{58 - 40} = \underline{18}$



Lesson 5

Objective: Solve one- and two-step word problems within 100 using strategies based on place value.

Homework Key

1. 81

2. 33

3. 75

4. a. 96 cm

b. 29 cm

5. a. \$47

b. \$66

c. \$79

Homework Samples

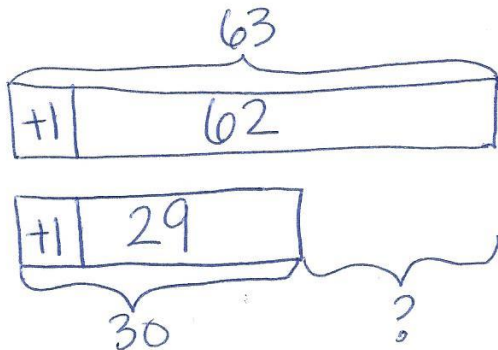
Solve and show your strategy.

1. 38 markers were in the bin. Chase added the 43 markers that were on the floor to the bin. How many markers are in the bin now?

$$38 \xrightarrow{+40} 78 \xrightarrow{+3} 81$$

There are 81 markers in the bin.

2. There are 29 fewer big stickers on the sticker sheet than little stickers. There are 62 little stickers on the sheet. How many big stickers are there?



$$62 - 29 = 63 - 30 = 33$$

There are 33 big stickers.

Grade 2 Module 4 Topic B

Strategies for Composing a Ten

Focus Standards:

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

Instructional Days Recommended: 5

In Topic B, students apply their understanding of place value strategies to the addition algorithm, moving from horizontal to vertical notation. Their understanding of vertical addition starts with concrete work with place value disks, moving to pictorial place value chart drawings, and ending with abstract calculations. Consistent use of place value disks on a place value chart strengthens students' place value understanding and helps them to systematically model the standard addition algorithm including the composition of a ten. It is important to note that the algorithm is introduced at this level and is connected deeply to the understanding of place value. However, fluency with the algorithm is a Grade 4 standard and is not expected at this level.

In Lesson 6, students use place value disks on a place value chart to represent the composition of 10 ones as 1 ten with two-digit addends. The use of manipulatives reminds students that they must add like units (e.g., $26 + 35$ is 2 tens + 3 tens and 6 ones + 5 ones).

10 10

1 1 1 1 1

1

10 10 10

1 1 1 1 1

10 10 10 10 10

1 1 1 1 1

1 1 1 1 1

1

10 10 10 10 10

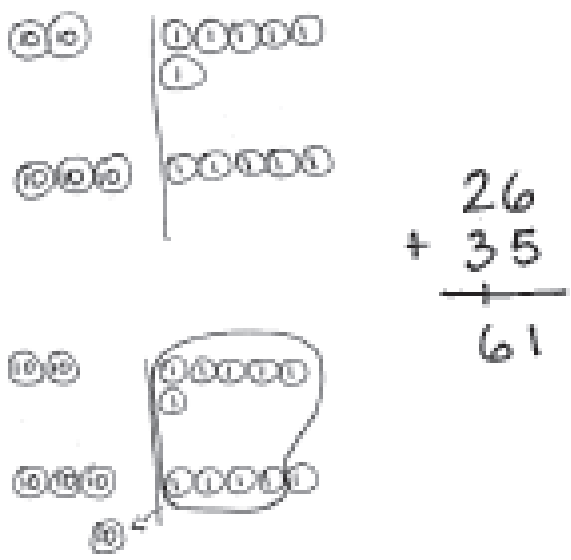
1

10

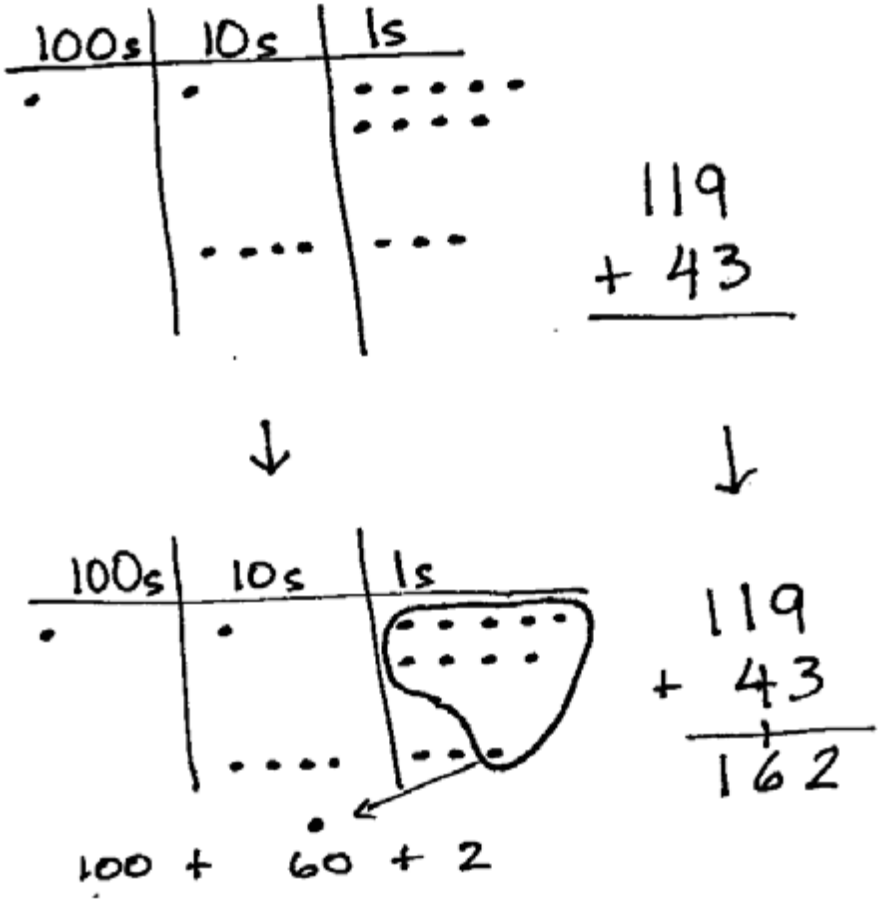
$$\begin{array}{r} 26 \\ + 35 \\ \hline 61 \end{array}$$

Lesson 7 builds upon this understanding as students relate manipulatives to vertical form, recording compositions as new groups below (as shown above). As they move the manipulatives, students use place value language to express the action as they physically make a ten with 10 ones and exchange them for 1 ten. They record each step of the algorithm in vertical form.

In Lesson 8, students move from concrete to pictorial as they draw unlabeled place value charts with labeled disks to represent addition (as shown on the next page). As they did with the manipulatives, students record each action in their drawings step-by-step in vertical form.



In Lessons 9 and 10, students work within 200, representing the composition of 10 ones as 1 ten when adding a two-digit addend to a three-digit addend. This provides practice drawing three-digit numbers without the complexity of composing a hundred. It also provides practice with adding like units. As student understanding of the relationship between their drawings and the algorithm deepens, they move to the more abstract chip model, in which place value disks are replaced by circles or dots (as shown below).



It is important to note that students must attend to precision in their drawings. Disks and dots are drawn in horizontal arrays of 5, recalling student work with 5-groups in Kindergarten and Grade 1. This visual reference enables students to clearly see the composition of the ten.

While some students may come into this topic already having learned addition in vertical form, including carrying above the tens, the process of connecting their understanding to the concrete and pictorial representations develops meaning and understanding of why the process works, not just how to use it. Therefore, students are less prone to making place value errors.

