

At RPDP, we support educators through professional development. Professional development can occur in a variety of ways: Entire staff trainings, grade level meetings, one-on-one support, etc. We collaborate with administrators and teachers regarding the developing and strengthening math content knowledge, use of best practices in the classroom, we model lessons, and provide support for the use of quality instructional materials.

Providing educators with quality resources in regards to instructional materials is a continuous priority. We provide this support through math content overviews, the use of instructional materials, further practice/skill development materials, and through quality assessments/tasks. As we work to create these resources for educators, we may recommend other quality resources from time to time.

In recent years, some states have received funds to create quality instructional materials for ALL educators for ALL states to access. We have selected some of those materials that we believe support our vision of quality instructional materials that support teachers in providing a solid mathematical foundation for students. For more elementary math resources please visit [Rpdp.net](http://Rpdp.net) .





# To Compose or Decompose: That is the Question

## Mathematics, Grade 2

In grade 2 students extend their understanding of place value of three digit numbers and in this unit students' focus on addition and subtraction within 1,000 using place value and properties of operations. This is the focus of Critical Area 2 in the 2011 MA Mathematics Curriculum Framework. Students are asked to explore the underpinnings of composing and decomposing numbers in order to flexibly think about how to find sums and differences. Students learn to represent numbers using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. Students relate these strategies to written methods. Students also endeavor to use the relationship between the two operations fluidly in appropriate contexts. Finally, students use these skills to solve real world problems.

*These Model Curriculum Units are designed to exemplify the expectations outlined in the MA Curriculum Frameworks for English Language Arts/Literacy and Mathematics incorporating the Common Core State Standards, as well as all other MA Curriculum Frameworks. These units include lesson plans, Curriculum Embedded Performance Assessments, and resources. In using these units, it is important to consider the variability of learners in your class and make adaptations as necessary.*



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Stage 1 Desired Results			
<b>ESTABLISHED GOALS</b> <b>G</b>  <b>Number and Operations in Base Ten</b>  <b>Use place value understanding and properties of operations to add and subtract.</b>  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. <sup>1</sup>  <b>Standards for Mathematical Practice</b> SMP.3 Construct viable arguments and critique the reasoning of others. SMP.4 Model with mathematics SMP.6 Attend to precision. SMP.7 Look for and make use of structure SMP.8 Look for and express regularity in repeated reasoning.	<b>Transfer</b>		
	<b>Students will be able to independently use their learning to...</b> T1. Reason abstractly and quantitatively in various problem solving situations.		
	<b>Meaning</b>		
	<b>UNDERSTANDINGS</b> <b>U</b> <b>Students will understand that...</b> 1. Numbers can be composed and decomposed to express the same value (325 can be expressed as 3 hundreds, 2 tens, and 5 ones, or 3 hundreds + 1 ten + 15 ones, etc.). 2. Composition and decomposition are strategies that <i>can</i> be used to add and subtract. 3. Numbers can be added and subtracted in different ways.	<b>ESSENTIAL QUESTIONS</b> <b>EQ</b> <b>Students will keep considering...</b> 1. How does place value understanding help when adding and subtracting numbers? 2. How does composition and decomposition of numbers help us understand the operations of addition and subtraction? 3. What different strategies can I use to demonstrate addition and subtraction accurately?	
<b>Acquisition</b>			
<b>Students will know...</b> <b>K</b> 1. Addition and subtraction are inverse operations that can be used to find solutions in numbers within one thousand (e.g. counting on, creating equivalent but easier known sums/differences). 2. There are different visual models and strategies that can be used to represent addition and subtraction (e.g. number lines, student generated strategies, manipulatives, drawings, etc.).	<b>Students will be skilled at...</b> <b>S</b> 1. Adding and subtracting within one thousand. 2. Decomposing and composing numbers by place value when adding and subtracting three-digit numbers (e.g. add or subtract hundreds and hundreds, tens and tens, ones and ones) 3. Using vocabulary terms including but not limited to: place value, digit, value,		

<sup>1</sup> Explanations may be supported by drawings or objects.





<p>SL.2.1. Participate in collaborative conversations with diverse partners about <i>grade 2 topics and texts</i> with peers and adults in small and larger groups.</p> <ol style="list-style-type: none"><li>Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).</li><li>Build on others' talk in conversations by linking their comments to the remarks of others.</li><li>Ask for clarification and further explanation as needed about the topics and texts under discussion.</li></ol> <p>SL.2.3 Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a topic or issue.</p>	<p>3.A digit's value is dependent upon its position in a number including the ones, tens, and hundreds places.</p> <p>4.A three digit number includes ones, tens, and hundreds.</p>	<p>operation, add, subtract, addition, subtraction, sum, difference, compose, decompose, increase, decrease, composition and decomposition.</p> <ol style="list-style-type: none"><li>Finding solutions to addition and subtraction problems using concrete models or drawings.</li><li>Using strategies based on place value and properties of operations to add and subtract.</li><li>Verbalizing their mathematical thought process when adding and subtracting.</li><li>Explaining their mathematical thought process in written form, including but not limited to number sentences, tally charts, illustrations, algorithms, and number lines, when adding and subtracting.</li></ol>
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Stage 2 – Evidence	
Evaluative Criteria	Assessment Evidence
<p><b>Interpretation:</b> Use place value knowledge effectively and compose and decompose numbers accurately</p> <p><b>Explanation:</b> Explains the strategies used</p> <p><b>Application:</b> Makes sense of novel problems</p>	<p><b>CURRICULUM EMBEDDED PERFORMANCE ASSESSMENT (PERFORMANCE TASKS)</b></p> <p><u>Goal:</u>            Congratulations! You have just gotten a job at the Franklin Park Zoo as Head Zoo Keeper. One of your responsibilities is to order food for the animals. Different animals require different amounts of food and it needs to be ordered on different schedules so it won't spoil. You need to figure out how much to order so that there will be enough, but not too much. Be sure to show how you solved the problem. Good Luck!</p> <p><u>Role:</u>            You are a Zoo Keeper.</p> <p><u>Audience:</u>            You will send orders to the suppliers of food for the animals. Ultimately, you need to keep the animals healthy and happy as well as the director of the zoo.</p> <p><u>Situation:</u>            You have the following animals to feed and order forms that need to be filled in.</p> <p><u>Penguins:</u> The 80 penguins eat a total of 504 pounds of fish each week.</p> <p>Week One:</p> <ul style="list-style-type: none"> <li>• Currently there are 282 pounds of fish in the freezer.</li> <li>• How many pounds of new fish should you order to feed the penguins for week one?</li> </ul> <p><b>Week One Order: _____ pounds of fish</b></p> <p>Week Two:</p>





- After week one, there are 216 pounds of fish left in the freezer. The 80 penguins eat a total of 504 pounds of fish each week.
- How many pounds of new fish should you order to feed the penguins for week two?

**Week Two Order: \_\_\_\_\_ pounds of fish**

Lions: The 2 lions eat 145 pounds of meat every week.

Week One:

- There are currently 17 pounds of meat in the fridge.
- How much more meat should you order to feed the two lions for week one?

**Week One Order: \_\_\_\_\_ lbs. of meat**

Week Two:

- After week one, there are 21 pounds of meat left. The 2 lions eat 145 pounds of meat every week.
- How many more pounds of meat should you order to feed both lions for week two?

**Week Two Order: \_\_\_\_\_ lbs. of meat**

Giraffes: The 3 giraffes eat 545 pounds of hay every week.

Week One:

- There are 126 pounds of hay left in the giraffe barn.
- How much new hay should you order to feed the giraffes for the next week?

**Week One Order: \_\_\_\_\_ lbs. of hay**

Week Two:





- After week one, there are 87 pounds of hay left. The 3 giraffes eat 545 pounds of hay every week.
- How much new hay should you order to feed the giraffes for the next week?

**Week Two Order: \_\_\_\_\_ lbs. of hay**

Teacher Note: As needed, numbers can be changed to meet the needs of all students.

