Mathematics Instructional Cycle Guide

Place Value 2.NBT.7

Melissa Potamianos, 2014 Connecticut Dream Team teacher

CT CORE STANDARDS

This Instructional Cycle Guide relates to the following *Standards for Mathematical Content* in the *CT Core Standards for Mathematics*:

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

CCSS.Math.Content.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**

This Instructional Cycle Guide also relates to the following *Standards for Mathematical Practice* in the *CT Core Standards for Mathematics*:

MP1. Make sense of problems and persevere in solving them.

- Students select an appropriate strategy to solve 3-digit subtraction problems with and without regrouping.

MP4. Model with mathematics

- Students can solve 3-digit subtraction problems multiple ways and explain the connection between the problem and the strategy they chose.

WHAT IS INCLUDED IN THIS DOCUMENT?

- A Mathematical Checkpoint to elicit evidence of student understanding and identify student understandings and misunderstandings **(p. 2)**
- A student response guide with examples of student work to support the analysis and interpretation of student work on the Mathematical Checkpoint **(pp. 3-8)**
- A follow-up lesson plan designed to use the evidence from the student work and address the student understandings and misunderstandings revealed **(pp. 9-13)**
- Supporting lesson materials **(pp. 14-17)**
- Precursory research and review of standard **2.NBT.7** and assessment items that illustrate the standard **(pp. 18-20)**
- Addendum: full page copies of examples of student work presented in student response guide **(pp. 21-23)**

HOW TO USE THIS DOCUMENT

1) Before the lesson, administer the **Three-Digit Subtraction with Regrouping *Mathematical Checkpoint*** individually to students to elicit evidence of student understanding.
2) Analyze and interpret the student work using the ***Student Response Guide***
3) Use the next steps or ***follow-up lesson plan*** to support planning and implementation of instruction to address student understandings and misunderstandings revealed by the Mathematical Checkpoint
4) Make instructional decisions based on the checks for understanding embedded in the follow-up lesson plan

MATERIALS SUGGESTED:

- Chart paper
- Markers
- Blank paper or student dry erase boards
- Base-ten blocks (interlocking blocks, if available)

MATERIALS PROVIDED:

- Student copy of “Checking for Understanding” p. 14
- Student copy of Misconception Problem: “Thinking About Our Strategies” p.15
- Student copy of “Exit Slip” p. 16
- Student copy of Reflection p. 17

TIME NEEDED

Three Digit Subtraction with Regrouping Checkpoint administration: **15-20 minutes**
Follow-Up Lesson Plan: 1-2 instructional blocks

Timings are only approximate. Exact timings will depend on the length of the instructional block and needs of the students in the class.

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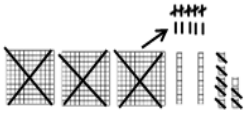
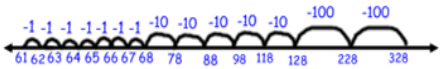
Three-Digit Subtraction with Regrouping

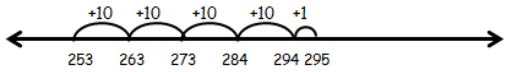
<table>
<tr><th colspan="3">Step 1: Elicit evidence of student understanding</th></tr>
<tr><th colspan="3">Mathematical Checkpoint</th></tr>
<tr><th>Question(s)</th><th colspan="2">Purpose</th></tr>
<tr><td rowspan="2">Bob, Mike, Pat and Sally each solved the following equation: 328-257= ? .
Decide which students solved the problem correctly. Explain your thinking.

Bob:
 
?=71
Correct way to solve 328-257= ? Yes No
Explain:

Mike:
 
?=61
Correct way to solve 328-257= ? Yes No
Explain:

Sally:
328 257
300+20+8 200+50+7
300-200=100 100+30+1=131
20-50=30
8-7=1 ?=131
Correct way to solve 328-257= ? Yes No
Explain:

Pat:
257
200+50+7
328-200=128
128-50=78
78-7=71 ?=71
Correct way to solve 328-257= ? Yes No
Explain:

Mike was asked to solve the following equation: 295-253=? Mike chose to use addition to solve this problem rather than subtraction. He chose to use an open number line. Why did Mike choose to use addition rather than subtraction?
  </td><td>CT Core Standard:</td><td>CCSS.MATH.CONTENT.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.</td></tr>
<tr><td>Target question addressed by this checkpoint:</td><td>• Can students subtract within 1,000 using concrete models, drawings, and strategies based on place value?
• Can students explain how a problem was solved?
• Do students understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones?
• Do students understand that they need to decompose tens and hundreds in order to subtract/regroup?
• Can students determine when addition would be a more efficient way of finding the difference?</td></tr>
</table>