**The sample homework responses contained in this manual are intended to provide insight into the skills expected of students and instructional strategies used in Eureka Math.*

Lesson 6

Objective: Use manipulatives to represent the composition of 10 ones as 1 ten with two-digit addends.

Homework Key

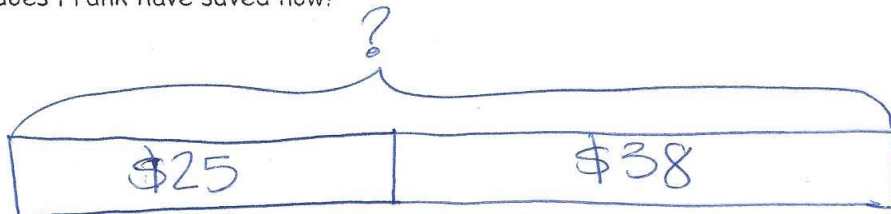
- | | | | |
|-------|----------------|----|------|
| 1. a. | 13, 39, 43, 83 | 3. | 85 |
| b. | 14, 28, 34, 84 | 4. | 93 |
| 2. a. | 30, 31 | 5. | \$63 |
| b. | 30, 32 | | |
| c. | 48, 51 | | |
| d. | 70, 72 | | |
| e. | 88, 93 | | |
| f. | 100, 103 | | |
| g. | 101, 98 | | |
| h. | 90, 93 | | |
| i. | 93, 89 | | |

Homework Samples

1. Solve using mental math, if you can. Use your place value chart and place value disks to solve those you cannot do mentally.

a. $4 + 9 = \underline{13}$	$30 + 9 = \underline{39}$	$34 + 9 = \underline{43}$	$34 + 49 = \underline{83}$
$\begin{array}{r} 3 \\ \uparrow \\ 4 \end{array}$		$\begin{array}{r} 6 \\ \uparrow \\ 34 \end{array}$	$\begin{array}{l} 34 + 50 = 84 \\ 84 - 1 = 83 \end{array}$
b. $6 + 8 = \underline{14}$	$20 + 8 = \underline{28}$	$26 + 8 = \underline{34}$	$26 + 58 = \underline{84}$

5. Frank's mother gave him \$25 to save. If he already had \$38 saved, how much money does Frank have saved now?



$$25 \xrightarrow{+30} 55 \xrightarrow{+8} 63$$

Frank has \$63 saved.

Lesson 7

Objective: Relate addition using manipulatives to a written vertical method.

Homework Key

1. a. 40, 40

b. 60, 60

c. 93, 93

2. 41, 52

3. 91

4. a. 64 cm

b. 46 cm

Homework Sample

1. Solve the following problems using the vertical form, your place value chart, and place value disks. Bundle a ten, if needed. Think about which ones you can solve mentally, too!

a. $31 + 9$

Handwritten vertical addition for $31 + 9$. The sum is 40. A note says "New groups (below) The 1 from the sum of 1 + 9 goes under the 3." The vertical form shows 31 plus 9 equals 40.

b. $42 + 18$

Handwritten vertical addition for $42 + 18$. The sum is 60.

c. $26 + 67$

Handwritten vertical addition for $26 + 67$. The sum is 93.

$32 + 8$

Handwritten vertical addition for $32 + 8$. The sum is 40.

$43 + 17$

Handwritten vertical addition for $43 + 17$. The sum is 60.

$28 + 65$

Handwritten vertical addition for $28 + 65$. The sum is 93.

Lesson 8

Objective: Use math drawings to represent the composition and relate drawings to a written method.

Homework Key (8)

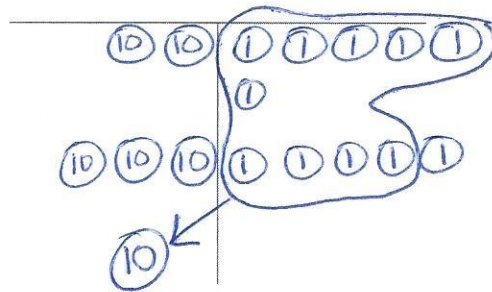
- 61; solved vertically; disks drawn
 - 42; solved vertically; disks drawn
 - 62; solved vertically; disks drawn
 - 69; solved vertically; disks drawn
 - 91; solved vertically; disks drawn
- 52
- 66 cm

Homework Sample

1. Solve vertically. Draw and bundle place value disks on the place value chart.

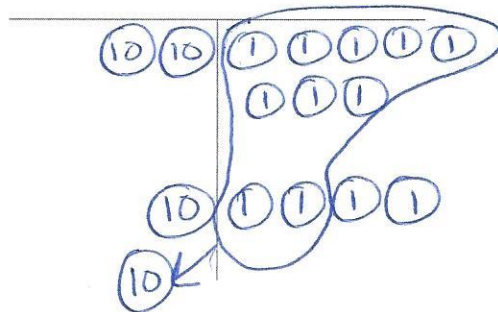
a. $26 + 35 = \underline{61}$

$$\begin{array}{r} 26 \\ +35 \\ \hline 61 \end{array}$$



b. $28 + 14 = \underline{42}$

$$\begin{array}{r} 28 \\ +14 \\ \hline 42 \end{array}$$



Lesson 9 - 10

Objective: Use math drawings to represent the composition when adding a two-digit to a three-digit addend.

Homework Key (9)

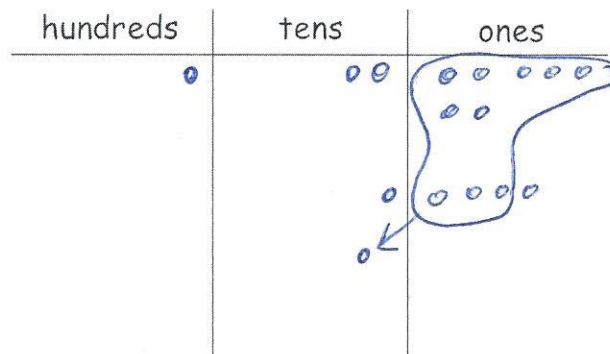
- 141
 - 181
 - 145
- $148 + 26 = 174$
- 71
 - 67

Homework Sample

1. Solve using the algorithm. Draw and bundle chips on the place value chart.

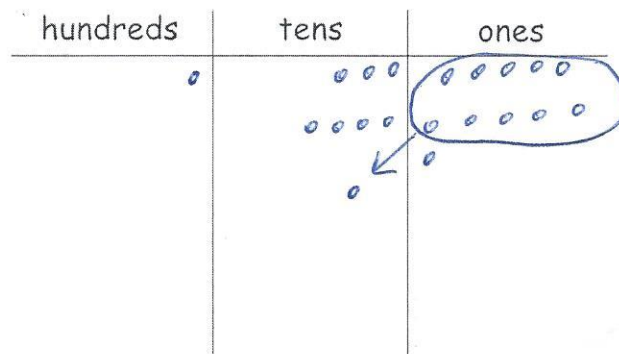
a. $127 + 14 = \underline{141}$

$$\begin{array}{r} 127 \\ + 14 \\ \hline 141 \end{array}$$



b. $135 + 46 = \underline{181}$

$$\begin{array}{r} 135 \\ + 46 \\ \hline 181 \end{array}$$



Lesson 10

Homework Key

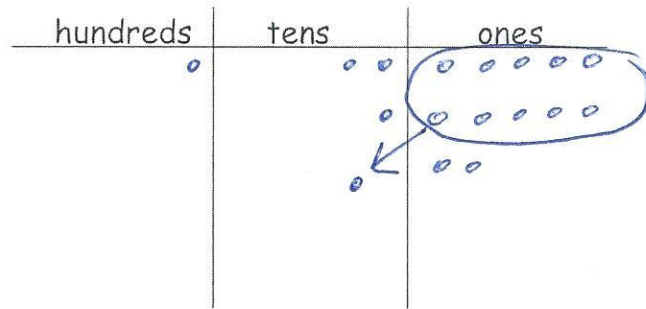
- 142
 - 162
 - 163
 - 187
- $158 + 34 = 192$; 1, 9, 2
- 57
 - 92