Product:

You will complete two order forms for each animal fulfilling the requirements of each animal.

Criteria for Success:

Your work will be evaluated using the attached rubric.

**OTHER EVIDENCE:**

1. Conference with students individually or in small groups; ask students to model numbers, use composition and decomposition with addition and subtraction (e.g. using base ten blocks, number line, student generated strategies, etc.), and explain the process and reasoning used in verbal or written form. This formative assessment should be ongoing throughout the unit, and should increase in difficulty as proficiency develops.
2. Ask students to use correct vocabulary when explaining their thinking. Create a poster for the classroom on which to list vocabulary and/or strategies used during the unit.
3. Ask students to solve situational place-value problems such as: The school needs 583 pencils. On hand we have 2 boxes of 100 pencils, 3 boxes of ten pencils, and 4 loose pencils. Pencils are sold in boxes of 100, boxes of 10, and individually. How many more pencils do we need to order so we have exactly enough for the students in our school? Show at least two different ways we could order the pencils.
4. Ask students to identify and explain errors in addition or subtraction examples.
  - Jorge incorrectly solved  $55-27=32$ . Find the error and explain what Jorge did wrong.
  - Sandra incorrectly solved  $55-27=38$ . Find the error and explain what Sandra did wrong.
  - Kenny incorrectly solved  $55 + 27 = 712$ . Find the error and explain what Kenny did wrong.







## Stage 3 – Learning Plan

### *Summary of Key Learning Events and Instruction*

#### Pre-Assessment :

- Ask students to model the value of a number within 1,000 using base ten models (e.g. exit ticket, teacher interview, computer/Smartboard/interactive board)
- Ask students to explain what happens to a number when it is added to or subtracted from. (i.e. Adding ***whole numbers*** makes a sum greater than the addends and conversely, subtracting ***whole numbers*** results in a difference smaller than the number subtracted from. Whole numbers are the set of counting numbers and zero (i.e. 0, 1, 2, 3, ...). See Illustration 1 in Glossary of Massachusetts Curriculum Framework for Mathematics (2010).

Teacher Note: When the set of numbers students work with expand to integers (which include negative numbers), these generalizations will no longer always be true.

#### Progress Monitoring:

Ask students to solve one and two-step addition and/or subtraction problems that arise in daily classroom routines (i.e. attendance, school supplies, etc)

#### Learning Events:

- Students play “Race to 200” where students roll two dice and create a two-digit number, then with each turn the player creates a two-digit number that is added to the previous number. Students cannot create a sum greater than 200.
- Students play “Race to 0” where students roll two dice and create a two-digit number that is subtracted from 200. With each turn, players make a two-digit number from the dice rolled and subtract from the previous difference. Students can’t go below 0.
- Students determine which operation to use (addition or subtraction) and then solve problems involving library books being taken out and brought back. Students will have an opportunity to practice using a number line to solve addition and subtraction problems.
- Students determine which operation to use (addition or subtraction) and then solve problems involving passengers boarding and exiting a train. Students will have an opportunity to practice using an open number line to solve addition and subtraction problems.
- Students solve one- and two-step addition and subtraction problems using information from a given chart. The problems involve the weights of big cats at a zoo. Students are encouraged to use a strategy most appropriate for the problem.
- Students solve one- and two-step addition and subtraction problems using information involving scores in Skee-Ball. Students are encouraged to use a strategy most appropriate for the problem.
- Students create and then solve one- and/or two-step problems requiring addition and subtraction of numbers up to 1,000.

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# Lesson 1: Race to 200

**Brief Overview:** Students use their understanding of place value and base ten blocks to add to 200. As you plan, consider the variability of learners in your class and make adaptations as necessary.

**Prior Knowledge Required:** Students need to be able to use place value understanding to compose numbers.

**Estimated Time:** 1 hour

**Resources for Lesson:** Dice, place value mats (optional), base ten blocks





**Lesson Name:** Race to 200

**Content Area/Course:** Math Grade 2

**Unit:** To Compose or Decompose: That is the Question!

**Time (minutes):** 60

**Lesson #:** 1

By the end of this lesson students will know and be able to:

Compose numbers based on place value understanding to solve addition problems within 200.

**Essential Question addressed in this lesson:**

How does place value understanding help when adding and subtracting numbers?

**Standard(s)/Unit Goal(s) to be addressed in this lesson:**

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.<sup>2</sup>

SMP.4 Model with mathematics

SMP.6 Attend to precision

SMP.7 Look for and make use of structure

SL.2.1. Participate in collaborative conversations with diverse partners about *grade 2 topics and texts* with peers and adults in small and larger groups

a. Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).

b. Build on others' talk in conversations by linking their comments to the remarks of others.

c. Ask for clarification and further explanation as needed about the topics and texts under discussion.

SL.2.3 Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a

<sup>2</sup> Explanations may be supported by drawings or objects.





topic or issue.

### **Instructional Resources/Tools**

Dice, place value mats (optional – available at [http://lrt.ednet.ns.ca/PD/BLM/table\\_of\\_contents.htm](http://lrt.ednet.ns.ca/PD/BLM/table_of_contents.htm), scroll down to page 216), base ten blocks, available at [http://nlvm.usu.edu/en/nav/frames\\_asid\\_154\\_g\\_1\\_t\\_1.html?from=grade\\_g\\_1.html](http://nlvm.usu.edu/en/nav/frames_asid_154_g_1_t_1.html?from=grade_g_1.html) – students use virtual base 10 blocks to create and solve addition problems.

### Anticipated Student Preconceptions/Misconceptions

Composition affects two places not just one i.e. ( $352 + 19 = 300 + 60 + 11 = 371$ , not 361 or 3611)

### Instructional Model

7E Learning Cycle (Elicit, Engage, Explore, Explain, Elaborate, Evaluate, Extend)

### Instructional Tips/Strategies/Suggestions:

Students need to understand place value and use place value to find sums. This lesson provides an opportunity for all students to explore addition using base ten blocks; however, by the end of the unit students may choose a different strategy as their primary strategy for solving addition and subtraction problems.

### Pre-Assessment

Teachers: pair students strategically to optimize data collection and use results to differentiate instruction.

Orally ask students to build and write the number represented by 2 hundreds + 1 ten + 4 ones using base ten manipulatives. Next, ask them to build and write the number represented by 1 hundred + 11 tens + 4. Lastly, ask students to write the number represented by 1 hundred + 10 tens + 14 ones. Ask students to turn and talk to explain how they built and found the value of each representation using precise mathematical language and regularity in repeated reasoning (SMP.4, SMP.6 & SMP.8)

### What students need to know and are able to do coming into this lesson (including language needs):

- Ten tens equals one hundred
- Compose three-digit numbers using place value of hundreds, tens, ones



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- Represent three-digit numbers in various ways (including representing numbers on a number line, manipulatives, sketches, and using place value)
- The value of a place to the left of a digit is ten times bigger (ex. 100 is ten times as big as 10)
- Vocabulary: place value, digit, hundreds, tens, ones, compose

**Elicit:**

Review key vocabulary (place value, digit, hundreds, tens, ones, compose and decompose)

*Allow 5 minutes.*

**Engage:**

Teacher models game “Race to 200”.

- Use two dice, base ten blocks, and place value mats to roll a two digit number and create it on the mat with the blocks.
- Continue to roll two digit numbers and “add” them on the place value mat composing when necessary.
- Students have the choice to roll one or two dice.
- Write down on paper the number sentences for each round.
- Possible accommodation - give each child a 1-200 chart and a counter to track their progress.

*Model using base ten blocks to show each sum. Ask students to record each move using a number sentence i.e. student had 143, rolled a 5 and a 1. Student added 15 to get 158. Student records  $143 + 15 = 158$ .*

*Allow 10 – 15 minutes.*

**Explore:**

Pair students and have them have them play “Race to 200.”

