

Mathematics!



A Story of Units! **Parent Handbook**

Grade 2
Module 5

Grade 2 Module 5

Addition and Subtraction Within 1,000 with Word Problems to 100

OVERVIEW

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

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

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

Throughout Module 5, students maintain addition and subtraction fluency within 100 as they use these skills during their daily application work to solve one- and two-step word problems of all types. The focus of concept development is reserved for adding and subtracting within 1,000; using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; and relating strategies to a written method. Note that a written method can include number bonds, chip models, arrow notation, the algorithm, or tape diagrams. Many students will need to record these strategies in order to solve correctly. The lessons are designed to provide ample time for discussions that center on student reasoning, explaining why their addition and subtraction strategies work. For example, students may use the relationship between addition and subtraction to demonstrate why their subtraction solution is correct.

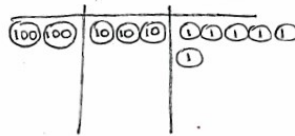
The module culminates with Topic D, wherein students synthesize their understanding of addition and subtraction strategies and choose which strategy is most efficient for given problems. They defend their choices using place value language and their understanding of the properties of operations.

Terminology

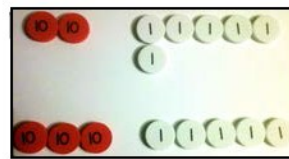
Terminology

New or Recently Introduced Terms

- Algorithm (a step-by-step procedure to solve a particular type of problem)
- Compensation (simplifying strategy where students add or subtract the same amount to or from both numbers to create an equivalent but easier 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)
- New groups below (show newly composed units on the line below the appropriate place in the addition algorithm)
- Simplifying strategy (e.g., to solve $299 + 6$, think $299 + 1 + 5 = 300 + 5 = 305$.)



Place value disk drawing



Place value disks

Familiar Terms and Symbols

- Addend
- Addition
- Bundle
- Difference
- Equation
- Number bond
- Place value
- Place value chart (pictured right)
- Place value or number disk (pictured above right)
- Rename
- Subtraction
- Tape diagram
- Total
- Unbundle
- Units of ones, tens, hundreds

Place Value Chart with Headings
(use with numbers)

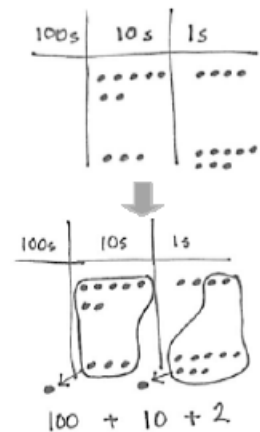
hundreds	tens	ones
7	2	6

Place Value Chart without Headings
(use with number disks)

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Suggested Tools and Representations

- Arrow notation, arrow way
- Chip model (pictured right)
- Number bond
- Place value charts and mats (pictured above right)
- Place value disk sets (18 ones, 18 tens, 18 hundreds, 1 one thousand per set)
- Tape diagram



Chip model

Lesson 1

Objective: Relate 10 more, 10 less, 100 more, and 100 less to addition and subtraction of 10 and 100.

We add and subtract like units. The digit in the hundreds place changes when adding and subtracting 100, just as the digit in the tens place changes when adding or subtracting 10.

The Arrow Method

$$212 + 106 = \underline{212} \xrightarrow{+100} 312 \xrightarrow{+10} 318$$

$$\underline{221} + 511 = 732 \quad 511 \xrightarrow{+200} 711 \xrightarrow{+20} 731 \xrightarrow{+1} 732$$

Lesson 2


Objective: Add and subtract multiples of 100 including counting on to subtract.

Number bonds

$$\begin{array}{r} 582 - 300 \\ \wedge \\ 500 \quad 82 \\ 500 - 300 = 200 \\ 200 + 82 = 282 \end{array}$$

I can choose which way works best for me!