Homework Sample

1. Solve using the algorithm. Draw chips and bundle when you can.

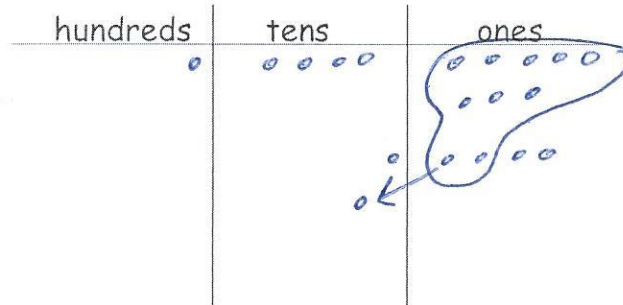
a. $125 + 17 = \underline{142}$

$$\begin{array}{r} 125 \\ + 17 \\ \hline 142 \end{array}$$



b. $148 + 14 = \underline{162}$

$$\begin{array}{r} 148 \\ + 14 \\ \hline 162 \end{array}$$



Grade 2 Module 4 Topic C

Strategies for Decomposing a Ten

Focus Standards:

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

Instructional Days Recommended: 6

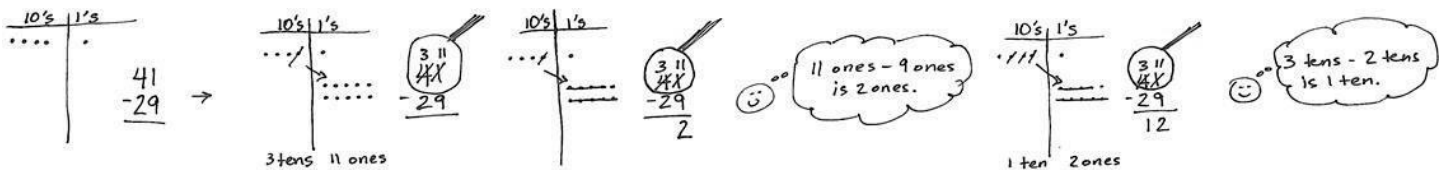
Topic C parallels Topic B as students apply their understanding of place value strategies to the subtraction algorithm, moving from concrete to pictorial to abstract. It is important to note that the algorithm is introduced at this level and is connected deeply to the understanding of place value. Fluency with the algorithm, however, is a Grade 4 standard.

In Lesson 11, students use place value disks on a place value chart to subtract like units (e.g., $76 - 43$ is 7 tens – 4 tens and 6 ones – 3 ones). They practice modeling the standard subtraction algorithm within 100 and learn to decompose 1 ten for 10 ones (e.g., in $76 - 47$, students must recompose 7 tens 6 ones as 6 tens 16

ones). The use of manipulatives allows students to physically experience the renaming and understand the *why* behind recomposing a quantity.

Lesson 12 builds upon this understanding as students relate manipulatives to a written method, recording recompositions in vertical form. In subtraction, a common error is for students to switch the top and bottom digits in a given place when renaming is necessary. They perceive the digits as a column of unrelated numbers, rather than part of a larger total, and simply subtract the smaller from the larger. Hence, many students would solve $41 - 29$ as 28 instead of understanding that they can take 9 ones from *41 ones*. To prevent this error and aid students in seeing the top number as the whole, students use a “magnifying glass to examine the minuend. They draw a circle around the top number and add a handle (see image below). Before subtracting, they look inside the magnifying glass at the whole number and determine if each digit is big enough to subtract the number below it. If not, they decompose one of the next larger units to make ten of the unit they need. In Lesson 13, this is used in conjunction with the chip model (shown below); students record each change they make to their model while simultaneously using the algorithm.

In Lessons 14 and 15, students continue working with the chip model on their place value charts and follow the same procedure for decomposing a ten and relating it to vertical form. Here, however, students subtract a two-digit subtrahend from a three-digit minuend (e.g., $164 - 36$). This provides practice working with and drawing three-digit numbers without the complexity of decomposing a hundred.



As in Topic A, Topic C closes with a lesson that focuses on one- and two-step word problems within 100. Students apply their place value reasoning, mental strategies, and understanding of compositions and decompositions to negotiate different problem types with unknowns in various positions. Because two different problem types (i.e., *add to*, *take from*, *put together/take apart*, *compare*) are often combined in two-step word problems, some quantities will involve single-digit

addends, especially when students are working with the more challenging comparison problems. Students are encouraged to be flexible in their thinking and to use drawings and/or models to explain their thinking. Students continue to use tape diagrams to solve word problems, relating the diagrams to a situation equation (e.g., $8 + \underline{\quad} = 41$) and rewriting it as a solution equation (e.g., $41 - 8 = \underline{\quad}$), thus illustrating the relationship between operations. Students find success when using their mental strategies of making a multiple of 10 and counting on (e.g., 9, 10, 20, 30 40, 41) as they experience the relationships between quantities within a context.

**The sample homework responses contained in this manual are intended to provide insight into the skills expected of students and instructional strategies used in Eureka Math.*

Lesson 11

Objective: Represent subtraction with and without the decomposition of 1 ten as 10 ones with manipulatives.

Homework Key

- 1, 21, 20, 19
 - 1, 51, 50, 49
- 31, 29
 - 31, 29
 - 35, 36
 - 26, 29
 - 34, 36
 - 29, 39
- 14; explanations will vary.
 - 39; explanations will vary.
- $45 - 37 = 8$
 - $52 - 37 = 15$
 - $48 - 37 = 11$
 - $55 - 37 = 18$

Homework Sample

- Solve using mental math.

a. $6 - 5 = \underline{1}$ $26 - 5 = \underline{21}$ $26 - 6 = \underline{20}$ $26 - 7 = \underline{19}$

b. $8 - 7 = \underline{1}$ $58 - 7 = \underline{51}$ $58 - 8 = \underline{50}$ $58 - 9 = \underline{49}$

Lesson 12

Objective: Relate manipulative representations to a written method.

Homework Key

- Answer provided.
 - 25
 - 18
 - 28
 - 35
 - 47
- 9
 - 28
 - 9

Homework Sample

- Use place value disks to solve each problem. Rewrite the problem vertically, and record each step as shown in the example.

a. $34 - 18$

$$\begin{array}{r} \textcircled{2} \textcircled{14} \\ \textcircled{34} \\ - 18 \\ \hline 16 \end{array}$$

b. $41 - 16$

$$\begin{array}{r} 3 \text{ } 11 \\ \cancel{4} \cancel{1} \\ - 16 \\ \hline 25 \end{array}$$

Decompose 1 ten into 10 ones.

c. $33 - 15$

$$\begin{array}{r} 2 \text{ } 13 \\ \cancel{3} \cancel{3} \\ - 15 \\ \hline 18 \end{array}$$

d. $46 - 18$

Lesson 13

Objective: Use math drawings to represent subtraction with and without decomposition and relate drawings to a written method.