*Possible questions to ask. Look for precise mathematical language, modeling and regularity of reasoning (SMP.4, SMP.6 & SMP.8):*

- *What do you need to roll to reach \_\_\_\_? How do you know?*
- *How many more do you need to be equal to your partner? Explain how you know.*
- *How many fewer do you have than your partner? Are you sure? Explain how you know.*

*Allow 20 – 30 minutes.*





**Explain:**

The teacher asks a pre-selected student team to share a problem from their Race to 200 game and to model how they solved it using base ten blocks and a number sentence (students can use actual blocks on an overhead or use the NLVM web site to model using virtual manipulatives). Ask students where the numbers written are shown with the base ten blocks focusing on where composing occurred. Discuss similarities and differences between the two ways of representing the addition problem. Focus on modeling, use of structure and precision (SMP.4, SMP.6 & SMP.7).

*During the exploration the teacher should circulate and identify various/unique problems that students solved while playing the game. Orchestrate a summarizing discussion by asking a pair of students to share their problem, solution, and thinking. Encourage students to use precise mathematical language to explain their modeling (SMP.4 & SMP.6). If more than one pair of students shares, be thoughtful regarding the order in which students share to create a logical progression. The use of a document camera would be effective.*

*Allow 10 – 15 minutes.*

**Elaborate/Extend:**

Give students 2 - 4 problems requiring addition to sums less than 300. Ask them to draw base ten blocks and model how to compose to find sums. (ex.  $87+24$ ;  $145 + 79$ )

**Evaluate:**

Ticket Out the Door: Ask students to show how to sketch 2 two-digit numbers using base ten blocks. Then, ask students to find and record the sum.

*Students don't need to be experts in addition at this point in the unit. They will continue to practice with addition and then subtraction throughout the unit.*

*Allow 5 minutes.*





## Lesson 2: Race to 0

**Brief Overview:** Students use their understanding of place value and base ten blocks to subtract from values no more than 200. As you plan, consider the variability of learners in your class and make adaptations as necessary.

**Prior Knowledge Required:** Students need to be able to use place value understanding to compose and decompose numbers.

**Estimated Time:** 1 hour

**Resources for Lesson:** Yes/No cards, dice, place value mats (optional), base ten blocks



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**Lesson Name:** Race to 0

**Content Area/Course:** Math Grade 2

**Unit:** To Compose or Decompose: That is the Question!

**Time (minutes):** 60

**Lesson #:** 2

*By the end of this lesson students will know and be able to:*

Compose and decompose numbers based on place value understanding to solve subtraction problems within 200.

**Essential Question addressed in this lesson:**

How does place value understanding help when adding and subtracting numbers?

**Standard(s)/Unit Goal(s) to be addressed in this lesson:**

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.<sup>3</sup>

SMP.4 Model with mathematics

SMP.6 Attend to precision

SMP.7 Look for and make use of structure

SL.2.1. Participate in collaborative conversations with diverse partners about *grade 2 topics and texts* with peers and adults in small and larger groups.

- Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).
- Build on others' talk in conversations by linking their comments to the remarks of others.

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<sup>3</sup> Explanations may be supported by drawings or objects.







c. Ask for clarification and further explanation as needed about the topics and texts under discussion.

SL.2.3 Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a topic or issue.

### **Instructional Resources/Tools**

Yes/No cards, dice, place value mats (optional), base ten blocks

### Anticipated Student Preconceptions/Misconceptions

- Students find the difference between digits in the same place even when decomposition is necessary. (ex.  $352 - 127 = 235$ )
- Decomposition or Composition affects two places not just one. ( $352$  leads to  $300 + 40 + 12$  not  $300 + 50 + 12$ )

### Instructional Model

7E Learning Cycle (Elicit, Engage, Explore, Explain, Elaborate, Evaluate, Extend)

### Instructional Tips/Strategies/Suggestions:

Students need to understand place value and use place value to find sums. This lesson provides an opportunity for all students to explore addition using base ten blocks; however, by the end of the unit students may choose a different strategy as their primary strategy.

### Pre-Assessment

Ask students to

- Decompose 352 at least 2 ways. (Possible responses: 3 hundreds + 5 tens + 2 ones; 2 hundreds + 15 tens + 2 ones; 3 hundreds + 4 tens + 12 ones)
- Explain how they know that 432 is larger than 423.
- Explain when 4 is less than 3. (i.e. Use place value – when 3 is in the tens place and 4 is in the ones place.)

Look for precise mathematical language, modeling and regularity in repeated reasoning (SMP.4, SMP.6 & SMP.8)

Teachers can use data collected in pre-assessment to differentiate instruction.



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What students need to know and are able to do coming into this lesson (including language needs):

- Ten tens equals one hundred
- Compose three-digit numbers using place value of hundreds, tens, ones
- Represent three-digit numbers in various ways (including representing numbers on a number line, manipulatives, sketches, and using place value)
- The value of a place to the left of a digit is ten times bigger (ex. In 100 is ten times as big as 10)
- Vocabulary: place value, digit, hundreds, tens, ones, compose and decompose



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**Elicit:**

Given a problem, students hold up yes/no cards to indicate whether or not decomposition is necessary to solve the problem. Discuss reasons (e.g. given the problem  $214 - 123 =$  ; students should hold up a “yes” card to indicate that 214 would need to be decomposed to 1 hundred + 11 tens + 4 ones in order to subtract 2 tens.

*Allow 5 minutes.*

**Engage:**

Teacher models game “Race to 0.”

- Use two dice, base ten blocks, and place value mats to roll a two digit number and create it on the mat with the blocks.
- Continue to roll two digit numbers and subtract the value, decomposing when necessary.
- Students have the choice to roll one or two dice.
- Write down on paper the number sentence for each round.
- Possible accommodation - give child each child a 1-200 chart and a counter to track their progress.

*Allow 10 – 15 minutes.*

**Explore:**

Pair students and have them have them play “Race to 0.”

*Possible questions to ask. Look for precise mathematical language, modeling and regularity of reasoning (SMP.4, SMP.6 & SMP.8):*

- *What do you need to roll to reach \_\_\_\_? How do you know?*
- *How many more do you need to be equal to your partner? Show me how you know. (In this game the player with the smallest number is winning.)*
- *How many fewer do you have than your partner? Are you sure? How do you know?*

*Allow 20 – 30 minutes.*





**Explain:**

Ask a pre-selected student team to share a problem from their game and to model how they solved it using base ten blocks and numbers. Ask students where the numbers written are shown with the base ten blocks. Discuss similarities and differences between the two ways of representing the problem with addition and subtraction focusing on where any decomposing occurred.

*During the exploration the teacher should circulate and identify various/unique problems that students solved while playing the game. Orchestrate a summarizing discussion by asking a pair of students to share their problem, solution and thinking. Encourage students to use precise mathematical language (SMP.6) to identify where decomposition occurred. If more than one pair of students shares, be thoughtful regarding the order in which students share to create a logical progression. The use of a document camera would be effective.*

*Allow 10 – 15 minutes.*

**Elaborate/Extend:**

Homework - Give students 2-4 problems requiring subtraction from values less than 300. Ask them to draw base ten blocks and model how to decompose to find differences (ex.  $194 - 87$ ;  $245 - 192$ ). Students may use NLVM or if available take home a bag of base ten blocks or paper cut-outs of base ten blocks.

**Evaluate:**

Ticket Out the Door: Give students 2 two-digit numbers in base ten blocks. Ask students to find the difference between the two values and to show all work.

*Allow 5 minutes.*





## Lesson 3: Library Game

**Brief Overview:** Students solve addition and subtraction problems based on books being returned to and checked out of the school library. The focus of this lesson will be identifying the required operation (addition or subtraction) and developing students' use of a number line to solve addition and subtraction problems. As you plan, consider the variability of learners in your class and make adaptations as necessary.

**Prior Knowledge Required:** Familiarity with a number line and problem situations that require addition or subtraction.