The Arrow Way

$$582 \xrightarrow{-100} 482 \xrightarrow{-100} 382 \xrightarrow{-100} 282$$
$$582 \xrightarrow{-300} 282$$


Lesson 3

Objective: Add multiples of 100 and some tens within 1,000.

$$280 \xrightarrow{+200} 480$$

$$280 \xrightarrow{+200} 480 \xrightarrow{+20} 500$$

$$280 \xrightarrow{+200} 480 \xrightarrow{+20} 500 \xrightarrow{+10} 510$$



3. Solve.

a. 66 tens + 20 tens = 86 tens b. 66 tens + 24 tens = 90 tens

c. 66 tens + 27 tens = 93 tens d. 67 tens + 28 tens = 95 tens

What is the value of 86 tens? 860

Lesson 4

Objective: Subtract multiples of 100 and some tens within 1,000.

When we subtract using mental math strategies it helps to use benchmark numbers.

$$440 - 260 =$$

$$440 \xrightarrow{-20} 420 \xrightarrow{-20} 400 \xrightarrow{-20} 380 \xrightarrow{-20} 180$$

$$440 \xrightarrow{-200} 240 \xrightarrow{-40} 200 \xrightarrow{-20} 180$$

$$440 \xrightarrow{-240} 200 \xrightarrow{-20} 180$$

$$820 - 320 \quad 820 \xrightarrow{-300} 520$$

$$820 - 360 \quad 820 \xrightarrow{-300} 520 \xrightarrow{-20} 500 \xrightarrow{-40} 460$$

$$820 - 390 \quad 820 \xrightarrow{-300} 520 \xrightarrow{-20} 500 \xrightarrow{-70} 430$$

a. 88 tens - 20 tens = 68 b. 88 tens - 28 tens = 60

c. 88 tens - 29 tens = 59 d. 84 tens - 28 tens = 56

e. What is the value of 60 tens? 600

f. What is the value of 56 tens? 560

Lesson 5

Objective: Use the associative property to make a hundred in one addend.

A mental math strategy is to take from one addend and give to the other so that you have an even hundred.

e. $199 + 86$
1 85

$200 + 85 = 285$

Solve.

a. 30 tens = 300

b. 43 tens = 430

c. $330 + 180$

310 20

$310 + 200 = 510$

c. 18 tens + 12 tens = 300

d. 18 tens + 13 tens = 310

1. 24 tens + 19 tens = 430

d. 25 tens + 29 tens = 540

Lesson 6

Objective: Use the associative property to subtract from three-digit numbers and verify solutions with addition.

It is easier to subtract round numbers. Adding the same amount to the minuend and the subtrahend will not effect the difference.

$514 - 290$

+10 514

+10 290

$524 - 300$

a. $451 - 199 = 452 - 200 = 252$

+1 451
+1 199

Check:

252
 $+ 200$
 452

Lesson 7

Objective: Share and critique strategies for varied addition and subtraction problems within 1,000.

Students have a variety of strategies to solve problems. Some lend themselves better to specific problems.

Student A

$$\begin{array}{r} 697 + 223 \\ \hline 920 \end{array}$$

3
220
 $700 + 220 = 920$

Student C

$$\begin{array}{r} 864 - 380 \\ \hline 844 - 20 \\ \hline 844 - 400 = 444 \end{array}$$

$$\begin{array}{r} 290 + 374 \\ \hline 300 + 364 = 664 \end{array}$$

10 364

Student B

$$697 \xrightarrow{+3} 700 \xrightarrow{+200} 900 \xrightarrow{+20}$$

Student D

$$\begin{array}{r} \cancel{720} | 864 \\ \hline \cancel{720} | 380 \\ \hline 884 - 400 = 484 \end{array}$$