Homework Key

1. a. 16
b. 26
c. 43
2. a. 12
b. 23
c. 12
d. 23
e. 22
f. 23

Homework Sample

1. Solve vertically. Use the place value chart and chips to model each problem. Show how you change 1 ten for 10 ones, when necessary. The first one has been started for you.

<p>a. $42 - 26 = \underline{16}$</p> $\begin{array}{r} 3 \ 12 \\ 42 \\ - 26 \\ \hline 16 \end{array}$	
<p>b. $54 - 28 = \underline{\quad}$</p> $\begin{array}{r} 4 \ 14 \\ 54 \\ - 28 \\ \hline 26 \end{array}$	

Lesson 14 - 15

Objective: Represent subtraction with and without the decomposition when there is a three-digit minuend.

Homework Key (14)

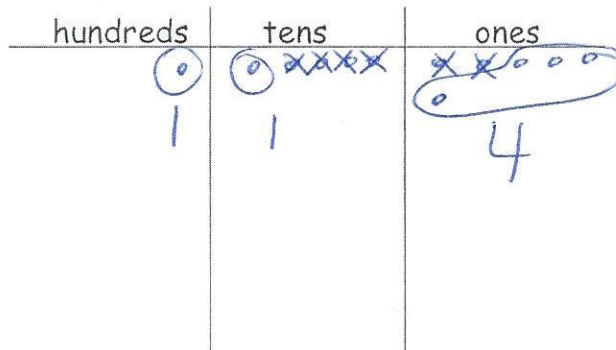
1. a. 114
b. 114
c. 118
2. a. 105
b. 117
3. a. $165 - 28 = 137$; 137
b. $165 - 19 = 146$; 146
c. $137 - 19 = 118$; 118

Homework Sample

1. Solve by writing the problem vertically. Check your result by drawing chips on the place value chart. Change 1 ten for 10 ones, when needed.

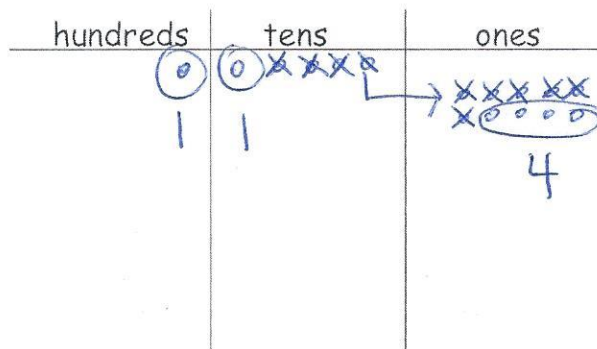
a. $156 - 42 = \underline{114}$

$$\begin{array}{r} 156 \\ - 42 \\ \hline 114 \end{array}$$



b. $150 - 36 = \underline{114}$

$$\begin{array}{r} 4 \text{ } 10 \\ 150 \\ - 36 \\ \hline 114 \end{array}$$



Lesson 15

Homework Key

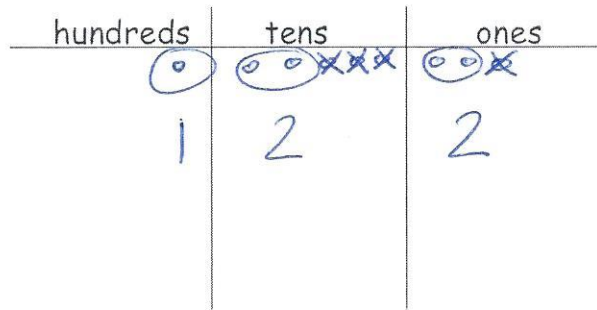
- 122
 - 115
 - 123
 - 123
- Lisa correctly modeled 166 on place value chart, unbundled 1 ten for 10 ones, subtracted 8 ones from 16 ones; explanations will vary.
 - Lisa needs to fix vertical form, 4 tens from 5 tens is 1 ten, 4 tens should be crossed off on the place value chart, the answer should be 118; explanations will vary

Homework Samples

- Solve each problem using vertical form. Show the subtraction on the place value chart with chips. Exchange 1 ten for 10 ones, when necessary.

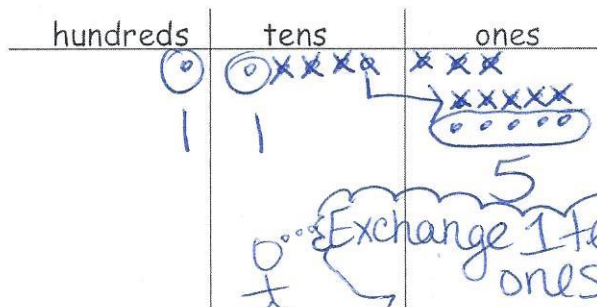
a. $153 - 31 = 122$

$$\begin{array}{r} 153 \\ - 31 \\ \hline 122 \end{array}$$



b. $153 - 38 = 115$

$$\begin{array}{r} 153 \\ \overset{4}{1} \overset{13}{5} \overset{3}{3} \\ - 38 \\ \hline 115 \end{array}$$

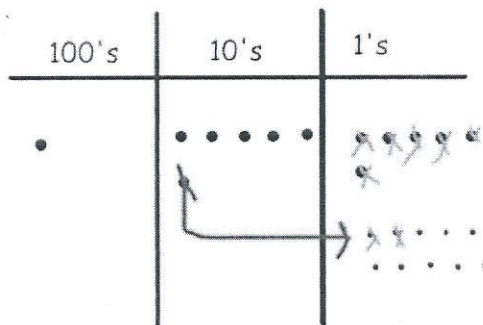


Exchange 1 ten for 10 ones, then subtract 38.

Lesson 15 (continued)

2. Lisa solved $166 - 48$ vertically and on her place value chart. Explain what Lisa did correctly and what she needs to fix.

$$\begin{array}{r} 5 \ 16 \\ 166 \\ - 48 \\ \hline 108 \end{array}$$



Lesson 16

Objective: Solve one- and two-step word problems within 100 using strategies based on place value.

Homework Key

1. 47; models will vary.
2. 17
3. 12
4. 81

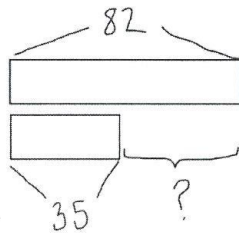
Homework Sample

Solve the following word problems. Use the RDW process.

1. Vicki modeled the following problem with a tape diagram.

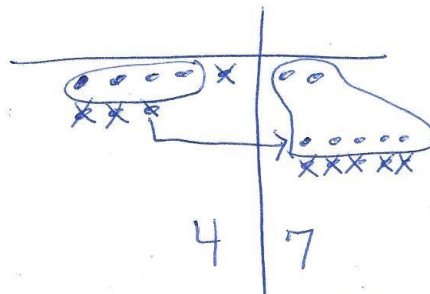
Eighty-two students are in the math club. 35 students are in the science club. How many more students are in the math club than science club?

$$\begin{array}{r} 712 \\ 82 \\ -35 \\ \hline 47 \end{array}$$



There are 47 more students in math club than science club.

Show another model to solve the problem. Write your answer in a sentence.



There are 47 more students in the math club.

Grade 2 Module 4 Topic D

Strategies for Composing Tens and Hundreds

Focus Standards:

- 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.)