**Estimated Time:** 1 hour

**Resources for Lesson:** Number lines, (+) and (-) cards (one pair per student)



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**Lesson Name:** Library Game

**Content Area/Course:** Math Grade 2

**Unit:** To Compose or Decompose: That is the Question!

**Time (minutes):** 60

**Lesson #:** 3

By the end of this lesson students will know and be able to:

- Use various strategies including the use of a number line to solve addition and subtraction problems within 500.
- Choose the appropriate operation to solve a word problem.

**Essential Question addressed in this lesson:**

How does composition and decomposition of numbers help us understand the operations of addition and subtraction?

**Standard(s)/Unit Goal(s) to be addressed in this lesson :**

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.<sup>4</sup>

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

SMP.4 Model with mathematics

SMP.6 Attend to precision

SMP.7 Look for and make use of structure

SL.2.1. Participate in collaborative conversations with diverse partners about *grade 2 topics and texts* with peers and adults in small and larger groups

- a. Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).

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<sup>4</sup> Explanations may be supported by drawings or objects.





- b. Build on others' talk in conversations by linking their comments to the remarks of others.
- c. Ask for clarification and further explanation as needed about the topics and texts under discussion.

SL.2.3 Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a topic or issue.

Connections to 2.MD.6 can be made during this lesson

**Instructional Resources/Tools (list all materials needed for this lesson)**

Number lines to 300 – can be made using cut up and reconfigured hundreds charts, meter sticks put together, marked off sentence strips, painter's tape number line on wall or floor, tiles on floor, or receipt tape. Approximately 25 feet will be needed if every fifth number is marked and numbers are an inch apart.

Numeral cards, + and – cards (one pair per student) or each child can use a dry erase board.

Anticipated Student Preconceptions/Misconceptions

Students don't realize that required decomposition or composition affects two places (i.e.  $352 = 300 + 40 + 12$ , not  $300 + 50 + 12$ )

Instructional Model

7E Learning Cycle (Elicit, Engage, Explore, Explain, Elaborate, Evaluate, Extend)

Instructional Tips/Strategies/Suggestions:

Use of a meter stick to represent a number line is preferable because it allows students to count by tens more readily.

Pre-Assessment

Give students a problem(s) solved incorrectly due to finding the difference between digits in the same place even when decomposition is necessary (ex.  $252 - 127 = 135$ ). Discuss reasons. Use a number line to demonstrate why it doesn't work. Look for precise mathematical language, modeling and the use of structure in explanations (SMP.3, SMP.4, SMP.6 & SMP.7)

Alternatively, students can work with adding 1s, 10s and 100s at the following web site: <http://www.free-training-tutorial.com/place-value/simple-equations.html>

What students need to know and are able to do coming into this lesson (including language needs):



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- Ten tens equal one hundred.
- Compose/decompose three-digit numbers using place value of hundreds, tens, ones
- One ten is comprised of ten ones; one hundred is comprised of ten tens
- Vocabulary: place value, digit, hundreds, tens, ones, compose, decompose







**Elicit:**

Give students a problem solved incorrectly due to finding the difference between digits in the same place even when decomposition is necessary. (ex.  $252 - 127 = 135$ ) Discuss reasons. Use a number line to demonstrate why it works or does not work. Encourage students to construct viable arguments and critique the reasoning of others using precise mathematical language (SMP.3 & SMP.6).

*Allow 5 minutes.*

**Engage:**

Teacher provides contexts for problems to illustrate when to add and when to subtract.

**“In the library there are 125 books. Twenty-eight books get returned. Does the number of books in the library increase or decrease? Would we need to add or subtract?”**

- Teacher models using number line to find solution.
- Use various methods on the number line. For example, move the tens first then ones, then reverse and do ones first and then tens to find same sum.
- Demonstrate how to write in an equation the jumps made on the number line.
- Highlight that we found the difference by thinking about a missing addend problem and counting up to the sum.

**“Now in the library there are 153 books. 38 children took out library books. Would the number of books in the library increase or decrease? Would we need to add or subtract?”**

- Teacher models using number line to find solution.
- Again, model using various methods on the number line. For example, move the tens first then ones, then reverse and do ones first and then tens to find same difference; try bigger jumps by 20, 50, or 100.
- Demonstrate how to write an equation that represents the jumps made on the number line and what just occurred in the equation.



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- *Goal of this lesson is to build number sense flexibility that can be translated into student generated algorithms. (Students who are ready can begin to model what is happening in the problem with student generated algorithms.) See instructional tools section for ideas on making number lines to 300.*

*Allow 10 – 15 minutes.*

**Explore:**

Teachers will establish small learning groups. Each group will receive enough numeral cards to generate library scenarios like those modeled by Teacher.

Library Game

1. Group members find the number of books by choosing three numeral cards (to represent the number of books in the library).
2. Students take turns drawing two numeral cards and providing a scenario of returning or borrowing books from an original number of books in the library (the number created in step 1).
3. Students find the new number of books in the library by composing or decomposing their number. Students may use the number line to show the appropriate jumps required.
4. Students record each equation on a recording sheets; all work should be shown.

*Keep activity within 300 to facilitate using the number line strategy.*

*Have students work in partners or groups of 3. Ask students to convince their group member(s) whether the number of library books increases or decreases and whether the operation should be addition or subtraction. While circulating, listen for precise academic language (SMP.6), viable arguments (SMP.3), opportunities to challenge misconceptions, and assumptions among students.*

*Allow 20 – 30 minutes.*

**Explain:**

Teacher initiates a small group followed by a whole group discussion with one or more of the following questions.

- How does using the number line help us to find sums and differences? (Alternatively, ask one or two students to show how they solved a problem using the number line.)





- Which is better: number lines or base ten blocks? Why? (To add to the discussion, ask one student to show how they solved a problem using the number line and have a second student show the solution using base ten blocks.)
- What other tools could we use to help us solve these problems? (This is particularly helpful if you saw a student using a unique strategy that could be shared with the class.)

*Allow 10 – 15 minutes.*

**Elaborate/Extend:**

Problems such as: “The library has 153 books. Children \_\_\_\_\_ (took out/returned) \_\_\_\_\_ (number of books) books. How many books are in the library now?”

Students fill in the blanks, decide the proper operation and use a number line (as discussed in class) or base ten block drawings to show how they found their solution.

**Evaluate:**

The teacher gives a few scenarios and students will hold up a card with + or – to show which operation they would use to solve the problem.

*Allow 5 minutes.*





## Lesson 4: Train Game

**Brief Overview:** Students solve addition and subtraction problems based on passengers getting on and getting off of a train; the focus of this lesson will be identifying the required operation (addition or subtraction) and developing students' use of an open number line to solve addition and subtraction problems. As you plan, consider the variability of learners in your class and make adaptations as necessary.

**Prior Knowledge Required:** Familiarity with a number line and problem situations that require addition or subtraction.

**Estimated Time:** 1 hour

**Resources for Lesson:** Number lines, (+) and (-) cards (one pair per student)





**Lesson Name:** The Train Game

**Content Area/Course:** Math Grade 2

**Unit:** To Compose or Decompose: That is the Question!

**Time (minutes):** 60

**Lesson #:** 4

*By the end of this lesson students will know and be able to:*

- Use various strategies including use of a number line to solve addition and subtraction problems within 500.
- Choose the appropriate operation to solve a word problem.

**Essential Question addressed in this lesson:**

How does composition and decomposition of numbers help us understand the operations of addition and subtraction?

**Standard(s)/Unit Goal(s) to be addressed in this lesson (type each standard/goal exactly as written in the framework):**

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.<sup>5</sup>

SMP.4 Model with mathematics

SMP.6 Attend to precision

SMP.7 Look for and make use of structure

SL.2.1. Participate in collaborative conversations with diverse partners about *grade 2 topics and texts* with peers and adults in small and larger groups

<sup>5</sup> Explanations may be supported by drawings or objects.





- a. Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).
- b. Build on others' talk in conversations by linking their comments to the remarks of others.
- c. Ask for clarification and further explanation as needed about the topics and texts under discussion.

SL.2.3 Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a topic or issue.