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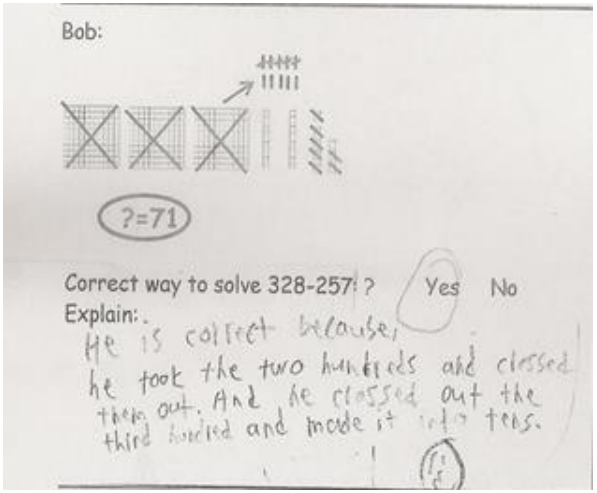
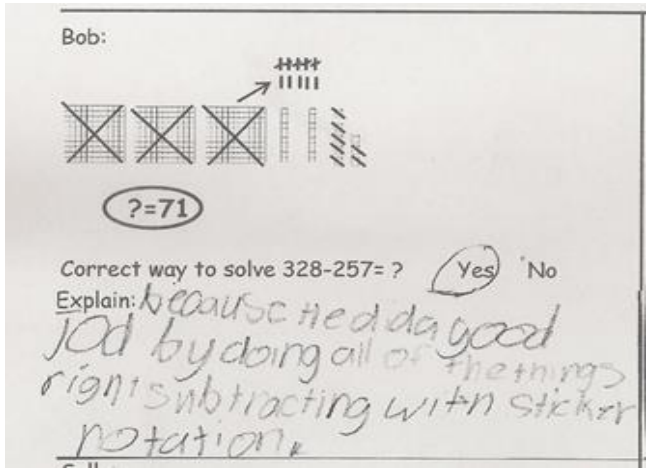
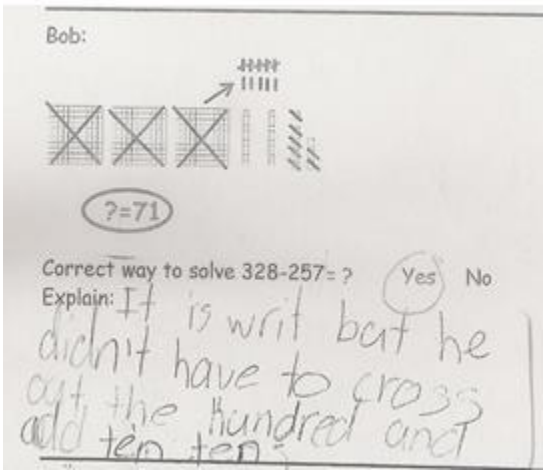
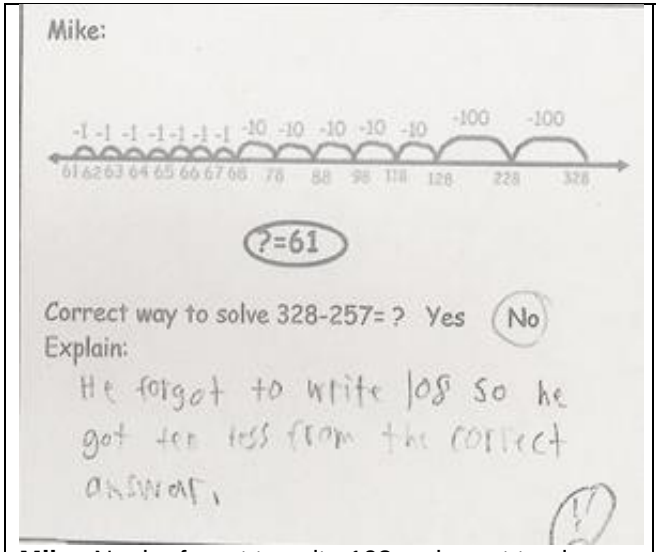
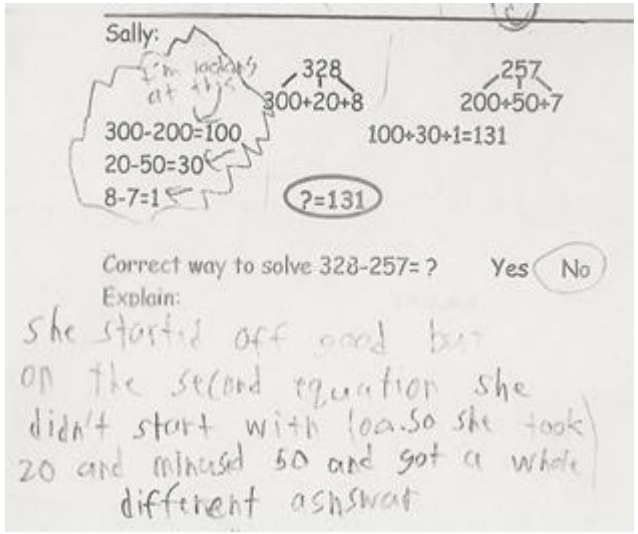
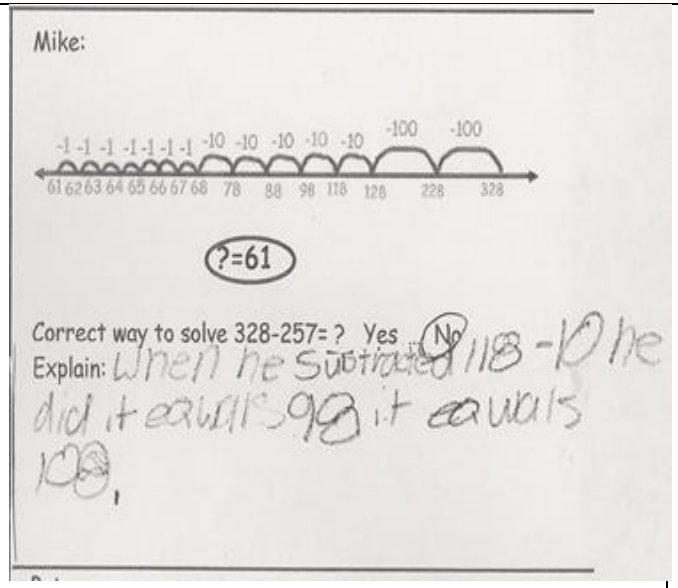
Step 2: Analyze and Interpret Student Work		
Student Response Guide		
Got It	**Developing**	**Getting Started**
Bob, Mike, Pat and Sally each solved the following equation: 328-257= ? Decide which students solved the problem correctly. Explain your thinking.	Bob, Mike, Pat and Sally each solved the following equation: 328-257= ? Decide which students solved the problem correctly. Explain your thinking.	Bob, Mike, Pat and Sally each solved the following equation: 328-257= ? Decide which students solved the problem correctly. Explain your thinking.
		
Bob: Yes, he is correct because he took the two hundreds and crossed them out. And he crossed out the third hundred and made it into tens.	**Bob**: Yes, because he did a good job by doing all of the things right subtracting with sticker notation (base ten materials).	**Bob**: Yes, it is right, but he didn't have to cross out the hundred and ten tens.



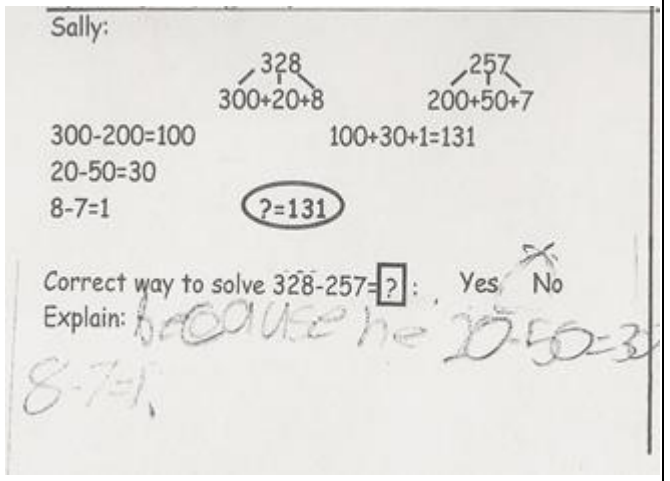
Mike: No, he forgot to write 108 so he got ten less from the correct answer.