Instructional Days Recommended: 6

In Lesson 17 of Topic D, students extend the base ten understanding developed in Topic A to numbers within 200. Having worked with manipulatives to compose 10 ones as 1 ten, students relate this to composing 10 tens as 1 hundred. For example, students might solve $50 + 80$ by thinking $5 \text{ ones} + 8 \text{ ones} = 13 \text{ ones}$, so $5 \text{ tens} + 8 \text{ tens} = 13 \text{ tens} = 130$. They use place value language to explain where they make a new hundred. They also relate 100 more from Module 3 to $+ 100$ and mentally add 100 to given numbers.

In Lesson 18, students use place value disks on a place value chart to represent additions with the composition of 1 ten and 1 hundred. They use place value language to explain where they make a new ten and a new hundred, as well as where to show each new unit on the place value chart. In Lesson 19, students relate manipulatives to the vertical form, recording compositions as new groups below. As they did in Topic B, students use place value language to express the action as they physically make 1 ten with 10 ones disks and 1 hundred with 10 tens disks. Working as partners, one student records each change on the vertical form step by step as the other partner moves the manipulatives.

In Lessons 20 and 21, students move from concrete to pictorial as they use math drawings to represent compositions of 1 ten and 1 hundred. Some students may need the continued support of place value drawings with labeled disks, while others use the chip model. In both cases, students relate their drawings to the vertical form, recording each change they make to their model on the numerical representation. They use place value language to explain these changes.

Lesson 22 focuses on adding up to four two-digit addends with totals within 200. Students now have multiple strategies for composing and decomposing numbers, and they use properties of operations (i.e., the associative property) to add numbers in an order that is easiest to compute. For example, when solving $24 + 36 + 55$, when adding the ones, a student may make a ten first with 4 and 6. Another student may decompose the 6 to make 3 fives (by adding 1 to the 4).

**The sample homework responses contained in this manual are intended to provide insight into the skills expected of students and instructional strategies used in Eureka Math.*

Lesson 17

Objective: Use mental strategies to relate compositions of 10 tens as 1 hundred to 10 ones as 1 ten.

Homework Key

- | | |
|-----------------------------------|-----------------------------------|
| 1. a. 6 ones; 6
6 tens; 60 | 2. a. 1, 1; 11
1, 1; 110 |
| b. 3 ones; 3
3 tens; 30 | b. 1, 2; 12
1, 2; 120 |
| c. 19; 19
109; 109
190; 190 | c. 1, 7; 17
1, 7; 170 |
| d. 1 ten; 10
1 hundred; 100 | 3. a. Answer provided |
| e. 1, 1; 11
1, 1; 110 | b. 80, 90, 100; 22, 100 |
| f. 1, 8; 18
1, 8; 180 | c. 70, 80, 90, 100, 200; 139, 200 |
| | d. 30, 100, 200; 173, 200 |

Homework Sample

1. Solve mentally.

a. 4 ones + 6 ones = 1 ten

$$4 + \underline{6} = 10$$

4 tens + 6 tens = 1 hundred

$$40 + \underline{60} = 100$$

b. 1 ten = 3 ones + 7 ones

$$10 = \underline{3} + 7$$

1 hundred = 3 tens + 7 tens

$$100 = \underline{30} + 70$$

c. 1 ten more than 9 ones = 19

$$10 + 9 = \underline{19}$$

1 hundred more than 9 ones = 109

$$100 + 9 = \underline{109}$$

1 hundred more than 9 tens = 190

$$100 + 90 = \underline{190}$$

Lesson 18

Objective: Use manipulatives to represent additions with two compositions.

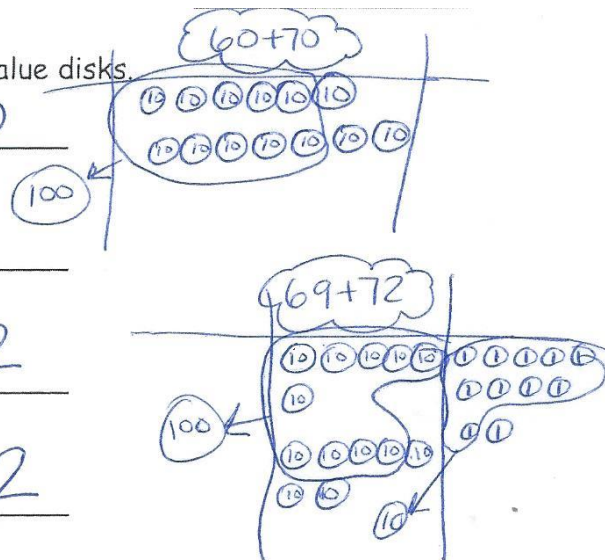
Homework Key

- 1. a. 110; 130
- b. 122; 141
- c. 131; 142
- d. 162; 142
- e. 100; 200
- 2. a. 2nd and 4th statements circled
- b. 1st and 4th statements circled
- 3. a. $86 + 57 = 143$; 143
- b. $129 + 78 = 207$; 207
- 4. a. 100
- b. 111
- c. 121

Homework Sample

1. Solve using your place value chart and place value disks.

- a. $20 + 90 = \underline{110}$ $60 + 70 = \underline{130}$
- b. $29 + 93 = \underline{122}$ $69 + 72 = \underline{141}$
- c. $45 + 86 = \underline{131}$ $46 + 96 = \underline{142}$
- d. $47 + 115 = \underline{162}$ $47 + 95 = \underline{142}$
- e. $28 + 72 = \underline{100}$ $128 + 72 = \underline{200}$



Lesson 19

Objective: Relate manipulative representations to a written method.

Homework Key

- 1. a. 121
 - b. 121
 - c. 114
 - d. 142
 - e. 144
 - f. 142
 - g. 200
 - h. 200
- 2. a. 123
 - b. 197

Homework Sample

1. Solve the following problems using the vertical form, your place value chart, and place value disks. Bundle a ten or hundred, if needed.

<p>a. $84 + 37 = 121$</p> <p>84 + 37 --- 121</p>	<p>b. $42 + 79 = 121$</p> <p>42 + 79 --- 121</p>
---	---

Lesson 20 - 21

Objective: Use math drawings to represent additions with up to two compositions and relate drawings to a written method.

Homework Key (20)

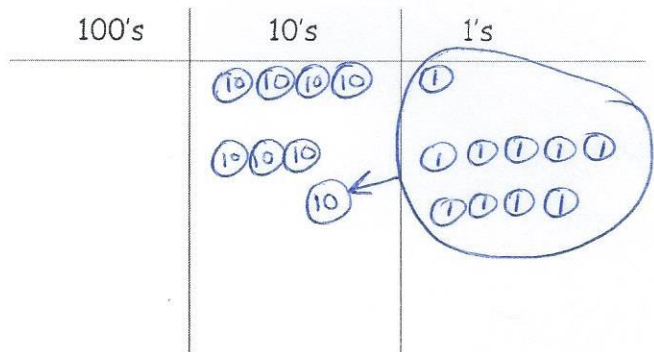
- 80
 - 80
 - 135
 - 163
 - 162
- 67 and 83 circled
 - 92 and 58 circled
 - 75 and 75 circled