Connections to 2.MD.6 can be made during this lesson

### **Instructional Resources/Tools (list all materials needed for this lesson)**

#### Anticipated Student Preconceptions/Misconceptions

Students don't realize that required decomposition or composition affects two places (i.e.  $352 = 300 + 40 + 12$ , not  $300 + 50 + 12$ )

#### Instructional Model

7E Learning Cycle (Elicit, Engage, Explore, Explain, Elaborate, Evaluate, Extend)

#### Instructional Tips/Strategies/Suggestions:

Encourage students to be efficient by using friendly numbers, e.g. 10 or multiples of 10, when counting on or counting back.

#### Pre-Assessment

Give students a real world problem(s) solved incorrectly due to finding the difference between digits in the same place even when decomposition is necessary.

For example, there are 252 people in the movie theater. 123 exit the theater building. The usher thinks there are 131 people left in the theater. Is he correct? Why or why not?





Discuss reasons. Use a number line to demonstrate why he is correct or incorrect. Look for precise mathematical language as students construct viable arguments (SMP.3 & SMP.6).

What students need to know and are able to do coming into this lesson (including language needs):

- Ten tens equal one hundred.
- Compose/decompose three-digit numbers using place value of hundreds, tens, ones
- One ten is comprised of ten ones; one hundred is comprised of ten tens
- Vocabulary: place value, digit, hundreds, tens, ones, compose, decompose





**Elicit:**

Give students a number decomposed incorrectly due to lack of understanding that decomposition or composition affects two places not just one. ( $552 = 500+40+12$  not  $500+50+12$ ). Use number line to prove the correct place value use is necessary.

*Allow 5 minutes.*

**Engage:**

The teacher provides context for problems to illustrate when to add and when to subtract, and models on an open number line.

**On the train there are 232 people. They stop in Boston and 45 people get off of the train. Would the number of people on the train increase or decrease? Would we need to add or subtract? How many people are on the train now?**

**On the train now there are 187 people. 38 people get on the train in Springfield. Would the number of people on the train increase or decrease? Would we need to add or subtract? How many people are on the train now?**

For each problem:

- The teacher models creating an open number line to find a solution. (A plain line on which the teacher marks key locations for this problem – and then jumps – to help students move to generating their own tools instead of using ones manufactured by the teacher.)
- Use jumps of ten or multiples of ten (e.g. 50, 100) when possible. (This would support SMP.7 making use of structure.)
- Write equations on paper.

*Goal of this lesson is to continue to build number sense flexibility that can be translated into student generated algorithms. For more information see [http://commoncoretools.files.wordpress.com/2011/04/ccss\\_progression\\_nbt\\_2011\\_04\\_073.pdf](http://commoncoretools.files.wordpress.com/2011/04/ccss_progression_nbt_2011_04_073.pdf) - Examples of different algorithms for addition and subtraction are described in the Numbers and Operations in Base Ten progression document. Grade 2 examples can be found on pages 8-10.*

*Allow 10 – 15 minutes.*



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### Explore:

Teachers will establish small learning groups. Each group will receive enough numeral cards to generate train scenarios similar to those modeled in the Engage section of the lesson, above.

### Train Game

1. Group members find the number of passengers by choosing three numeral cards (to represent the number of passengers on the train).
2. Students take turns drawing two numeral cards and providing a scenario of passengers getting on or off of the train.
3. Group members locate the starting number on the number line. (Again, for students who are ready, move away from a “teacher generated” number line to an open number line that the students mark appropriately to solve the problem.)
4. Group members demonstrate the number of people on the train by moving along their number line, using the dry erase marker to show the jumps.
5. Group members record equations on slates or recording sheets.
6. Group members share their responses, discuss their reasoning, and model their solutions with the number line. (SMP.3 & SMP.4)

*The goal of this lesson is to continue to build number sense flexibility that can be translated into student generated algorithms.*

- *The teacher should ask students to explain how they knew whether to add or subtract and why they chose the strategy they did.*
- *Students will create open number lines by marking key locations on an open number line and recording the distance of their “jumps.”*
- *Circulate to encourage students to draw open number lines to solve the problems. Be sure students are choosing appropriate benchmark numbers on the open number line, are making jumps of ten or multiples of ten when possible, and are using knowledge of place value to solve problems (e.g. breaking numbers into its place value parts to help determine reasonable jumps to make on the number line).*
- *Differentiation: use of teacher generated or student generated number lines, vary the size of numbers.*

*In group discussions listen for and prompt the use of precise academic language, viable arguments, opportunities to challenge misconceptions, and assumptions among students, attention to precision, and regularity in repeated reasoning (SMP.3 & SMP.6).*

*Allow 20 – 30 minutes.*



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**Explain:**

Ask students to discuss the following questions in small groups and then initiate large group discussion.

- What is difficult about creating your own number line to solve a problem?
- Do number lines for different problems look the same? Why or why not?
- Do number lines for the same problems look the same? Why or why not?
- Why is it important to be able to create and open number line?

*During the exploration the teacher should circulate and identify various/unique open number line strategies that students used to solve a problem. Orchestrate a summarizing discussion by asking students to share their solutions and thinking, being thoughtful regarding the order in which students share to create a logical progression. Focus on precise mathematical language, constructing viable arguments and critiquing the reasoning of others. (SMP.3, SMP.6 & SMP.7) Consider asking 2-3 students to share their open number line strategy for the same problem and discuss how each student's solution number line was similar and different. The use of a document camera would be effective.*

*Allow 10 – 15 minutes.*

**Elaborate/Extend:**

*Homework: Problems such as: The train has 245 passengers. \_\_\_\_\_ people (got on/got off) the train. How many passengers are on the train now? Students fill in the blanks, decide the proper operation and use a self-generated number line or base ten block drawings to show how they found their solutions.*

**Evaluate:**

Exit Ticket: Students use an open number line to solve a problem.

*Allow 5 minutes.*





## Lesson 5: Big Cats

**Brief Overview:** Students use a table containing the weights of big cats to solve addition and subtraction one- and two-step problems. As you plan, consider the variability of learners in your class and make adaptations as necessary.

**Prior Knowledge Required:** Ability to gather information from a table, to compare numbers, as well as familiarity with problem situations that require addition or subtraction.

**Estimated Time:** 1 hour

**Resources for Lesson:** *Big Cats Weight at the Zoo* table (displayed as a poster or projected); Student pages





**Lesson Name:** Big Cats

**Content Area/Course:** Math Grade 2

**Unit:** To Compose or Decompose: That is the Question!

**Time (minutes):** 60

**Lesson #:** 5

*By the end of this lesson students will know and be able to:*

*Solve addition and/or subtraction problems, including one- and two-step problems.*

**Essential Question addressed in this lesson:**

What different strategies can I use to demonstrate addition and subtraction accurately?

**Standard(s)/Unit Goal(s) to be addressed in this lesson (type each standard/goal exactly as written in the framework):**

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.<sup>6</sup>

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

SMP.6 Attend to precision

SMP.7 Look for and make use of structure

SMP.8 Look for and express regularity in repeated reasoning

SL.2.1. Participate in collaborative conversations with diverse partners about *grade 2 topics and texts* with peers and adults in small and larger group

a. Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and

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<sup>6</sup> Explanations may be supported by drawings or objects.





texts under discussion).

- b. Build on others' talk in conversations by linking their comments to the remarks of others.
- c. Ask for clarification and further explanation as needed about the topics and texts under discussion.

SL.2.3 Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a topic or issue.

### **Instructional Resources/Tools (list all materials needed for this lesson)**

Any manipulatives or materials typically used for addition/subtraction should be available, Big Cats Weight at the Zoo table (large enough for the class to see – display as a poster or project), Student pages

### Anticipated Student Preconceptions/Misconceptions

- Students find the difference between digits in the same place even when decomposition is necessary (i.e.  $352 - 127 = 235$ ).
- Students don't realize that required decomposition or composition affects two places (i.e.  $352 = 300 + 40 + 12$ , not  $300 + 50 + 12$ )

### Instructional Model

7E Learning Cycle (Elicit, Engage, Explore, Explain, Elaborate, Evaluate, Extend)

### Instructional Tips/Strategies/Suggestions:

The use of a document camera would be effective, particularly during the “Explain” section of the lesson.