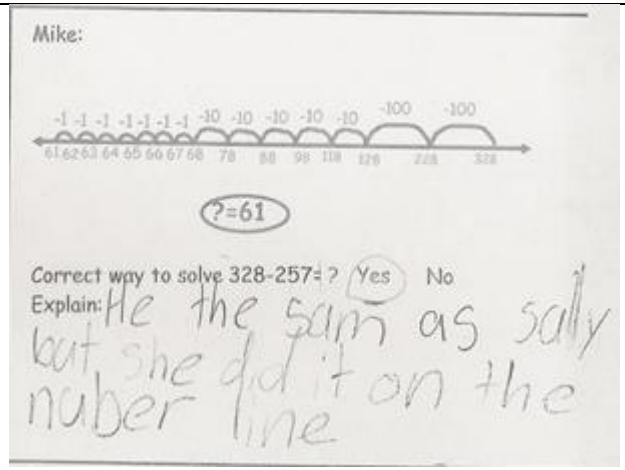
Sally: No, she started off good but on the second equation. She didn't start with 100 So, she took 20 and "minused" 50 and got a whole different answer.



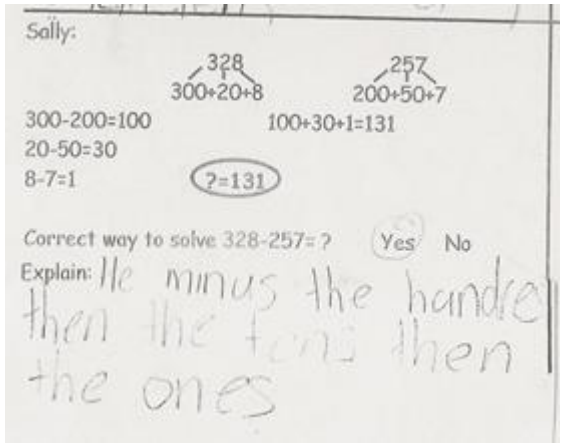
Mike: No, when he subtracted 118-10, he did it equals 98. It equals 108.



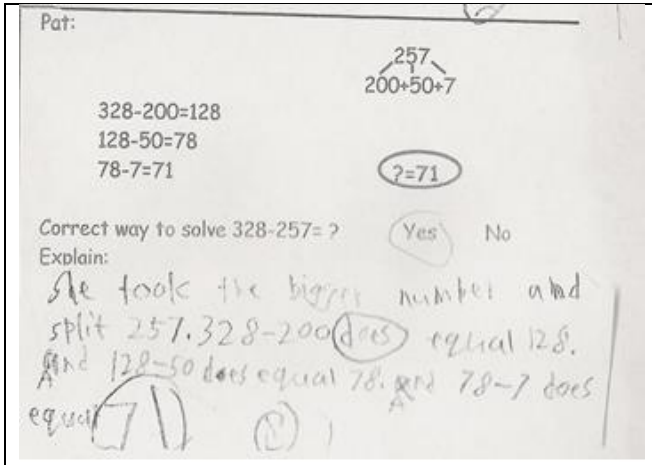
Sally: No, because he 20-50=30, 8-7=1.



Mike: Yes, he is the same as Sally, but she did it on the number line.

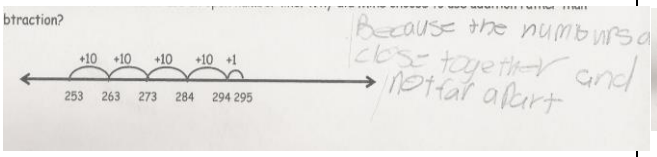


Sally: Yes, he minus the hundreds, then the tens, then the ones.

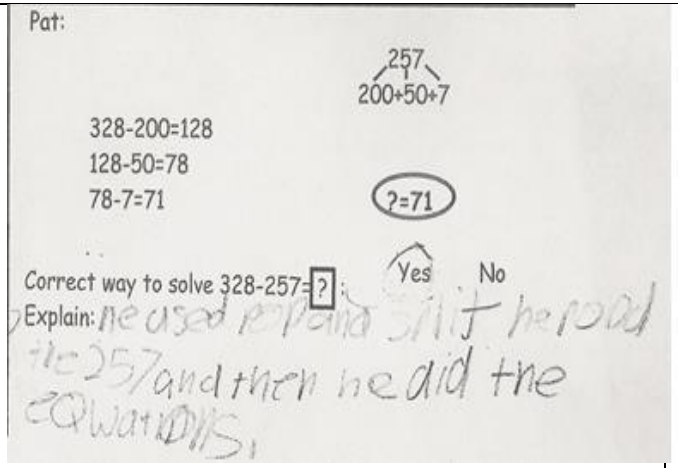


Pat: Yes, she took the bigger number and split 257. 328-200 does equal 128. And, 128-50 does equal 78. And, 78-7 does equal 71.

Mike was asked to solve the following equation: 295 - 253= ? Mike chose to use addition to solve his problem rather than subtraction. He chose to use the open number line. Why did Mike choose to use addition rather than subtraction?

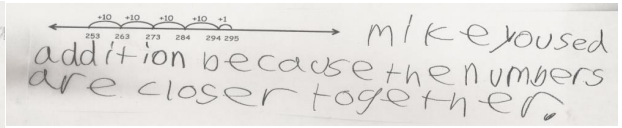


Mike 2: Because the numbers are close together and not far apart



Pat: Yes, he used “pop and split.” He “popped” the 257 and then he did the equations.

Mike was asked to solve the following equation: 295 - 253= ? Mike chose to use addition to solve his problem rather than subtraction. He chose to use the open number line. Why did Mike choose to use addition rather than subtraction?



Mike 2: Mike used addition because the numbers are close together.

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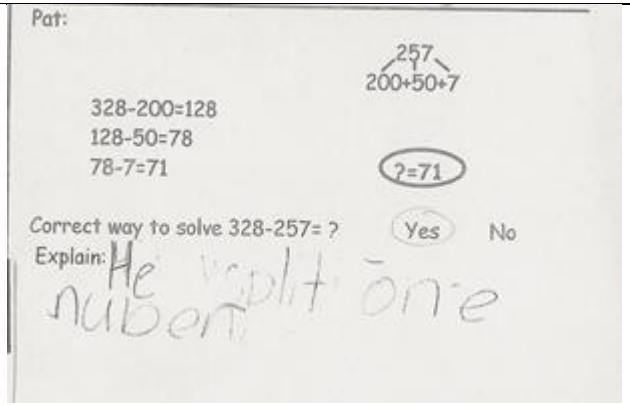
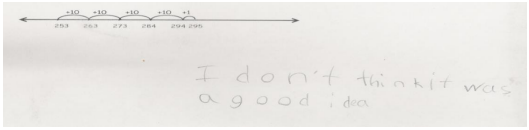


Pat: Yes, he split one number.

