Grade 2 Module 4
Addition and Subtraction within 200

Terms:

- Equation
- Minuend
- New groups below
- Place value chart (pictured below right)
- Place value or number disk (pictured to the right)
- Subtrahend
- Totals below

Topic 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

- Relate 10 more and 10 less and 1 more and 1 less to addition and subtraction
- See numbers in terms of place value units:
    54-10 is 5 tens 4 ones minus 1 ten
- Record the addition and subtraction of multiples of 10 using arrow notation

$$33 + 12: \quad 33 \xrightarrow{+10} 43 \xrightarrow{+1} 44 \xrightarrow{+1} 45$$

Lesson 2: Add and subtract multiples of 10 including counting on to subtract.

- Use place value understanding to add and subtract multiples of 10 before counting on by tens
    - when adding 20 to 43, they may count 53, 63
    - to solve 92-60, one student might think 9 tens – 6 tens is 3 tens, plus 2 is 32
        - another student might start at 60, adds on 3 tens and then 2 ones to reach 92, so 32

Lessons 3 & 4: Add and subtract multiples of 10 and some ones within 100.

- Problems are intentionally chosen so that the ones digit is close to a multiple of 10 (e.g. 38, 39, 41), which prompts students to discover and use relationships between the numbers to develop a variety of simplifying strategies
- For example, mentally reason that for 29 + 42, can make a multiple of 10 and count on to solve – use a number bond to decompose 42 as 1 and 41 to make 30 + 41 = 71

$$29 + 42 = 30 + 41$$
$$\underset{1 \quad 41}{\diagdown}$$
$$= 72$$

- Use arrow notations to record their mental math – first add a multiple of 10, then count on 2 to make 71

$$24 \xrightarrow{+40} 69 \xrightarrow{+2} 71$$

Lesson 5: Solve one- and two-step word problems within 100 using strategies based on place value.

- Use Read, Draw, Write Process
  - Read the problem using close reading strategies
  - Draw something, while asking "What can I draw?" and "What conclusions can I make from my drawing?"
  - Solve & Write a statement and Assess the solution for reasonableness

Topic B: Strategies for Composing a Ten

- 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 number disks, moving to pictorial place value chart drawings, and ending with abstract calculation.
- 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 3 standard and is not expected at this level.

Lesson 6: Use manipulatives to represent the composition of 10 ones as 1 ten with two-digit addends.

- students use number 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

Lesson 7: Relate addition using manipulatives to a written vertical method.

- students relate manipulatives to a written method, recording compositions as *new groups below* in vertical form
- 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 change in the written method, step by step.

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

Lesson 8: Use math drawings to represent the composition and relate drawings to a written method.

- students move from concrete to pictorial as they draw unlabeled place value charts with labeled disks to represent addition. As they did with the manipulatives, students record each action in their drawings step by step on the written method.

$$26 + 35$$
$$\underline{+\ \ 35}$$
$$61$$
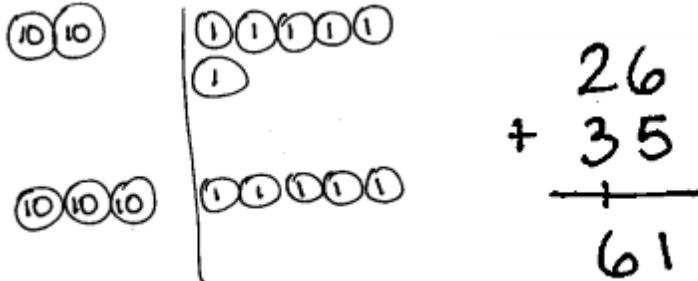
Lessons 9 & 10: Use math drawings to represent the composition when adding a two-digit to a three-digit addend.