### Pre-Assessment

352 people attended the circus on Saturday and 127 attended on Sunday.

- How many people attended the circus over the weekend?
- What is the difference in attendance for the two days?





What students need to know and are able to do coming into this lesson (including language needs):

- Compose three-digit numbers using place value of hundreds, tens, ones
- Represent three-digit numbers using manipulatives
- Read and write three-digit numbers
- One ten is comprised of ten ones; one hundred is comprised of ten tens
- A digit in the tens place is worth that many tens (8 in the tens place has a value of 80)
- Vocabulary: place value, digit, hundreds, tens, ones.



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**Elicit:**

Jacob the Jaguar has 321 spots. Chuck the Cheetah has 234 spots.

- What is the difference in the two cats' number of spots?
- How many spots do the two cats have together?

*Allow 5 minutes.*

**Engage:**

In a large group, teacher displays the Big Cats chart and the student sheet (use an overhead, document camera, projector, or poster maker). Ask the students to explain the following parts of the chart:

- Each cat's name
- Weight of Animal

Also, ask students to identify important rules (constraints) of the problem. Students may identify the following information:

- Largest possible combined weight/smallest possible combined weight
- The bridge can *hold up to* 700 lbs.

*The student sheet may be used in parts; some of the problems can be completed in class; one-step problems (#4-7) could be given for homework. Be sure to ask students explain what each assigned question is asking before asking them to solve the problem.*

*Allow 10 – 15 minutes.*

**Explore:**

Allow students to work in partners or small groups to solve the problems on the student sheet.

Initially, the teacher needs to focus on students who may struggle to get started. Next, the teacher should check in with each group, observing student strategies used, and asking questions to move student thinking/work forward.

- How do you know your answer is reasonable?
- What do you know, what do you need to know?
- How did you solve the problem? What strategies/operations did you use?



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- How else could you solve the problem?
- Explain your strategy for solving this problem?

*While circulating, the teacher may choose students with interesting strategies and/or common misconceptions to share summarizing the lesson. Focus on problems 3 and 8. This questioning supports SMP.3, SMP.6, SMP.7 and SMP.8.*

*Allow 20 – 30 minutes.*

**Explain:**

Ask students who used one of the following strategies to share their thinking with the class: concrete models or drawing, strategies based on place value, properties of operations, relationship between addition and subtraction. The teacher should ask students to explain how they knew whether to add or subtract and why they chose the strategy they did. This supports SMP.3.

*During the exploration the teacher should circulate and identify various/unique strategies that students used to solve problems 3 and 8 that are two step problems. Orchestrate a summarizing discussion by asking students to share their solutions and thinking (SMP.3 & SMP.6), being thoughtful regarding the order in which students share to create a logical progression. Show several ways to solve the same problem. The use of a document camera would be effective.*

*Allow 10 – 15 minutes.*

**Elaborate/Extend:**

Students can be asked to do one or more of problems 4-7 for homework.

**Evaluate:**

Exit Ticket: Who are the two heaviest cats at the zoo? How much do they weigh together? Please show your work.






*An alternative to the Ticket Out the Door would be to collect and evaluate the student class work completed during the Explore part of the lesson.*

*Allow 5 minutes.*





## BIG CATS' WEIGHT AT THE ZOO

<b>Animal</b>	<b>Photo</b>	<b>Weight of Animal</b>
Charlie the Cheetah		132 lbs
Jackie the Jaguar		211 lbs
Lenny the Lion		426 lbs
Burt the Bengal Tiger		488 lbs
Manuel the Mountain Lion		143 lbs





Use the table “Big Cats’ Weights at the Zoo” to answer the following questions. Show how you thought about each question.

<p>1. How much do Jackie the Jaguar and Lenny the Lion weigh together?</p> <div data-bbox="391 636 566 770">A photograph of a jaguar with a spotted coat, looking towards the right.</div> <div data-bbox="631 636 829 770">A photograph of a male lion with a large, golden-brown mane, looking towards the left.</div>	<p>2. How much do Charlie the Cheetah and Jackie the Jaguar weigh together?</p> <div data-bbox="1024 636 1201 770">A photograph of a cheetah with a spotted coat, looking towards the left.</div> <div data-bbox="1276 636 1453 770">A photograph of a jaguar with a spotted coat, looking towards the right.</div>
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3. What is the difference between the weights of the two sets of cats (from problems 1 & 2)? Show how you solved the problems.

4. How much more does Jackie the Jaguar weigh than Charlie the Cheetah?



5. What is the smallest possible combined weight of two cats at the zoo?





<p>6. What is the difference in weight of the cat at the zoo that weighs the least and the cat at the zoo that weighs the most?</p>	<p>7. The combined weight of two cats is about 640 pounds. Which two cats could it be?</p>
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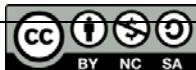


**Two animals need to cross a bridge at the zoo. The bridge can hold up to 700 lbs.**

8. Will Charlie the Cheetah and Lenny the Lion be able to cross together safely? How do you know?



9. Could another animal join the Charlie and Lenny? If so, which animal? Show how you know.





## Lesson 6: Skee-ball

**Brief Overview:** Students solve two-step problems based on Skee-ball games. As you plan, consider the variability of learners in your class and make adaptations as necessary.

**Prior Knowledge Required:** Familiarity with problem situations that require addition or subtraction.

**Estimated Time:** 1 hour

**Resources for Lesson:** Base ten blocks, number lines available for those who need/want to use them to solve their problems.



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**Lesson Name:** Skee-Ball

**Content Area/Course:** Math Grade 2

**Unit:** To Compose or Decompose: That is the Question!

**Time (minutes):** 60

**Lesson #:** 6

By the end of this lesson students will know and be able to:

Use various strategies to compose and decompose numbers to solve addition and subtraction problems within 500.

**Essential Question addressed in this lesson:**

What different strategies can I use to demonstrate addition and subtraction accurately?

**Standard(s)/Unit Goal(s) to be addressed in this lesson (type each standard/goal exactly as written in the framework):**

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.<sup>7</sup>

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

SMP.6 Attend to precision

SL.2.1. Participate in collaborative conversations with diverse partners about *grade 2 topics and texts* with peers and adults in small and larger groups.

- Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).
- Build on others' talk in conversations by linking their comments to the remarks of others.
- Ask for clarification and further explanation as needed about the topics and texts under discussion.

SL.2.3 Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a

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<sup>7</sup> Explanations may be supported by drawings or objects.





topic or issue.

**Instructional Resources/Tools (list all materials needed for this lesson)**

Model Skee-ball target and beanbags (optional)

Anticipated Student Preconceptions/Misconceptions

- Students find the difference between digits in the same place even when decomposition is necessary (i.e.  $352 - 127 = 235$ ).
- Students don't realize that required decomposition or composition affects two places (i.e.  $352 = 300 + 40 + 12$ , not  $300 + 50 + 12$ )

Instructional Model

7E Learning Cycle (Elicit, Engage, Explore, Explain, Elaborate, Evaluate, Extend)

Instructional Tips/Strategies/Suggestions:

The use of a document camera would be effective, particularly during the "Explain" section of the lesson.

Pre-Assessment

The zoo received 3 new big cats. Altogether, the three cats' weight is 569 pounds. How much could each cat weigh?

What students need to know and are able to do coming into this lesson (including language needs):

- Ten tens equals one hundred
- Compose three-digit numbers using place value understanding
- Represent three-digit numbers in various ways (e.g. on a number line and using manipulatives, sketches, and place value).
- The value of a place to the left of a digit is ten times bigger (e.g. 100 is ten times bigger than 10)
- Vocabulary: place value, digit, hundreds, tens, ones, compose and decompose







**Elicit:**

How do you explain that 432 is larger than 423? (Use related problems to activate place value knowledge.)