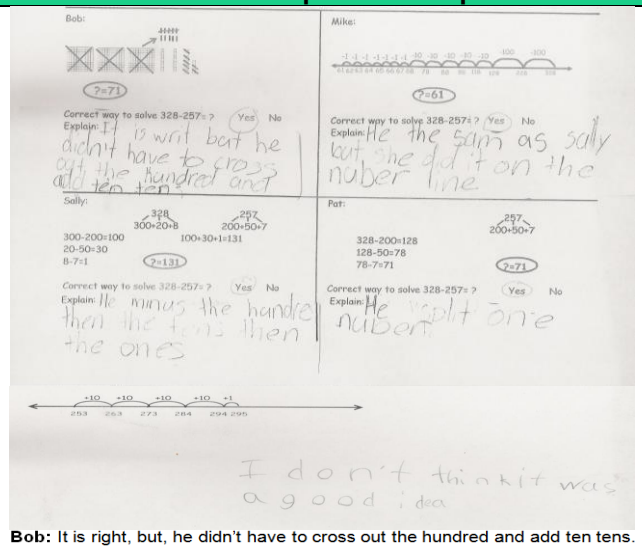
Mike was asked to solve the following equation: 295 - 253= ? Mike chose to use addition to solve his problem rather than subtraction. He chose to use the open number line. Why did Mike choose to use addition rather than subtraction?



Mike 2: I don’t think it was a good idea.

Getting Started

Student Response Example



Bob: It is right, but, he didn't have to cross out the hundred and add ten tens.

Mike: He the same as Sally, but she did it on the open number line.

Sally: He minus the hundreds, the tens, then the ones.

Pat: He split the number.

Mike 2: I don't think it was a good idea.

Indicators

- Student is not able to apply their understanding of subtracting two-digit numbers to three-digit numbers.
- Student has not yet developed a clear understanding of equivalence (1 flat = ten rods or 100 =10 tens).
- Student may not understand how to decompose numbers into ones, tens, or hundreds (splitting by using expanded notation).
- Student lacks understanding of when to regroup/decompose numbers in order to subtract.
- Student may have difficulty counting back by hundreds, tens or ones starting with a three-digit number.
- Student has difficulty counting back by tens across century (hundreds) marks.
- Student has difficulty counting back by ones across decade (tens) marks.
- Student tries to subtract a larger number from a smaller number (i.e. 20-50). Student does not understand commutative property.
- Student may not understand the relationship between addition and subtraction and that sometimes it is more efficient to "add on" to find the difference.

In the Moment Questions/Prompts

Q: Show/make twenty using unifix cubes or rods. Can you subtract fifty from that? Why or why not?

Q: Show 257 using base ten blocks: What would be the most efficient way to show what you made using an equation?

Q: How many groups of tens are in 23? How many groups of ten are in 230? How many groups of ten in 235?

Q: Let's break a flat apart. What would we have? Would we still have 100? Why or why not?

Q: What do you notice about the groups of ten as we count back from 128 to 28? (12 tens, 11 tens, 10 tens, 9 tens, etc.). How can this pattern help you when subtracting on the open number line?

Closing the Loop (Interventions/Extensions)

Use interlocking base ten blocks to model equivalency (1 flat = 10 rods).

Use interlocking base ten blocks to model subtraction with regrouping.

http://learnzillion.com/lessons/3692-add-and-subtract-100-from-a-number-using-place-value

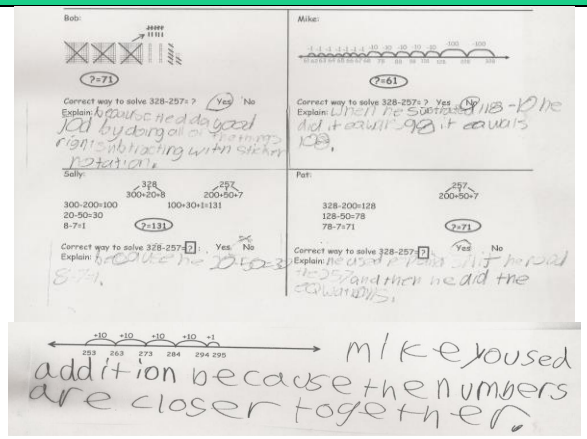
http://learnzillion.com/lessons/3696-subtract-multiples-of-100-to-a-number-using-a-number-line

http://learnzillion.com/lessons/2765-subtract-within-1000-using-base-10-block

http://learnzillion.com/lessons/4426-subtract-threedigit-numbers-with-base-ten-blocks
http://learnzillion.com/lessons/3694-subtract-using-expanded-notation

Developing

Student Response Example



Bob: Because he did a good job by doing all of the things right subtracting with sticker notation.

Mike: When he subtracted 118-10 he did it equals 98. It equals 108.

Sally: Because he 20-50=30, 8-7=1

Pat: He used pop and split. He popped the 257 and then did the equations.

Mike 2: Mike used addition because the numbers are closer together.

Indicators

- Student may still lack an understanding of how to regroup/decompose base ten blocks in order to subtract.
- Student can count back by hundreds, tens, and ones starting with a three-digit number.
- Student can count back by tens across century (hundreds) marks.
- Student can count back by ones across decade (tens) marks.
- Student can decompose a number by using “splitting” or expanded notation to subtract.
- Student understands commutative property. (i.e. 20-50 ≠ 30)
- Student may not understand when to add on or to remove the difference when solving for a subtraction problem.

In the Moment Questions/Prompts

Q: Explain why you think Bob did a good job using his strategies? What strategies did he use?

Q: Tell me why you think Bob exchanged a 100 for 10 tens?

Q. What might have happened if Bob had not crossed out his hundred when he regrouped?

Q. What happens when you try to subtract 50 from 20?

Q: Let’s look at Sally’s work. Does “splitting” both numbers and subtracting the hundreds, tens, and ones always work? Why or why not?

Q: Why do you think Pat “popped” 328 into her head (kept 328 whole) and split the 257 instead of “popping” the 257 and splitting/decomposing the 328?

Q: Is it more efficient to count up when the numbers are closer together?

Closing the Loop (Interventions/Extensions)

http://learnzillion.com/lessons/2610-subtract-within-1000-by-decomposing

http://learnzillion.com/lessons/3192-subtract-threedigit-numbers-by-decomposing

http://learnzillion.com/lessons/2722-subtract-within-1000-using-an-open-number-line

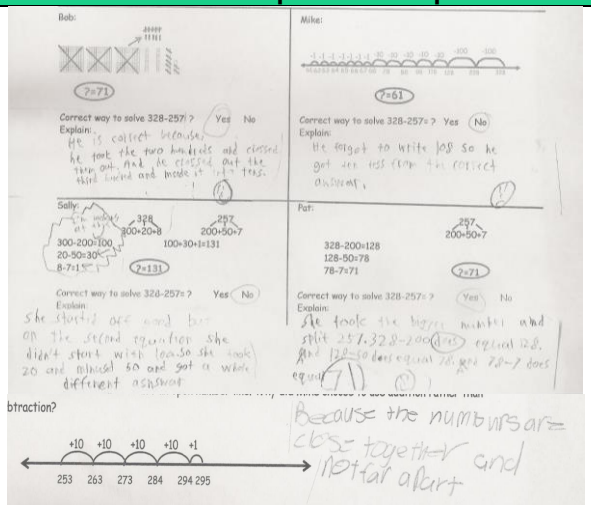
http://learnzillion.com/lessons/2978-subtract-threedigit-numbers-with-a-number-line

http://learnzillion.com/lessons/3002-subtract-threedigit-numbers-using-expanded-form

http://learnzillion.com/lessons/2645-subtract-by-using-addition

Got it

Student Response Example



Bob: He is correct because he took the two hundreds and crossed them out. And he crossed out the third hundred and made it into tens.