- 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

$$119$$
$$\underline{+\ 43}$$

$$119$$
$$\underline{+\ \ 43}$$
$$162$$

100 + 60 + 2
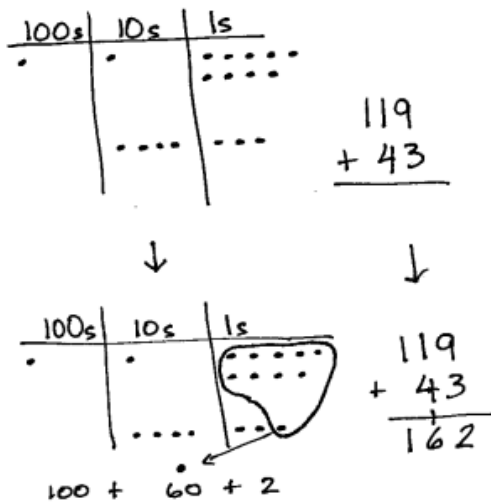
- While some students may come into this topic already having learned vertical addition, including carrying above the tens, the process of connecting their understanding to the concrete and pictorial representations develops meaning and understanding of why the process works, not just how to use it. Therefore, students will be less prone to making place value errors.

Topic C: Strategies for Decomposing a Ten

- 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. However, fluency with the algorithm is a Grade 3 standard.

Lesson 11: Represent subtraction with and without the decomposition of 1 ten as 10 ones with manipulatives.

- students use number 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 without decompositions, and then progress to problems that require exchanging 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: Relate manipulative representations to a written method.

- 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.

Lesson 13: Use math drawings to represent subtraction with and without decomposition and relate drawings to a written method.
- used in conjunction with the chip model (shown below); students record each change they make to their model simultaneously on the algorithm.
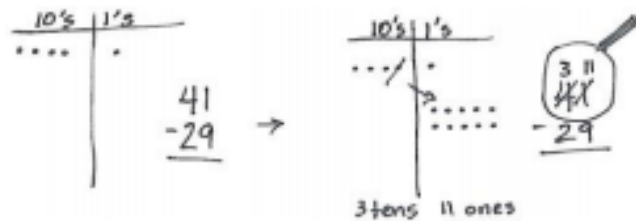
Lessons 14 & 15: Represent subtraction with and without the decomposition when there is a three-digit minuend.
- students move to the more abstract dot drawings on their place value charts and follow the same procedure for decomposing a ten and relating it to the written method. Here, however, students 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.
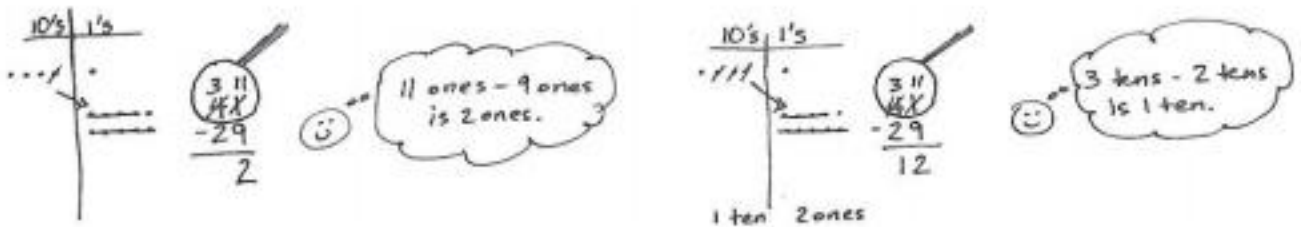
Lesson 16: Solve one- and two- step word problems within 100 using strategies based on place value.
- Students apply their place value reasoning, mental strategies, and understanding of compositions and decompositions to negotiate different problem types with unknowns in various positions
- They are 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 + _____ = 41) and rewriting it as a solution equation (e.g., 41 – 8 = ___), thus illustrating the relationship between operations

Topic D: Strategies for Composing Tens and Hundreds

Lesson 17: Use mental strategies to relate compositions of 10 tens as 1 hundred to 10 ones as 1 ten.
- 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 ones + 8 ones = 13 ones, so 5 tens + 8 tens = 13 tens = 130.
- They use place value language to explain when they make a new hundred. They also relate 100 more from Module 3 to + 100 and mentally add 100 to given numbers.