When is 4 less than 3? (Example: in the number 34.)

*Ask students to explain their thinking and defend their reasoning using a “think-pair-share” strategy (SMP.3 & SMP.6).*

*Allow 5 minutes.*

**Engage:**

Place a model Skee-ball target on the floor; use bean bags to model the game. Ask students to find scores for three throws and compare scores with a partner. The use of movement can aid in the engagement of this lesson.

An alternative to playing Skee-Ball on the floor is to allow students to play the game online at <http://www.arcadeboss.com/game-230-8-Skee-Ball.html>

*Be sure all students are familiar with the game of Skee-Ball either with floor game, pictures, or online game.*

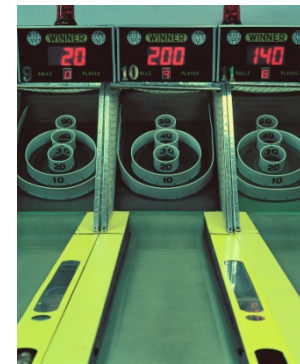
*Allow 10 – 15 minutes.*

**Explore:**

Students complete the following Skee-Ball problems.

Skee-Ball possible scores are 325, 275, 245, 120, and 100.

1. Tevan scored 670 in three throws. What possible score could he have earned for each throw?
2. Nu wants to score more than Tevan to win the game. Tevan scored 670 points. With her first throw Nu scored 120. What could Nu score with her next two throws to win? Is there a different way Nu could win? Explain.
3. Genesis scored 325, 245, and 120 with three throws. Giovanni scored 325, 275, and 100 with three throws. Who won the game and by how many points did the player win? Explain how you solved the problem.



points.

won





*During the explore part of the lesson, the teacher facilitates the students' work and plans for the Explain part of the lesson (see below). The teacher as a facilitator encourages the exploration of alternative algorithms.*

*Use both suggested and emerging questions. Focus on precise mathematical language and constructing viable arguments (SMP.3 & SMP.6).*

- *What do you need to find out?*
- *What do you know? What do you need to know?*
- *How do you know Giovanni/Genesis won by (number of points)?*
- *Did you find a different way that Nu could win?*
- *Is there a different way to compare Genesis and Giovanni's scores?*
- *Can you explain your problem solving strategy in your own words?*
- *Can you think of another way to solve the problem?*

*Allow 20 – 30 minutes.*

**Explain:**

The teacher should orchestrate and encourage discussion of various problem solving strategies and techniques. Discuss different strategies used by students to answer the questions in the explore section of the lesson. For number 3, students might eliminate the 325 (because they both scored 325) and compare the sum of the remaining scores; students may find the sum of the three scores and subtract to find difference; students may “balance” the two scores by finding the difference of each round and combining the differences. This supports SMP.3, SMP.6, SMP.7 and SMP.8.

*During the exploration the teacher should circulate and identify various/unique strategies that students used to solve problem 3. Orchestrate the a summarizing discussion by asking students to share their solutions and thinking, being thoughtful regarding the order in which students share to create a logical progression. The use of a document camera would be effective.*

*Allow 10 – 15 minutes.*

**Extend:**



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Use the Skee-Ball game (possible scores are 325, 275, 245, 120, 100) to write a story problem. Solve the problem and explain your solution. Students may use the problems solved in class as a model for their work.

*May be given as homework*

*Allow 10 – 15 minutes.*

**Evaluate:**

Ticket out the door:

Sean scored 100 and 120. His final score was 545. If Sean threw three balls, what score did he earn for the third ball? Show how you found your answer.

*An alternative to the Ticket out the Door would be to collect and evaluate the student class work completed during the Explore part of the lesson.*

*Allow 5 minutes.*



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## Lesson 7: Story Problems to 1,000

**Brief Overview:** Students create and then solve one- or two-step problems requiring addition and subtraction of numbers up to 1,000. As you plan, consider the variability of learners in your class and make adaptations as necessary.

**Prior Knowledge Required:** Students should be familiar with situations in which addition or subtraction is required and be able to solve an addition/subtraction problem using an appropriate strategy.

**Estimated Time:** 60 minutes

**Resources for Lesson:** Base ten blocks, number lines available for those who need/want to use them to solve their problems.



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**Lesson Name:** Create-a-Story

**Content Area/Course:** Math Grade 2

**Unit:** To Compose or Decompose: That is the Question!

**Time (minutes):** 60

**Lesson #:** 7

*By the end of this lesson students will know and be able to:*

*Apply mathematical knowledge to analyze and model mathematical relationships in a real-life context in order to make decisions, draw conclusions, and solve problems.*

**Essential Question addressed in this lesson:**

What different strategies can I use to demonstrate addition and subtraction accurately?

**Standard(s)/Unit Goal(s) to be addressed in this lesson (type each standard/goal exactly as written in the framework):**

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.<sup>8</sup>

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

SMP.4 Model with mathematics

---

<sup>8</sup> Explanations may be supported by drawings or objects.





## SMP.6 Attend to precision

SL.2.1. Participate in collaborative conversations with diverse partners about *grade 2 topics and texts* with peers and adults in small and larger groups.

- a. Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).
- b. Build on others' talk in conversations by linking their comments to the remarks of others.
- c. Ask for clarification and further explanation as needed about the topics and texts under discussion.

SL.2.3 Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a topic or issue.

## **Instructional Resources/Tools (list all materials needed for this lesson)**

Base ten blocks, number lines available for those who need/want to use them to solve their problems.

### Anticipated Student Preconceptions/Misconceptions

Confusion regarding digit placement versus digit value

### Instructional Model

7E Learning Cycle (Elicit, Engage, Explore, Explain, Elaborate, Evaluate, Extend)

### Instructional Tips/Strategies/Suggestions:

### Pre-Assessment



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Ask students if there is enough information in a problem in order solve it. Provide problems where the information missing is one of the addends or the subtrahend. Also provide a problem where the operation required (addition or subtraction) is not clearly identified. These problems are impossible to solve and are intended to model for students what they must include in the problems they write.

For example, there are 125 penguins in the zoo. Some slide into the water. Some are left on the rocks. How many slid into the water?

There are 35 pelicans at the zoo. There also 28 macaws. How many of these birds ate fish today?

What students need to know and are able to do coming into this lesson (including language needs):

- Ten tens equals one hundred
- Compose three-digit numbers using place value of hundreds, tens, ones
- Represent three-digit numbers using in various ways (including representing numbers on a number line, manipulatives, sketches, and using place value)
- The value of a place to the left of a digit is ten times bigger (ex. In 100 is ten times as big as 10)
- Vocabulary: place value, digit, value, operation, add, subtract, addition, subtraction, sum, difference, compose, decompose, composition and decomposition



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**Elicit:**

The teacher reads math literature relating to composing and decomposing to hook students. Examples of literature:

- *The 329<sup>th</sup> Friend*, Marjorie Weinman Sharmut
- *A Fair Bear Share*, Stuart Murphy
- *The Shark Swimathon*, Stuart Murphy

*Allow 5 minutes.*

**Engage:**

The teacher explains to students that they will be writing their own composing and decomposing number story problems. To model the process, the teacher and students write a story problem together.

- Explain to students that we will be looking at student attendance from the day before as one scenario of using composing and decomposing numbers in real life.
  - There are 453 students at the elementary school. If 34 students were marked absent at 8:15 in the morning, how many students were in school that day?
  - Next, explain to students that 8 students came in late and were marked tardy for the day. Ask how many students were in school at dismissal?
- Ask students to discuss in pairs or groups what steps they would need to do to solve the problem, without solving it. Guide students to discover, if they have not figured it out, that this word problem has two steps.
- Ask students in pairs or groups to solve the word problem, seeking an alternative method of finding a solution if time allows.
- Circulate and identify two pairs/groups to share their work. If possible identify a couple of different strategies/methods used to solve the problem to expose students to the understanding that there is more than one strategy that could be used.