Mike: He forgot to write 108 so he got ten less from the correct answer.

Sally: She started off good but on the second equation she didn't start with 100. She took away 20 and minused 50 and got a whole different answer.

Pat: She took bigger number and split 257. 328 does equal 128. And 128-50 does equal 78. 78-7 does equal 71.

Mike 2: Because the numbers are close together and not far apart.

Indicators

- Student can efficiently count backwards by hundreds, tens, and ones.
- Student can decompose a number by using splitting (expanded notation) to subtract.
- Student understands why it is more efficient to keep one number whole (minuend) and decompose the second number (subtrahend).
- Student knows when it is more efficient to subtract either by adding on or removing the difference.

In the Moment Questions/Prompts

Q: How do you know when to "split" or decompose both numbers when subtracting and when to "keep one number whole and split/decompose the other?"

Q: Would Pat have gotten the same solution if she subtracted the ones first, then the tens, then the hundreds? Which way do you think may or may not be more efficient?

Q: How are Mike's and Pat's strategies for solving 328-257 similar? How are they different?

Closing the Loop (Interventions/Extensions)

Extend the student's understanding by modeling decomposing a subtrahend to get to a landmark/benchmark number. (68-15=? decompose 15 into 8 + 7, subtract the 8 to get to the landmark/benchmark number of 60)

http://learnzillion.com/lessons/3120-explain-subtraction-by-using-knowledge-of-addition

http://learnzillion.com/lessons/3054-choose-appropriate-strategies-to-explain-why-addition-or-subtraction-work-to-solve-word-problems

Steps 3 and 4: Act on Evidence from Student Work and Adjust Instruction	
Lesson Objective:	Use place value understanding to solve three-digit subtraction problems with regrouping.
Content Standard(s):	2. NBT B. 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**
Targeted Practice Standard :	MP1. Make sense of problems and persevere in solving them. • Students select an appropriate strategy to solve 3-digit subtraction problems with regrouping. MP4. Model with mathematics • Students can solve 3-digit subtraction problems multiple ways and explain the connection between the problem and the strategy they chose.

Mathematical Goals	Success Criteria
• Solve a three-digit subtraction problem by keeping the bigger number whole and splitting/decomposing the smaller number into parts (*I can subtract three-digit numbers by keeping the bigger number whole and subtracting the parts of the smaller number.)* • Know when and how to regroup tens (or hundreds) to subtract (*I can know when to regroup to subtract.)*	• Use visual or concrete base ten models to subtract three-digit numbers. • Decompose the subtrahend into hundreds, tens, and ones. • Regrouping the tens (or hundreds) when necessary in order to subtract. • Pair equations with visual models to show what is happening in the problem.

Launch (Probe and Build Background Knowledge)

Purpose: Engage students in skip counting to probe and support the development of the understanding of place value, equivalence, and the patterns that occur when counting back (subtracting).

Have students sit in a community circle. Select one student to choose a three-digit number between 960 and 970. Record that number on the top of a piece of chart paper. Beginning with that number, go around the circle having each child subtract a hundred from the previous number until they reach a two-digit number. (Teacher may select a second student to choose a starting number to ensure everyone has a turn.) Record the student answers on the chart paper. Discuss the patterns students notice. Focus on the number of hundreds decreasing by one each time. (967, 867, 767, 667…)

Select one student to choose a three-digit number between 340 and 350. Record that number on the top of a piece of chart paper. Beginning with that number, go around the circle having each child subtract ten from the previous number. Record the student answers on the chart paper. Discuss the patterns students notice. Focus on the number of tens decreasing by one each time. (341, 331, 321, 301, 291, 281, 280…)

Questions and prompts to guide the discussion could include:

- What patterns did you notice as we counted back?
- Will these patterns always occur?
- Why do you think these patterns are occurring?
- How do you think these patterns will help us when we are subtracting three-digit numbers?

Instructional Task

Purpose: Students solve three-digit subtraction problems with regrouping using visual place value models and equations.

Engage (Setting Up the Task)

Display the following problem:

- Katie had a collection of 237 marbles. She decided to give Ned 154 marbles to start a collection. How many marbles did Katie have left in her collection?

Use the following questions/prompts to facilitate the discussion:

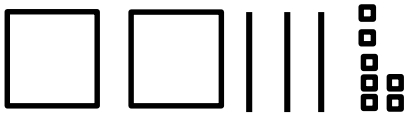
- *Picture or visualize the story problem in your mind. What **action** do you see happening? (Katie is taking away from her collection.)*
- *Will Katie have more than 237 marbles or less than 237 once she gives some to Ned?*
- *How would we write an equation to match this word problem? Think about what happened in the beginning (B), what happened in the middle (M), and what happened in the end (E). Write your equation on your response sheet.*

$$\underset{B}{237} \quad \underset{M}{-154} \quad \underset{E}{=?}$$

(The equation represents numerically a "summary" of the story problem being presented.)

Select a student to share his or her response. Ask students to then draw 237 on their response sheets using base ten block notation to represent Katie's marbles. Select a student volunteer to draw his/her answer on the board.

- *How can I show the 237 marbles Katie had in the beginning using base-ten blocks?*



- *We know that Katie gave away 154 marbles. How many hundreds, tens, and ones did she give away?*

Display the task directions below and instruct students to work with their partners to solve the problem. Prompt students with the following questions:

- *What do you and your partner already know about subtracting two digit numbers?*
- *What have you and your partner learned about subtraction with three digit numbers?*
- *How could you use what you have learned to help you solve this problem?*

Some students may need access to the actual base-ten block manipulatives to work through this problem. (Interlocking base-ten blocks, if they are available may work best.)

Explore (Solving the Task)

Working with your partner, find out how many marbles Katie has left after giving 154 of her marbles to Ned.
Use base ten block notation and equations to show your thinking.
Be prepared to share your thinking with the class.

Extension: For students, who are ready to use another visual representation, ask them to solve the problem using an open number line. Ask them to explain how their thinking on the open number line is similar or different from using base-ten block notation.