Homework Sample

1. Solve vertically. Draw chips on the place value chart and bundle, when needed.

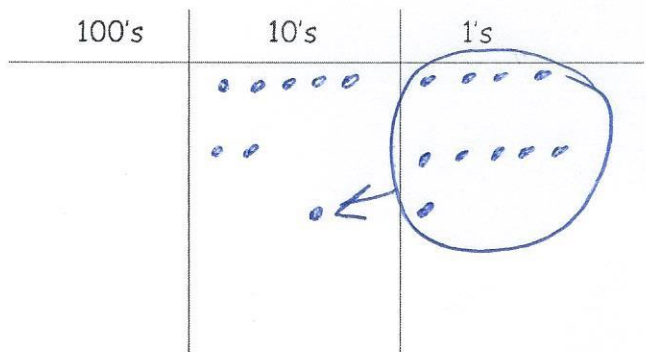
a. $41 + 39 = \underline{80}$

$$\begin{array}{r} 41 \\ + 39 \\ \hline 80 \end{array}$$



b. $54 + 26 = \underline{80}$

$$\begin{array}{r} 54 \\ + 26 \\ \hline 80 \end{array}$$



Lesson 21

Homework Key

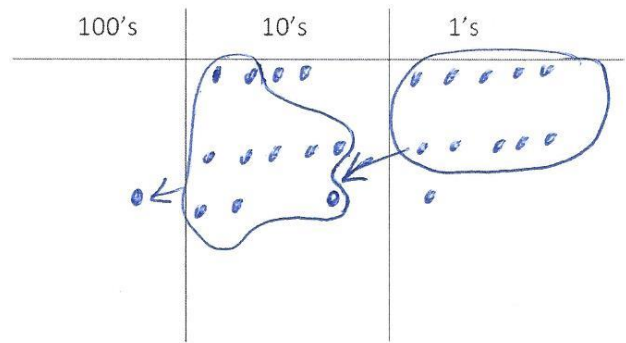
1. a. 121
b. 151
c. 176
d. 205
2. a. 106
b. 175

Homework Sample

1. Solve vertically. Draw chips on the place value chart and bundle, when needed.

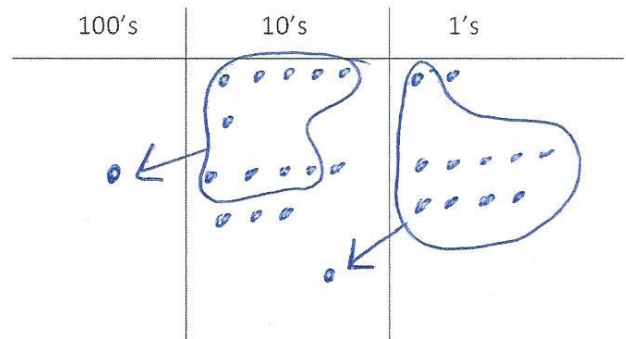
a. $45 + 76 = \underline{121}$

$$\begin{array}{r} 45 \\ +76 \\ \hline 121 \end{array}$$



b. $62 + 89 = \underline{151}$

$$\begin{array}{r} 62 \\ +89 \\ \hline 151 \end{array}$$



Lesson 22

Objective: Solve additions with up to four addends with totals within 200 with and without two compositions of larger units.

Homework Key

1. a. 16; 76; 166
- b. 15; 135; 165
- c. 20; 120; 190
2. a. 90
- b. 166
- c. 94
- d. Red and Green
- e. Blue and Black

Homework Sample

1. Look to make 10 ones or 10 tens to solve the following problems using place value strategies.

<p>a.</p> $6 + 3 + 7 = \underline{16}$ $6 + 10 = 16$	$36 + 23 + 17 = \underline{76}$ $30 + 20 + 10 + 10 = 70$ $50 + 6 + 20 = 76$	$126 + 23 + 17 = \underline{166}$ $120 + 20 + 10 + 10 = 160$ $126 + 40 = 166$
<p>b.</p> $8 + 2 + 5 = \underline{15}$ $10 + 5 = 15$	$38 + 22 + 75 = \underline{135}$ $30 + 10 + 20 + 75 = 125$ $100 + 10 + 20 + 5 = 135$ $100 + 35 = 135$	$18 + 62 + 85 = \underline{165}$ $10 + 10 + 60 + 85 = 165$ $20 + 60 + 85 = 165$ $100 + 60 + 5 = 165$
<p>c.</p> $9 + 4 + 1 + 6 = \underline{20}$ $10 + 10 = 20$	$29 + 34 + 41 + 16 = \underline{120}$ $20 + 10 + 30 + 40 + 10 + 10 = 120$	$81 + 34 + 19 + 56 = \underline{190}$ $80 + 10 + 10 + 34 + 56 = 180$ $80 + 10 + 10 + 30 + 10 + 50 = 190$ $100 + 30 + 10 + 50 = 190$ $100 + 40 + 50 = 190$

Grade 2 Module 4 Topic E

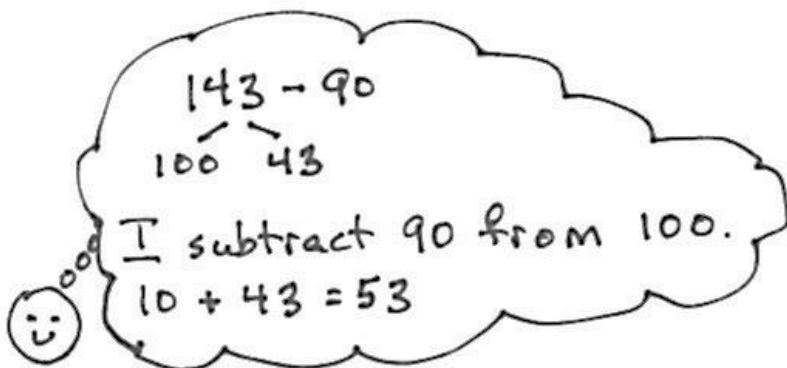
Strategies for Decomposing Tens and Hundreds

Focus Standards:

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

Instructional Days Recommended: 6

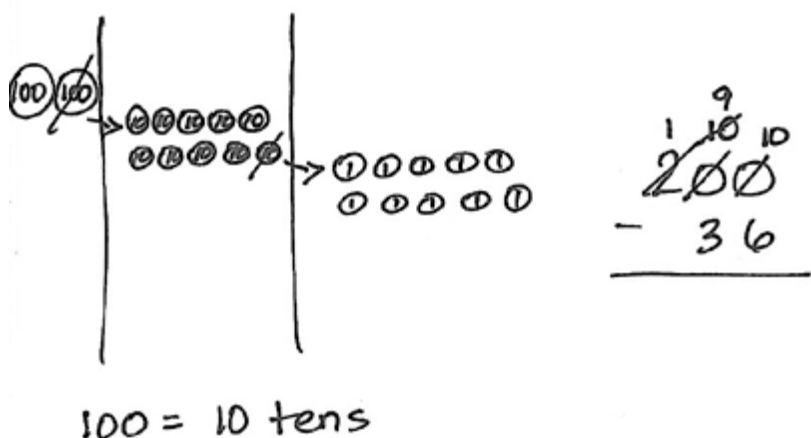
Topic E begins with an extension of mental math strategies learned in first grade, when students learned to subtract from the ten by using number bonds. In Lesson 23, they return to this strategy to break apart three-digit minuends and subtract from the hundred. For example, in first grade students solved $14 - 9$ by restating the problem as $10 - 9 + 4$. In second grade, students use the same strategy to restate $143 - 90$ as $100 - 90 + 43$.