*Allow 10 – 15 minutes.*



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**Explore:**  
Students (either individually or in pairs or small groups) are asked to write their own story problems that requires composing and decomposing numbers, with the challenge of writing two step problems. Students will write a word problem and display the math in their final product. While students are working, the teacher will circulate and conduct student interviews using the following possible questions while encouraging the use of content vocabulary introduced throughout the unit:

- Did you provide enough information in your word problem for other students to understand the scenario?
- What operation(s) is involved in finding a solution?
- Do you think your problem involves composing or decomposing numbers?
- Are there alternative ways of solving your word problem?
- What visual models and /or strategies can be used to solve this word problem?
- Can you add another step to your word problem that uses a different operation?

*During the explore part of the lesson, the teacher facilitates the students' work and plans for the Explain part of the lesson (see below).*

*Allow 20 – 30 minutes.*

**Explain:**  
The teacher should orchestrate and encourage discussion of various problems and problem solving strategies and techniques. Chosen group(s) will share their word problem with the class along with an explanation of their thought process in choosing the context for the addition and/or subtraction.

*During the exploration the teacher should circulate and identify various/unique problems that students wrote and/or various strategies students used to solve their problem. Orchestrate a summarizing discussion by asking students to share their problems and/or solutions and thinking, being thoughtful regarding the order in which students share to create a logical progression. Focus on precise mathematical language, modeling and constructing viable arguments and critiquing the reasoning of others (SMP.3, SMP.4 & SMP.6). The use of a document camera would be effective.*

*Allow 10 – 15 minutes.*

**Elaborate/Extend:**  
Write a two step word problem using composing and decomposing about your family, a current event, or sporting event. Solve your problem in at least one way.

**Evaluate:**  
There are 357 girls in our school and 365 boys in our school. How many students are there in all? How many more boys than girls are there in our school? Show or explain how you found your answers.

*Allow 5 minutes.*



# Curriculum Embedded Performance Assessments (CEPA)

## Grade 2 Unit – To Compose or Decompose: That is the Question!

This CEPA requires students to demonstrate their understanding of place value to add and subtract numbers within 1,000. Given a performance task, students may use their developing strategies (i.e. concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction) to solve each part of this task (2.NBT.7). This CEPA also requires students to explain how they know their strategies are correct (2.NBT.9). Finally, students are required to make sense of problems and persevere in solving them (SMP.1)

### Feed the Animals!

Congratulations! You have just gotten a job at the Franklin Park Zoo as Head Zoo Keeper. One of your responsibilities is to order food for the animals. Different animals require different amounts of food and it needs to be ordered on different schedules so it won't spoil. You need to figure out how much to order so that there will be enough, but not too much. Be sure to show how you solved the problem . Good Luck!

You have the following animals to feed and order forms that need to be filled in.

Penguins: The 80 penguins eat a total of 504 pounds of fish each week.

Week One:

- Currently there are 282 pounds of fish in the freezer.
- How many pounds of new fish should you order to feed the penguins for week one?



**Week One Order: \_\_\_\_\_ pounds of fish**

Week Two:

- After week one, there are 216 pounds of fish left in the freezer. The 80 penguins eat a total of 504 pounds of fish each week.
- How many pounds of new fish should you order to feed the penguins for week two?





**Week Two Order:** \_\_\_\_\_ pounds of fish

Lions: The 2 lions eat 145 pounds of meat every week.

Week One:

- There are currently 17 pounds of meat in the fridge.
- How much more meat should you order to feed the two lions for week one?

**Week One Order:** \_\_\_\_\_ lbs. of meat

Week Two:

- After week one, there are 21 pounds of meat left. The 2 lions eat 145 pounds of meat every week.
- How many more pounds of meat should you order to feed both lions for week two?

**Week Two Order:** \_\_\_\_\_ lbs. of meat

Giraffes: The 3 giraffes eat 545 pounds of hay every week.

Week One:

- There are 126 pounds of hay left in the giraffe barn.
- How much new hay should you order to feed the giraffes for the next week?

**Week One Order:** \_\_\_\_\_ lbs. of hay

Week Two:

- After week one, there are 87 pounds of hay left. The 3 giraffes eat 545 pounds of hay every week.
- How much new hay should you order to feed the Giraffes for the next week?

**Week Two Order:** \_\_\_\_\_ lbs. of hay

Teacher Note: As needed, numbers can be changed to meet the needs of all students.





Your work will be evaluated using the attached rubric.

Teacher Note: As needed, numbers can be changed to meet the needs of all students.



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## CEPA Rubric:

### Grade Two: To Compose or Decompose That is the Question

The Student...	Emerging	Meeting	Exceeding
Uses place value knowledge effectively	Does not use place value understanding or is inconsistent with its use.	Can flexibly employ place value strategies to compose and decompose numbers.	Employs a variety of strategies to configure and reconfigure numbers using place value knowledge with ease to fit the requirements of a problem.
Explains the strategies used	Attempts to explain solutions using one strategy <sup>1</sup> in all situations and is not always successful.	Flexibly describes the use of more than one strategy <sup>1</sup> in appropriate situations.	Flexibly describes a variety of strategies <sup>1</sup> and uses of manipulatives interchangeably in a variety of situations.
Composes and decomposes numbers accurately to solve addition and subtraction word problems	Does not recognize when composition or decomposition is necessary.	Knows when composition or decomposition is required and executes it with accuracy.	Knows when composition and decomposition is required and executes it with accuracy and in a variety of ways.
Makes sense of novel problems	Struggles to understand the context of problems and therefore the action required to solve them.	Understands the context of problems and is able to retell in their own words.	Understands the context of problems and is able to identify similar structure in other problems.

<sup>1</sup>Strategies include: using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction



## CEPA documents and other resources needed:

### FEED THE ANIMALS!

Congratulations! You have just gotten a job the Franklin Park Zoo as Head Zoo Keeper. One of your responsibilities is to order food for the animals. Different animals require different amounts of food and it needs to be ordered on different schedules so it won't spoil. You need to figure out how much to order so that there will be enough, but not too much. Be sure to demonstrate your strategies and show your work. Good Luck!

Penguins: The 80 penguins eat a total of 504 pounds of fish each week.

Week One:

- Currently there are 282 pounds of fish in the freezer.
- How many pounds of new fish should you order to feed the penguins for week one?



#### Boston Fish Company

Week One Order: \_\_\_\_\_ pounds of fish

Week Two:



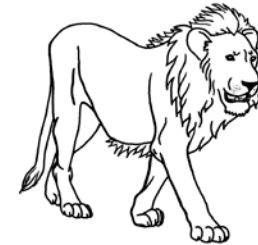
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- After week one, there are 216 pounds of fish left in the freezer. The 80 penguins eat a total of 504 pounds of fish each week.
- How many pounds of new fish should you order to feed the penguins for week two?

### Boston Fish Company

Week Two Order: \_\_\_\_\_ pounds of fish



Lions: The 2 lions eat 145 pounds of meat every week.

Week 1:

- There are currently 17 pounds of meat in the fridge.
- How many pounds of new meat should you order to feed the lions for week one?

### Dorchester Meat Market

Week One Order: \_\_\_\_\_ pounds of meat

Week 2:

- After week one, there are 21 pounds of meat left. The 2 lions eat 145 pounds of meat every week.
- How many pounds of new meat should you order to feed both lions for week two?

### Dorchester Meat Market





Week Two Order: \_\_\_\_\_ pounds of meat

Giraffes: The 3 giraffes eat 545 pounds of hay every week.

Week 1:

- There are 126 pounds of hay left in the giraffe barn.
- How much new hay should you order to feed the giraffes for week one?



### Belmont Farm

Week One Order: \_\_\_\_\_ pounds of hay

Week 2:

- After week one, there are 87 pounds of hay left. The 3 giraffes eat 545 pounds of hay every week.
- How much new hay should you order to feed the giraffes for the week two?

### Belmont Farm

Week Two Order: \_\_\_\_\_ pounds of hay