Circulate amongst the students and gather information about their thinking using some of the possible questions and prompts below:

Clarifying Questions/Prompts:	Advancing Questions/Prompts:
• How could you split 154? • What part of 154 will you take away first? Why? • How many tens are in a hundred? • How could splitting a hundred into ten tens help you solve this problem? • Does your equation match your base ten block notation? • Can you subtract 50 from 30? Why or why not? • What did you do when you were working with two-digit numbers and you did not have enough ones?	• How would you thinking change if you were to subtract 119 marbles? • How would your thinking change if Katie only had 207 marbles? • How could you tell by looking at your equation when you would and when you would not have to regroup?

Select three to four student pairs to copy their responses onto chart paper.

Elaborate (Discuss Task and Related Mathematical Concepts)

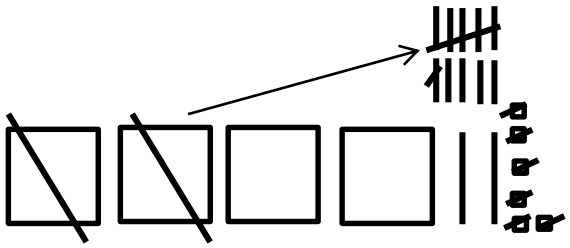
Post the chart papers on the board. Choose different students to explain the thinking/strategies each pair of students used to solve the problem. Ask the students to notice similarities and differences between the students' responses.

- *What strategies did these partners use?*
- *How is this response alike or different from this one?*
- *What steps or strategies were similar to or different from when we subtracted two-digit numbers?*

Checking for Understanding

Purpose: Instruct students to solve independently the following equation to gather evidence of student understanding of three-digit subtraction with regrouping.

Katie solved for the following equation: 426 -163 = ? Is her answer correct? Why or why not?



426-163=?
426-100= 326
326-60=66
66-6=**60**
60 was Katie's answer.

163=100+60+3

Common Misunderstanding

Purpose: Use the opposing views prompt to engage students in discussion as to why one strategy is more reliable or efficient than the other and to address the common misunderstanding of the commutative property.

Display the prompt below. Instruct students to explain their thinking using pictures, equations, and/or words.

Katie and Ned are solving for the equation: 367-295=? Katie wants to subtract the hundreds, then the tens, then the ones. She used a similar strategy when she was adding three-digit numbers. Ned does not think this is a good strategy to use for subtraction. He is going to keep one number whole and split/decompose the other number into hundreds, tens, and ones and then subtract. How can Ned convince Katie that his way may be more reliable and efficient or that it might work better?

Checking for Understanding

Purpose: Pose the following question as an exit slip to gather information about students' understanding of three- digit subtraction with regrouping.

Solve the following equation:

536-218=?

Closure

Purpose: Students summarize their learning.

Students use "think, pair, and share" to tell what they have learned about subtracting three-digit numbers. Responses are posted on chart paper.

Purpose: Students will reflect upon their own understanding of subtracting three-digit numbers with regrouping.

I can subtract a three-digit number using base ten blocks. ☺ ☹

I can write equations to show my thinking. ☺ ☹

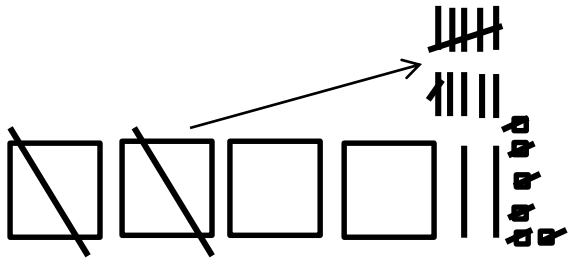
I can teach someone else how to subtract three-digit numbers. ☺ ☹

I could use more practice with: _____.

Extension Task
Purpose: Students will learn when it is more efficient to add on to find the difference rather than subtract the subtrahend. Solve the following equations using an open number line: 89-76=? 89-6=? *Did anyone add on to solve either equation? Why did you add one? Did you find the same difference? When would it be more efficient to add on rather than remove to find the difference?* Look at these two equations. 189-176=? 189-16=? *Could you use adding on to find the difference for either one? Why or why not?*

Checking for Understanding

Katie solved for the following equation: 426 -163 = ? Is her answer correct? Why or why not?



426-163=?
426-100= 326
326-60=66
66-6=**60**
60 was Katie's answer.

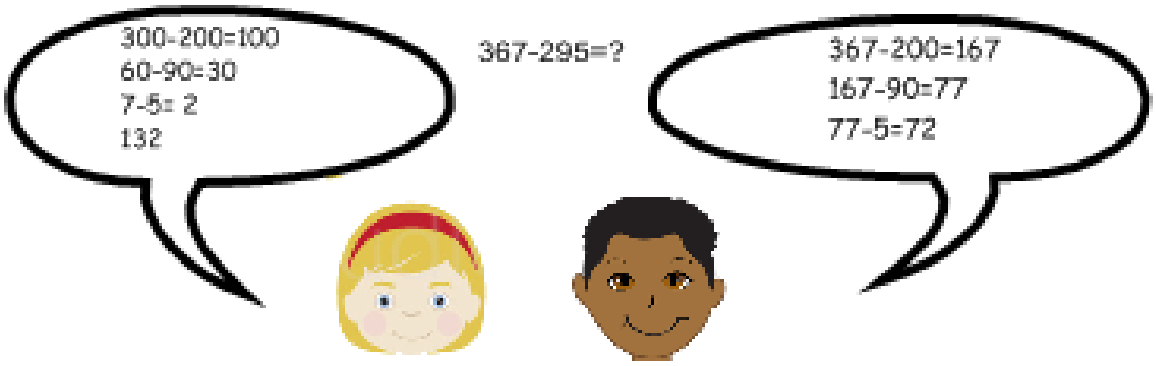
163=100+60+3

Thinking About Our Strategies

Katie and Ned are solving for the equation: **367 - 295 = ?**

Katie wants to subtract the hundreds, then the tens, then the ones. She used a similar strategy when she was adding three-digit numbers. Ned does not think this is a good strategy to use for subtraction. He is going to keep one number whole and split/decompose the other number into hundreds, tens, and ones and then subtract.

How can Ned convince Katie that his way may be more reliable and efficient, or that it might work better?



LearnZillion

Exit Slip

Solve the following equation:

536 – 218= ?

LearnZillion

Thinking About My Learning

I can subtract a three-digit number using base ten blocks. 

I can write equations to show my thinking. 

I can teach someone else how to subtract three-digit numbers. 