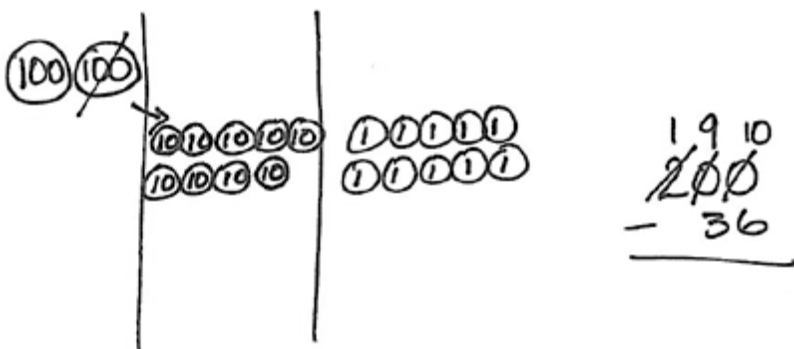
In Lesson 24, students use place value disks on a place value chart to represent subtraction and develop an understanding of decomposition of tens and hundreds. This concrete model helps students see the answer to the question, “Do I have enough ones?” or “Do I have enough tens?” When they do not, they exchange one of the larger units for ten of the smaller units. Repeated practice with this exchange solidifies their understanding that within a unit of ten there are 10 ones, and within a unit of a hundred there are 10 tens. This practice is connected to the strategies they learned with tens and ones; they learn that the only real difference is in place value. The strategies are also connected to addition through part–whole understanding, which is reinforced throughout.

In Lesson 25, students move towards the abstract when they model decompositions on their place value charts while simultaneously recording the changes in the vertical form. Students draw a magnifying glass around the minuend, as they did in Topic C. They then ask the question, “Do I have enough ones?” They refer to the place value disks to answer and exchange a ten disk for 10 ones when necessary. They record the change in the vertical form. Students repeat these steps when subtracting the tens.

Students use math drawings in Lesson 26 as they move away from concrete representations and into the pictorial stage. They follow the same procedure for decomposing numbers as they did in Lesson 25 with the place value disks, but now they may use a chip model or place value disk drawing. They continue to record changes in the vertical form as they work with their models.



Topic E closes with the special case of subtracting from 200. Using place value disk drawings on a place value chart, students review the concept that a unit of 100 is comprised of 10 tens. They then model 1 hundred as 9 tens and 10 ones and practice counting to 100 both ways (i.e., 10, 20, 30, ...100 and 10, 20, ...90, 91, 92, 93, ...100). Next, they model the decomposition of a hundred either in two steps (as 10 tens then decomposing 1 ten as 10 ones) or one step (as 9 tens and 10 ones) as they represent subtractions from 200 (see image to the right). Students use this same reasoning to subtract from numbers that have zero tens. For example, to subtract 48 from 106, students model the decomposition of 106 as 10 tens 6 ones and as 9 tens 16 ones. Throughout the lesson, students relate their models to the vertical form step by step.



$$\begin{array}{r} 190 \\ \cancel{200} \\ - 36 \\ \hline \end{array}$$

$$100 = 9 \text{ tens } 10 \text{ ones}$$

**The sample homework responses contained in this manual are intended to provide insight into the skills expected of students and instructional strategies used in Eureka Math.*

Lesson 23

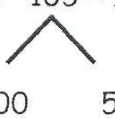
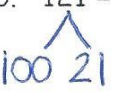
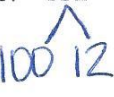
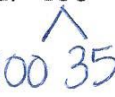
Objective: Use number bonds to break apart three-digit minuends and subtract from the hundred.

Homework Key

- Answer provided.
 - 31
 - 32
 - 65
 - 76
 - 79
 - 76
 - 98
- 62
- 78

Homework Sample

- Solve using number bonds to subtract from 100. The first one has been done for you.

<p>a. $105 - 90 = 15$</p>  <p>$100 - 90 = 10$ $10 + 5 = 15$</p>	<p>b. $121 - 90 = 31$</p>  <p>$100 - 90 = 10$ $10 + 21 = 31$</p>
<p>c. $112 - 80 = 32$</p>  <p>$100 - 80 = 20$ $20 + 12 = 32$</p>	<p>d. $135 - 70 = 65$</p>  <p>$100 - 70 = 30$ $30 + 35 = 65$</p>

Lesson 24

Objective: Use manipulatives to represent subtraction with decompositions of 1 hundred as 10 tens and 1 ten as 10 ones.

Homework Key

1. a. 30; 29; 100; 99
b. 110; 100; 90
2. a. 65; yes; no
b. 68; yes; yes
c. 49; no; yes
d. 147; no; yes
e. 77; yes; yes
f. 96; yes; yes
g. 32; yes; yes
h. 33; yes; yes
i. 75; yes; yes
j. 94; yes; yes
k. 85; yes; yes
l. 49; yes; yes
3. 86

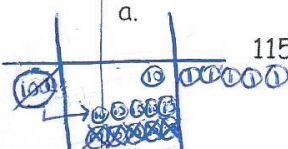
Homework Samples

1. Solve using mental math. If you cannot solve mentally, use your place value chart and place value disks.

a. $38 - 8 = \underline{30}$ $38 - 9 = \underline{29}$ $138 - 38 = \underline{100}$ $138 - 39 = \underline{99}$

b. $130 - 20 = \underline{110}$ $130 - 30 = \underline{100}$ $130 - 40 = \underline{90}$

2. Solve using your place value chart and place value disks. Unbundle the hundred or ten when necessary. Circle what you did to model each problem.

<p>a.  $115 - 50 = \underline{65}$</p> <p>I unbundled the hundred. <input checked="" type="radio"/> Yes <input type="radio"/> No</p> <p>I unbundled a ten. <input type="radio"/> Yes <input checked="" type="radio"/> No</p>	<p>b. $125 - 57 = \underline{\hspace{2cm}}$</p> <p>I unbundled the hundred. <input type="radio"/> Yes <input type="radio"/> No</p> <p>I unbundled a ten. <input type="radio"/> Yes <input type="radio"/> No</p>
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Lesson 25

Objective: Relate manipulative representations to a written method.

Homework Key

1. a. 27
b. 17
c. 51
d. 53
e. 97
f. 89
g. 16
h. 69
2. \$79
3. b. 144 - 88

Homework Sample

1. Solve the following problems using the vertical form, your place value chart, and place value disks. Unbundle a ten or hundred when necessary. Show your work for each problem.

a. $65 - 38$ $\begin{array}{r} 5 \\ \cancel{6} \\ - 38 \\ \hline 27 \end{array}$	b. $66 - 49$ $\begin{array}{r} 5 \\ \cancel{6} \\ - 49 \\ \hline 17 \end{array}$
c. $111 - 60$ $\begin{array}{r} 0 \\ \cancel{1} \\ - 60 \\ \hline 51 \end{array}$	d. $120 - 67$ $\begin{array}{r} 0 \\ \cancel{1} \\ - 67 \\ \hline 53 \end{array}$

Lesson 26

Objective: Use math drawings to represent subtraction with up to two decompositions and relate drawings to a written method.

Homework Key

1. a. 49
b. 83
c. 52
d. 59
e. 58

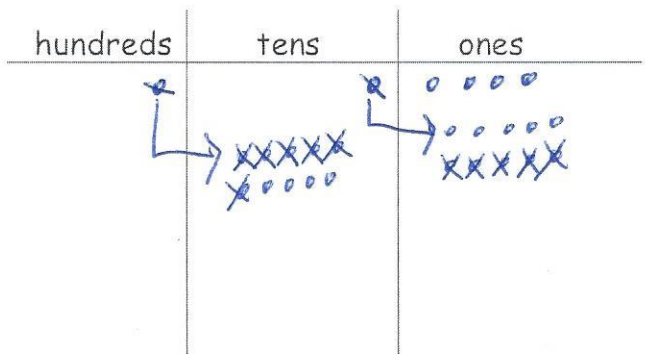
2. 4; place value chart and chips drawn to model $123 - 54 = 69$

Homework Sample

1. Solve vertically. Draw chips on the place value chart. Unbundle when needed.

a. $114 - 65 = \underline{49}$

$$\begin{array}{r} \overset{10}{\cancel{1}} \overset{14}{\cancel{4}} \\ - 65 \\ \hline 49 \end{array}$$



Lesson 27 - 28

Objective: Subtract from 200 and from numbers with zeros in the tens place.