Lesson 18: Use manipulatives to represent additions with two compositions.
- Students use number 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 when they make a new ten and a new hundred, as well as where to show each new unit on the place value chart

Lesson 19: Relate manipulative representations to a written method.
- Students relate manipulatives to a written method, recording compositions as new groups below in vertical form. As they did in Topic B, students use place value language to express the action as they physically make 1 hundred with 10 tens disks and 1 ten with 10 ones disks

Lessons 20 & 21: Use math drawings to represent additions with up to two compositions and relate drawings to a written method.
- 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 a written method, recording each change they make to their model on the numerical representation. They use place value language to explain these changes.

Lesson 22: Solve additions with up to four addends with totals within 200 with and without two compositions of larger units.
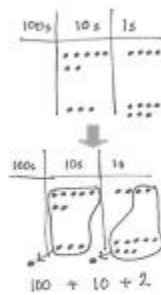
- Focuses on adding up to four two-digit addends with totals within 200. Students now have multiple strategies for composing and decomposing numbers, and they use properties of operations (i.e., the associative property) to add numbers in an order that is easiest to compute.

  - 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)
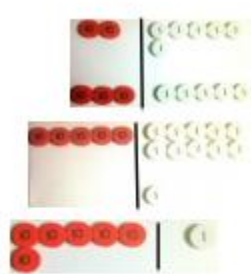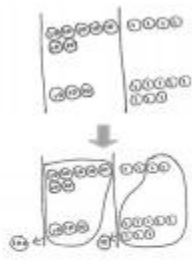
| Place value disks | Place value chart with labeled disks | Chip model | New groups below |

Topic E: Strategies for Decomposing Tens and Hundreds

Lesson 23: Use number bonds to break apart three-digit minuends and subtract from the hundred.
- Students use the strategy of breaking 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

Lesson 24: Use manipulatives to represent subtraction with decompositions of 1 hundred as 10 tens and 1 ten as 10 ones.
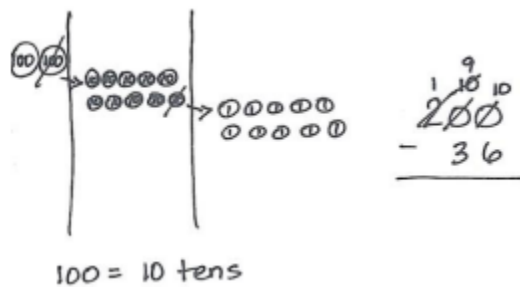
- students use number disks on a place value chart to represent subtraction and develop an understanding of decomposition of tens and hundreds. This concrete model helps students see the answer to the question, "Do I have enough ones?" or, "Do I have enough tens?" When they do not, they exchange one 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

Lesson 25: Relate manipulative representations to a written method.

- students move towards the abstract when they model decompositions on their place value chart while simultaneously recording the changes in the written 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 written form. Students repeat these steps when subtracting the tens.

Lesson 26: Use math drawings to represent subtraction with up to two decompositions and relate drawings to a written method.

- 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 number disks, but now they may use a chip model or number disk drawing. They continue to record changes in the written form as they work with their models

100 = 10 tens

Lessons 27 & 28: Subtract from 200 and from numbers with zeros in the tens place.
- Using number disks 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

$$100 = 9 \text{ tens } 10 \text{ ones}$$
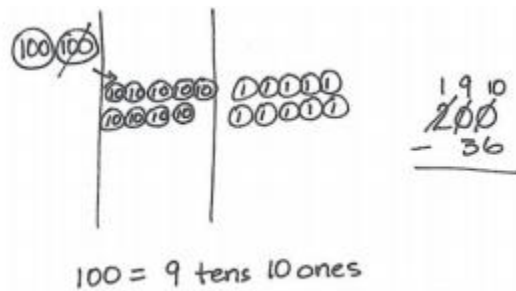
Topic F: Explanations of Written Methods

Lesson 29: Use and explain the totals below written method using words, math drawings, and numbers.
- They decompose two- and three-digit numbers, then add like units and record the totals horizontally (see image below). 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 drawing relates to this written method.

Horizontal Notation

Totals Below

Left to Right   Right to Left

Lesson 30: Compare totals below to new groups below as written methods.
- students represent and solve problems using both the totals below and the new groups below methods

Lesson 31: Solve two-step word problems within 100.
- 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 will involve smaller numbers and will be scaffolded to address the heightened level of difficulty