I could use more practice with:

<table>
<tr><th colspan="3">Research and review of standard</th></tr>
<tr><th>Content Standard(s):</th><th colspan="2">Standard(s) for Mathematical Practice:</th></tr>
<tr><td>Use place value understanding and properties of operations to add and subtract
<u>2.NBT.7</u>
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</td><td colspan="2"><u>MP1</u>. Make sense of problems and persevere in solving them.
<u>MP4</u>. Model with mathematics</td></tr>
<tr><th>Smarter Balanced Claim</th><th colspan="2">Smarter Balanced Item</th></tr>
<tr><td>None</td><td colspan="2">Illustrative Mathematics: “How Many Days to Summer Vacation?”
http://www.illustrativemathematics.org/illustrations/1063</td></tr>
<tr><th>CPR Pre-Requisites</th><td colspan="2">Conceptual Understanding and Knowledge
Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones.
Understand 100 can be thought of as a bundle of ten tens — called a "hundred."
Understand that ten ones can be “bundled” together to make one set of ten; a ten can also be represented as 10 single units.
Understand the numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones)
Procedural Skills
Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.
Add up to four two-digit numbers using strategies based on place value and properties of operations.
Representational
Use concrete and visual models to solve problems.
Social knowledge
Place value names and location of ones, tens, and hundreds.
“Place” refers to the location of a digit within a number.
“Value” means how much a digit represent.
“Open Number Line”
“Base-Ten Blocks”</td></tr>
</table>

Standards Progression		
Grade(s) below	**Target grade**	**Grade(s) above**
Understand place value **1.NBT.2**: Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases: a. 10 can be thought of as a bundle of ten ones — called a “ten.” b. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones. c. The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones) **Use place value understanding and properties of operations to add and subtract.** **1.NBT.4:** Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten. **1.NBT.5:** Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used. **1.NBT.6:** Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.	**Understand place value**. **NBT.1** Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases: **2.NBT.1.a** 100 can be thought of as a bundle of ten tens — called a "hundred." **2.NBT.1.b** The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones). **Use place value understanding and properties of operations to add and subtract.** **2.NBT.5** Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. **2.NBT.6** Add up to four two-digit numbers using strategies based on place value and properties of operations.	**Use place value understanding and properties of operations to perform multi-digit arithmetic** **3.NBT.2**: Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

Common Misconceptions/Roadblocks

What characteristics of this problem may confuse students?

- The fact that the problem requires students to generalize the understanding of place value to a new “place” may confuse them.

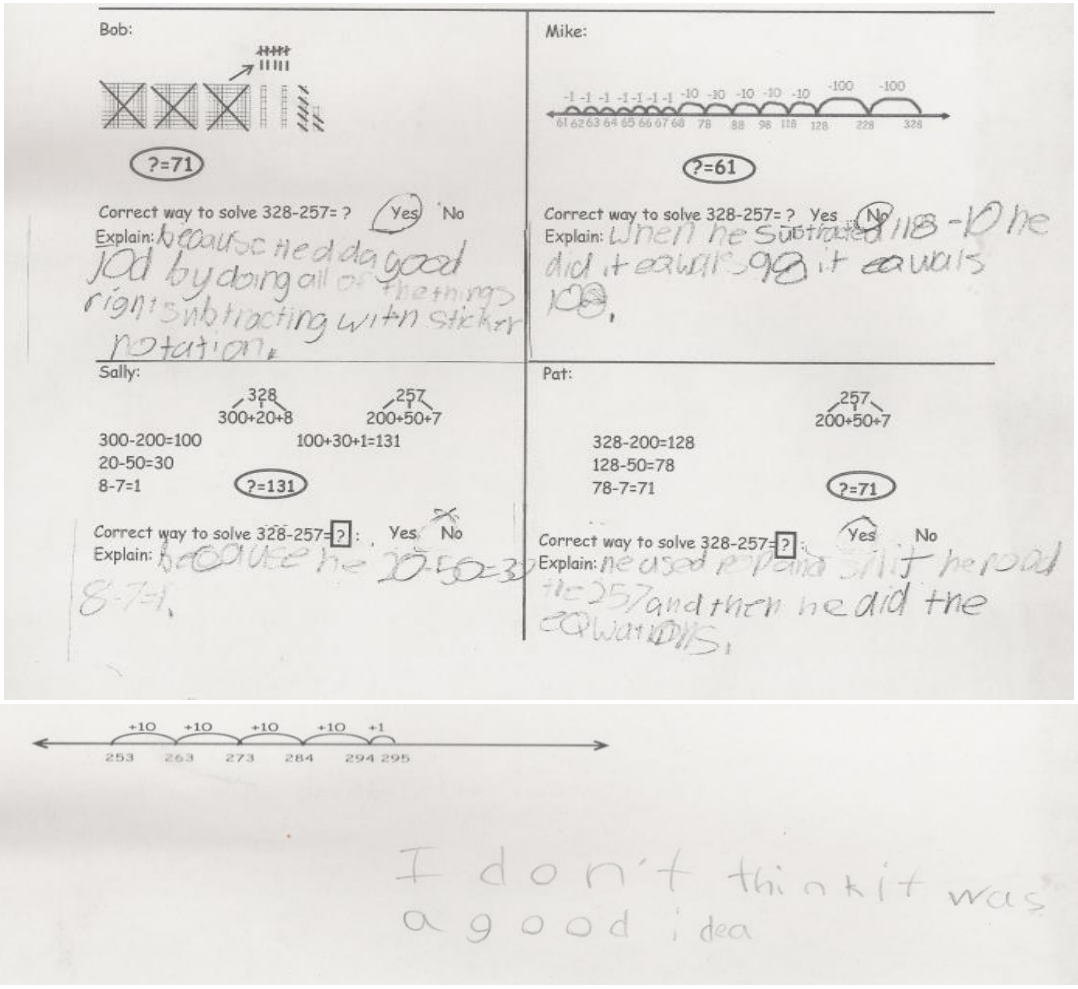
What are the common misconceptions and undeveloped understandings students often have about the content addressed by this item and the standard it addresses?

- Students try to subtract a larger number from a smaller number (i.e. 50-90). Do not understand commutative property.
- Student maybe unable to generalize methods that he/she already knows for adding and subtracting two-digit numbers to a situation requiring them to add/subtract with three digit numbers.
- Students have difficulty counting back by tens across century (hundreds) marks.
- Students have difficulty counting back by ones across decade(tens) marks.
- Student lacks concept that sometimes it is necessary to decompose tens or hundreds.

What overgeneralizations may students make from previous learning leading them to make false connections or conclusions?

- Students try to solve the problem with the traditional algorithm without having a clear understanding of regrouping and/or place value.
- When viewing multi-digit numbers, students see them as numbers independent of place value. (i.e. 32 is “3” and “2” not “30” and “2”.

Getting Started



Bob: Because he did a good job by doing all of the things right subtracting with sticker notation.