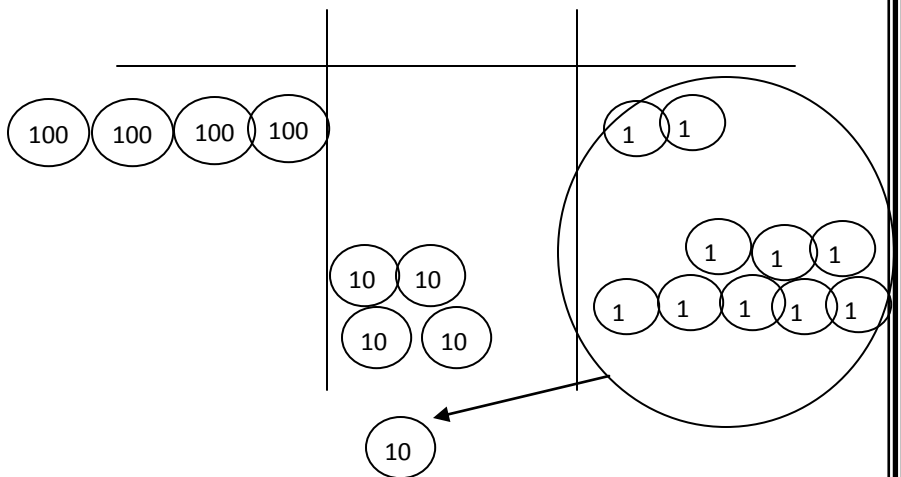
290 is very close to 300 so a number bond is easier to use.

Lesson 8

Objective: Relate manipulative representations to the addition algorithm.