Homework Key (27)

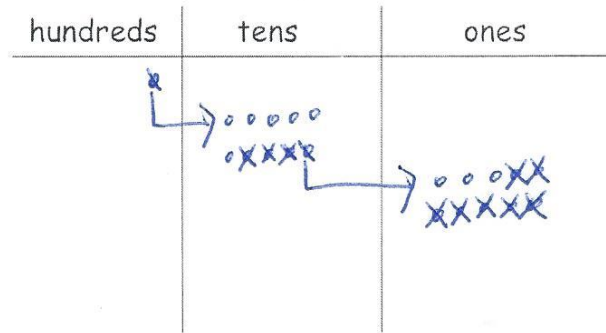
- 63
 - 51
 - 151
 - 143
 - 117
- Answers will vary.

Homework Sample

1. Solve vertically. Draw chips on the place value chart. Unbundle when needed.

a. $100 - 37 = \underline{63}$

$$\begin{array}{r} 0910 \\ \cancel{100} \\ - 37 \\ \hline 63 \end{array}$$



Lesson 28

Homework Key

- 42
 - 48
 - 139
 - 93
 - 57
- 64 shells

Homework Sample

1. Solve vertically. Draw chips on the place value chart. Unbundle when needed.

a. $136 - 94 = \underline{42}$

$$\begin{array}{r} 0 \text{ } 13 \\ \times 136 \\ - 94 \\ \hline 42 \end{array}$$

hundreds	tens	ones
x	o o o	x x x o o
L	x x x x o x x x x x	x

Grade 2 Module 4 Topic F

Student Explanations of Written Methods:

Focus Standards:

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

Instructional Days Recommended: 3

Module 4 culminates with Topic F, in which students think about and discuss the multiple strategies they have learned to represent and solve addition and subtraction problems. They share their reasoning as they link their drawings to two written methods and discuss the similarities, differences, and efficacy of each approach.

In Lesson 29, students learn the totals below written method. Throughout Grades 1 and 2, students decompose numbers into expanded form to recognize place value and to understand that they must add like units. These problems are written horizontally. Here, students use this prior learning to solve addition problems in a similar way. They decompose two- and three-digit numbers, then add like units

and record the totals horizontally (see image on next page). They then transition into the vertical form of the method when they decompose the numbers mentally, add like units, and record the totals below. The totals below method gives students the option of adding from left to right or from right to left. Students explain how each step of their math drawings relates to this written method.

Horizontal Notation

$$\begin{array}{r} 127 \\ + 59 \\ \hline 186 \end{array} \rightarrow \begin{array}{r} 100 + 20 + 7 \\ + \quad \quad 50 + 9 \\ \hline 100 + 70 + 16 \end{array}$$

Totals Below

$\begin{array}{r} 127 \\ + 59 \\ \hline 100 \\ 70 \\ 16 \\ \hline 186 \end{array}$	$\begin{array}{r} 127 \\ + 59 \\ \hline 16 \\ 70 \\ 100 \\ \hline 186 \end{array}$
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Left to Right Right to Left

In Lesson 30, students represent and solve problems using both the totals below and the new groups below methods (students used the latter method throughout the module). They relate both methods to their math drawings and discuss the differences and similarities between the two.

In Lesson 31, students apply knowledge of addition and subtraction strategies to solve two-step word problems. Students are challenged to make sense of more complex relationships as they are guided through more difficult problem types, such as comparison problems. These problems involve smaller numbers and are scaffolded to address the heightened level of difficulty.

**The sample homework responses contained in this manual are intended to provide insight into the skills expected of students and instructional strategies used in Eureka Math.*

Lesson 29

Objective: Use and explain the totals below written method using words, math drawings, and numbers.

Homework Key

- 15, 60; 75
 - 11, 80, 100; 191
 - 8, 110, 100; 218
 - 9, 110, 100; 219
 - 12, 70, 100; 182
 - 10, 90, 100; 200
 - 10, 100, 100; 210
 - 11, 80, 100; 191
- Solved vertically using totals below
16, 130; 146

Homework Sample

- Add like units and record the totals below.

<p>a.</p> $\begin{array}{r} 48 \\ + 27 \\ \hline 15 \text{ (8+7)} \\ \hline 60 \text{ (40+20)} \\ \hline \end{array}$ <p style="text-align: center;">75</p>	<p>b.</p> $\begin{array}{r} 118 \\ + 73 \\ \hline 11 \text{ (8+3)} \\ \hline 80 \text{ (10+70)} \\ \hline 100 \text{ (100+0)} \\ \hline \end{array}$ <p style="text-align: center;">191</p>
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Lesson 30

Objective: Compare totals below to new groups below as written methods.

Homework Key

1. Explanations will vary.
2. a. Solution strategies will vary.
b. Explanations will vary.
3. Solution strategies will vary.

Homework Sample

1. Kari and Marty solved $136 + 56$.

Kari's work:	Marty's work:
$\begin{array}{r} 136 \\ + 56 \\ \hline 192 \end{array}$	$\begin{array}{r} 136 \\ + 56 \\ \hline 12 \\ 80 \\ + 100 \\ \hline 192 \end{array}$

Explain what is different about how Kari and Marty solved the problem.

Kari used new groups below to solve the problem
and Marty used totals below.

Lesson 31

Objective: Solve two-step word problems within 100.

Homework Key

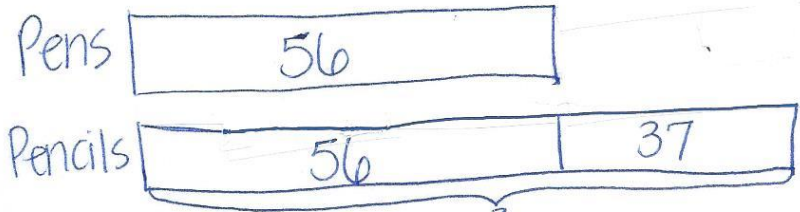
- 1. a. 93
b. 149
- 2. 30
- 3. 52
- 4. \$78

Homework Sample

1. Melissa had 56 pens and 37 more pencils than pens.

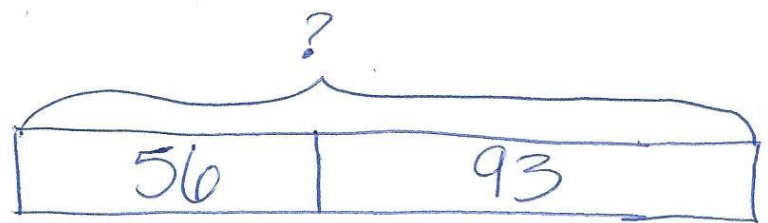
a. How many pencils did Melissa have?

Melissa has 93 pencils.



$$\begin{array}{r} 56 \\ + 37 \\ \hline 13 \text{ (6+7)} \\ 80 \text{ (50+30)} \\ \hline 93 \end{array}$$

b. How many pens and pencils did Melissa have?



$$\begin{array}{r} 56 \\ + 93 \\ \hline 149 \end{array}$$

There are 149 pens and pencils.