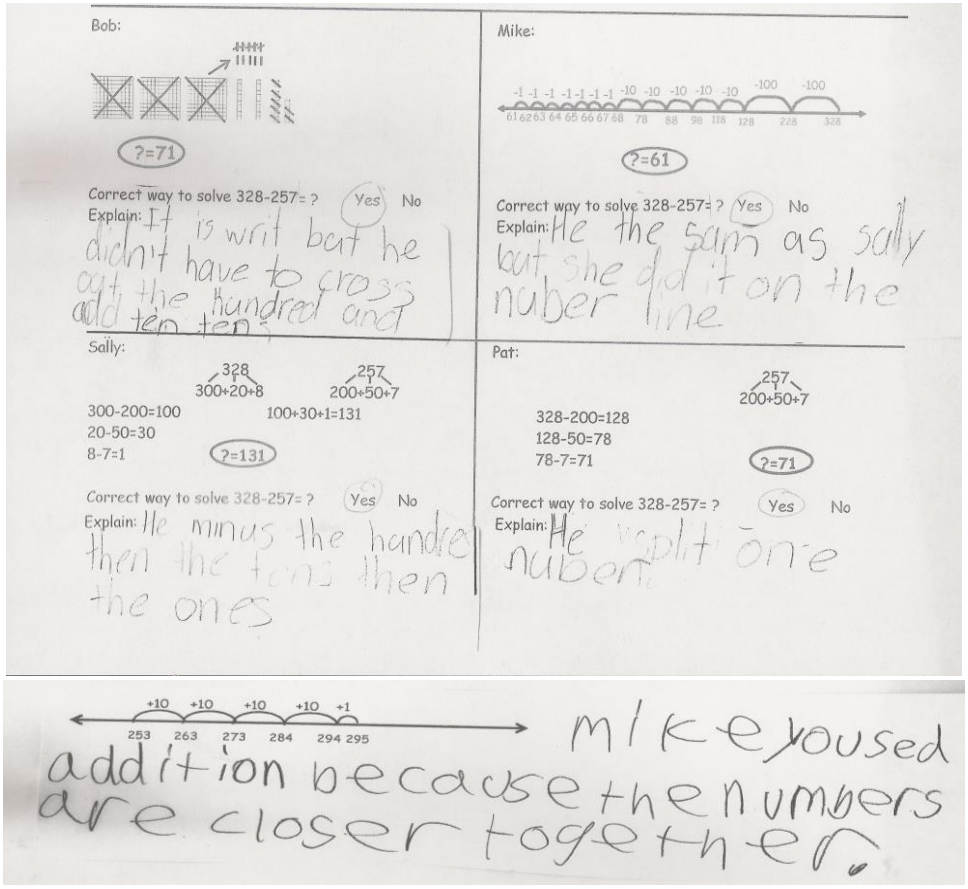
Mike: When he subtracted 118-10 he did it equals 98. It equals 108.

Sally: Because he 20-50=30, 8-7=1

Pat: He used pop and split. He popped the 257 and then did the equations.

Mike 2: Mike used addition because the numbers are closer together.

Developing



Bob: It is right, but, he didn't have to cross out the hundred and add ten tens.

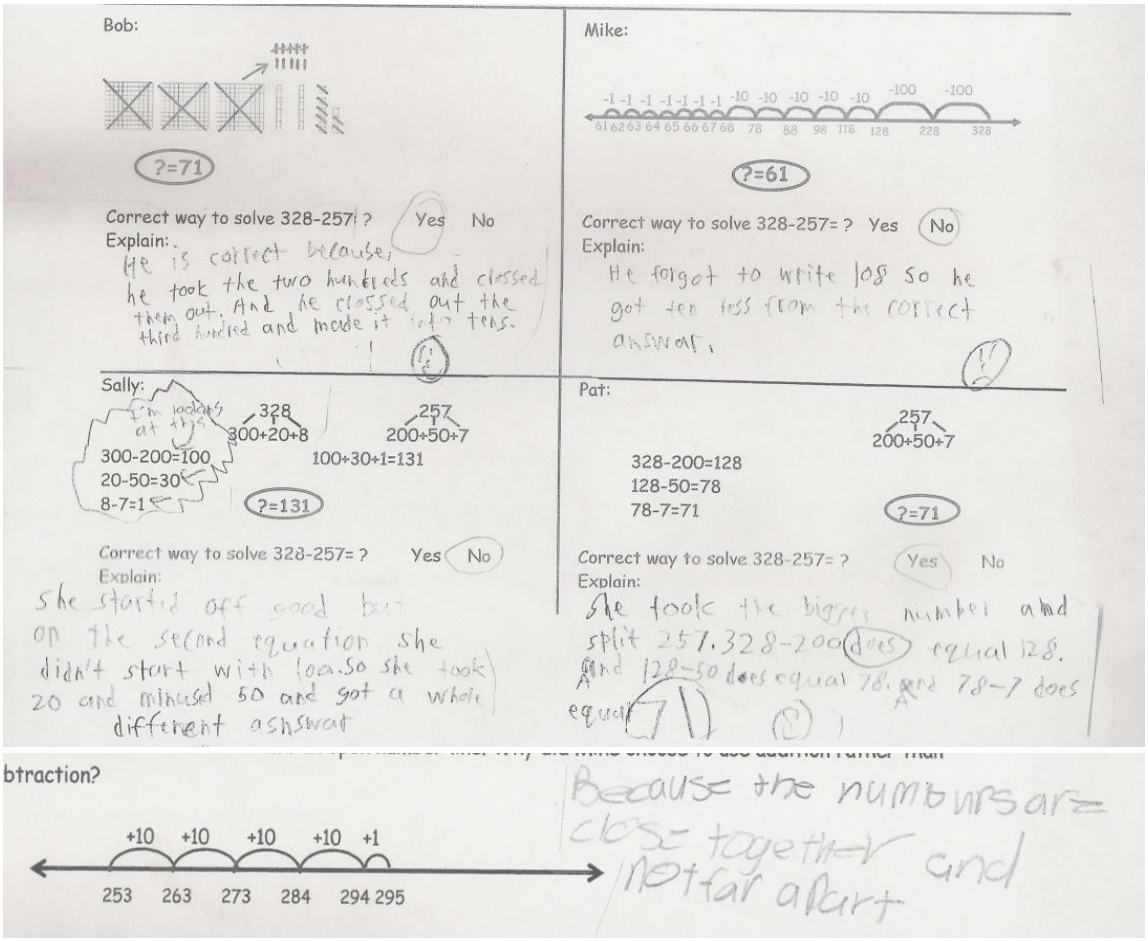
Mike: He the same as Sally, but she did it on the open number line.

Sally: He minus the hundreds, the tens, then the ones.

Pat: He split the number.

Mike 2: I don't think it was a good idea.

Got It



Bob: He is correct because he took the two hundreds and crossed them out. And he crossed out the third hundred and made it into tens.

Mike: He forgot to write 108 so he got ten less from the correct answer.

Sally: She started off good but on the second equation she didn't start with 100. She took away 20 and minused 50 and got a whole different answer.

Pat: She took bigger number and split 257. 328 does equal 128. And 128-50 does equal 78. 78-7 does equal 71.

Mike 2: Because the numbers are close together and not far apart.