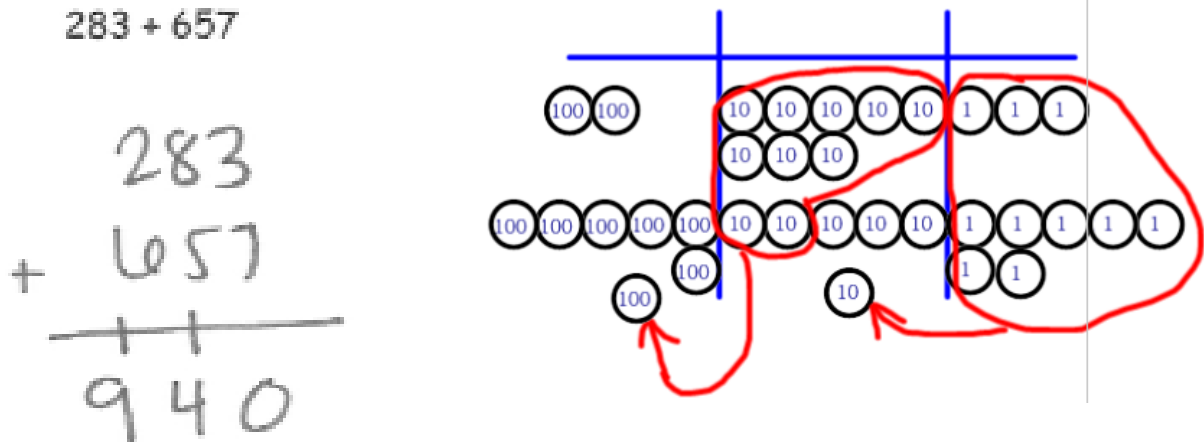
$402 + 48$

$$\begin{array}{r} 402 \\ + 48 \\ \hline 450 \end{array}$$



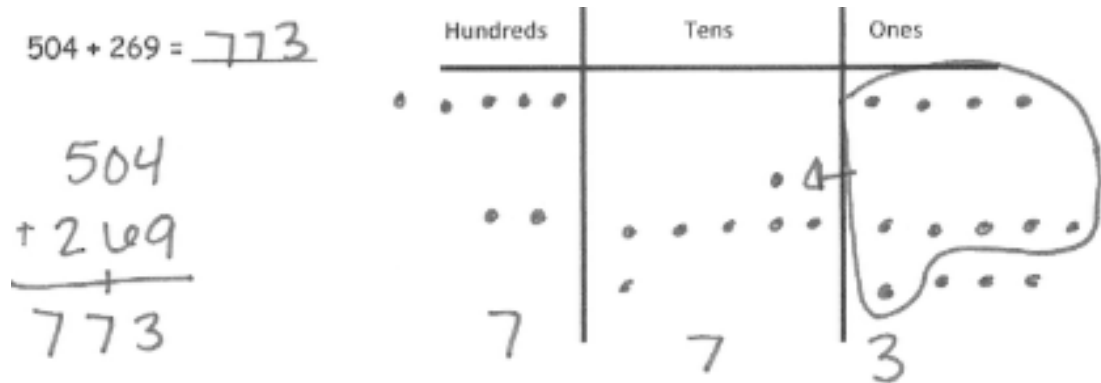
Lesson 9

Objective: Relate manipulative representations to the addition algorithm.



Lesson 10

Objective: Use math drawings to represent additions with up to two compositions and relate drawings to the addition algorithm.



Lesson 13

Objective: Relate manipulative representations to the subtraction algorithm, and use addition to explain why the subtraction method works.

Four subtraction problems showing the process of borrowing:

$$\begin{array}{r} 312 \\ - 186 \\ \hline \end{array}$$

$$\begin{array}{r} 012 \\ 312 \\ - 186 \\ \hline \end{array}$$

$$\begin{array}{r} 21012 \\ 312 \\ - 186 \\ \hline \end{array}$$

$$\begin{array}{r} 21012 \\ 312 \\ - 186 \\ \hline 126 \end{array}$$

A base ten block diagram illustrating the subtraction of 186 from 312. The top row shows three 100 blocks, one 10 block, and two 1 blocks. The bottom row shows one 100 block, one 10 block, and six 1 blocks. Red arrows show the decomposition of a 100 block into ten 10 blocks and a 10 block into ten 1 blocks. The numbers 1, 2, and 6 are written below the blocks to indicate the remaining quantities.

An addition problem showing the inverse operation:

$$\begin{array}{r} 126 \\ + 186 \\ \hline 312 \end{array}$$

Lesson 14

Objective: Use math drawings to represent subtraction with up to two decompositions, relate drawings to the algorithm, and use addition to explain why the subtraction method works.

A place value chart with columns labeled H (Hundreds), T (Tens), and O (Ones). Red dots represent the number 389. A red arrow points from the Tens column to the Ones column, and another from the Hundreds column to the Tens column.

A base ten block diagram showing three 100 blocks, eight 10 blocks, and nine 1 blocks. Red arrows indicate the decomposition of a 100 block into ten 10 blocks and a 10 block into ten 1 blocks.

Two addition problems showing the inverse operation:

$$\begin{array}{r} 51018 \\ 618 \\ - 229 \\ \hline 389 \end{array}$$

$$\begin{array}{r} 389 \\ + 229 \\ \hline 618 \end{array}$$

Lesson 15

Objective: Use math drawings to represent subtraction with up to two decompositions, relate drawings to the algorithm, and use addition to explain why the subtraction method works.

a. $699 - 210$	Solve vertically or mentally:	Check:									
<table border="1"> <thead> <tr> <th>Hundreds</th> <th>Tens</th> <th>Ones</th> </tr> </thead> <tbody> <tr> <td>.....</td> <td>.....</td> <td>.....</td> </tr> <tr> <td>4</td> <td>8</td> <td>9</td> </tr> </tbody> </table>	Hundreds	Tens	Ones	4	8	9	$\begin{array}{r} 699 \\ - 210 \\ \hline 489 \end{array}$	$\begin{array}{r} 489 \\ + 210 \\ \hline 699 \end{array}$
Hundreds	Tens	Ones									
.....									
4	8	9									

Lesson 16

Objective: Subtract from multiples of 100 and from numbers with zero in the tens place.

$700 - 509 = \underline{191}$

hundreds	tens	ones
.....
700		
- 509		
191		

hundreds	tens	ones
.....
1	9	1

Lesson 17

Objective: Subtract from multiples of 100 and from numbers with zero in the tens place.

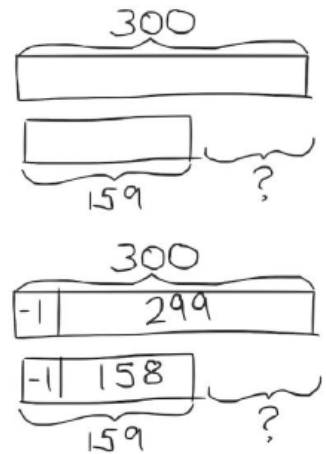
Solve $600 - 367$. Then, check your work using addition.

<p>Solution:</p> $\begin{array}{r} 5 \cancel{6} \cancel{0} \cancel{0} \\ - 367 \\ \hline 233 \end{array}$	<p>Check:</p> $\begin{array}{r} 233 \\ + 367 \\ \hline 600 \end{array}$
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Lesson 18

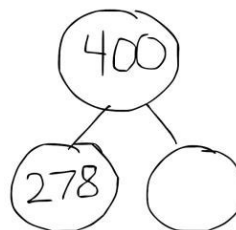
Objective: Apply and explain alternate methods for subtracting from multiples of 100 and from numbers with zero in the tens place.

Using compensation helps us avoid having to subtract across two or more zeros.



We can use the arrow method and our knowledge of addition to find the solution to a subtraction problem.

$$278 \xrightarrow{+2} 280 \xrightarrow{+20} 300 \xrightarrow{+100} 400$$
$$400 - 278 = 122$$



Lesson 19

Objective: Choose and explain solution strategies and record with a written addition or subtraction method.

The Arrow Method

$$236 \xrightarrow{+4} 240 \xrightarrow{+60} 300 \xrightarrow{+100} 400$$

$$4 + 60 + 100 = 164$$

Number Bond

$$389 + 411$$

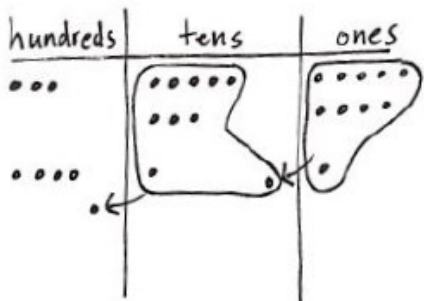
$$\begin{array}{r} / \ \backslash \\ 11 \ 400 \end{array}$$

$$400 + 400 = 800$$

Compensation

$$\begin{array}{r} 399 \\ - 235 \\ \hline 164 \end{array}$$

Chip Model



Standard Algorithm

$$\begin{array}{r} 390 \\ 400 \\ - 236 \\ \hline 164 \end{array}$$

$$\begin{array}{r} 389 \\ + 411 \\ \hline 800 \end{array}$$

Lesson 20

Objective: Choose and explain solution strategies and record with a written addition or subtraction method.

$$\begin{array}{r} 549 \\ +3 \\ \hline 546 \end{array}$$

$$\begin{array}{r} 297 \\ +3 \\ \hline 300 \end{array}$$

?

I used compensation and added 3 to both numbers, so that I could subtract 300 instead of 297. So, 549 minus 300 equals 249. Easy!

$$549 - 300 = 249$$

$$499 \xrightarrow{+100} 599 \xrightarrow{+1} 600 \xrightarrow{+65} 665$$

I used the arrow way, because it's easy to add on from 499. I added on a hundred, then 1 more to make 600, then 65 more. So, I also got 665.

$$499 + 166$$

$$\begin{array}{r} / \ \backslash \\ 1 \ 165 \end{array}$$

$$500 + 165 = 665$$

I used a number bond since 499 is so close to 500. I took 1 from 166 and added it to 499 to get 500; then I added on the rest to get 665.

$$\begin{array}{r} 41316 \\ - 297 \\ \hline 249 \end{array}$$

I used the algorithm to solve, because I know the steps, so it doesn't take me long.