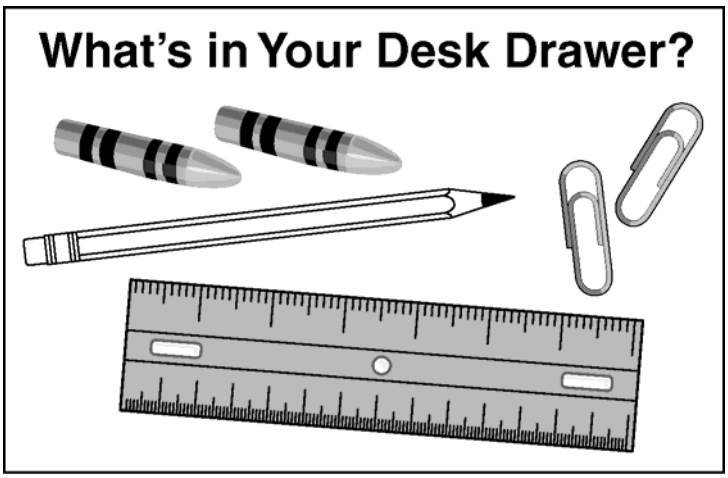
SITES-M Mathematics Challenge



Level: Grade One

Standard: Number and Operations

Learning Target: Focus on Addition and Subtraction

Checks for Understanding

0106.2.3	Count forward and backward by ones beginning with any number less than 100.
0106.2.4	Skip count by twos, fives, and tens.
0106.2.10	Use models (such as discrete objects, connecting cubes, and number lines) to represent "part-whole," "adding to," "taking away from," and "comparing to" situations to develop understanding of the meaning of addition and subtraction
0106.2.13	Solve problems that require addition and subtraction of numbers through 100.

SITES-M Mathematics Challenge

Grade 1–Focus on Addition and Subtraction

The purpose of the Mathematics Challenges is to provide opportunities for students to develop and demonstrate understanding of important mathematical concepts and standards. Each Challenge includes a set of tasks that require higher-order thinking skills. Because these types of tasks may be new for students and they will have varying levels of understanding, the student responses will vary. The Challenges and guiding questions were designed to help teachers plan their implementation and elicit, analyze, and act on evidence of student understanding.

You will be able to choose which Mathematics Challenge Packet to implement each month, according to the learning needs of your students and your teaching context. Each packet contains all the materials necessary to implement the Mathematics Challenge including a grade-appropriate Challenge, the Mathematics Challenge Meeting Protocol, and the Guiding Questions for Analyzing Student Responses to Mathematics Challenges.

For each Challenge, you will complete a six step process of planning, implementation, and analysis and reflection.

The Mathematics Challenge Process

Stage	Step	Task
Planning	Step 1.	Review the Mathematics Challenge Meeting Protocol
	Step 2.	Review and solve the Mathematics Challenge prior to your Professional Learning Community (PLC) meeting. Think about your responses to the guiding questions on the Meeting Protocol
	Step 3.	Hold your PLC meeting and discuss your responses to the Guiding Questions on the Meeting Protocol
Implementation	Step 4.	Implement the Mathematics Challenge with your class
Analysis and Reflection	Step 5.	For your own planning and documentation, respond to the Guiding Questions on the Analyzing Student Responses Protocol
	Step 6.	To help us improve the Challenges and to provide recommendations for teachers implementing them in future years, complete the Mathematics Challenge Feedback Log and provide copies of all student work to the Assessment Coordinator

SITES-M Mathematics Challenge

Grade 1–Focus on Addition and Subtraction

Mathematics Challenge Meeting Protocol

Each month, your Professional Learning Community will meet to discuss the implementation of one Mathematics Challenge. In preparation for your monthly meeting, please print and review this month's Mathematics Challenge, solve all tasks within the Challenge, and think about the guiding questions below. These questions will be used to facilitate a group discussion regarding the implementation of the upcoming Mathematics Challenge.

Guiding Questions for Implementing the Mathematics Challenges

1. What is the title of the Challenge that you will use this month?
2. What skills or standards is this Challenge measuring?
3. Where does this Challenge fit within your curriculum? Within which unit?
4. At what point during the unit will you administer this Challenge (e.g., At the beginning of a unit to determine what students do or do not know, at the end of a unit to assess what students have or have not learned, in the middle of a unit to determine where to go next instructionally)?
5. How will your students complete this Challenge (e.g., individually, one-on-one, in small groups, as a class)? Why?
6. Are there any prerequisite skills, common misunderstandings, or vocabulary needs that you will have to address? What are they?
7. What difficulties do you anticipate your students will have with the Challenge? How will you address them?
8. Are these skills and difficulties different for special needs students, ELL students, etc.? How? Will you do anything different for these students? What?
9. How will you evaluate student responses (e.g., grade responses with the provided rubric, scan responses to identify common mistakes/misconceptions, have students evaluate one another's responses, have students evaluate their own response)?
10. What will student responses to this Challenge tell you about student understanding?
11. How might you use this evidence of student understanding to adapt your teaching and learning?
12. What other materials, resources, or support might you need? Where can you get them?
13. How can your colleagues assist you in the analysis of student understanding?
14. What other questions or concerns do you have about this Mathematics Challenge?

After you have implemented the challenge with your class, be sure to respond to the Guiding Questions on the Analyzing Student Responses Protocol.

SITES-M Mathematics Challenge

Grade 1–Focus on Addition and Subtraction

Standard: Number and Operations

Learning Target: Focus on Addition and Subtraction

Claims:
Students should understand and be able to explain or demonstrate how to:

- ✓ Count forward and backward by ones beginning with any number less than 100;
- ✓ Skip count by twos, fives, and tens;
- ✓ Use models (such as discrete objects, connecting cubes, and number lines) to represent "part-whole," "adding to," "taking away from," and "comparing to" situations to develop understanding of the meaning of addition and subtraction;
- ✓ Solve problems that require addition and subtraction of numbers through 100.

Task Preparation:

Each student will need a copy of the Student Response Sheet and a pencil.

If a student is unable to respond in writing, a scribe may be appointed or verbal answers may be accepted, but the responses will need to be documented for scoring.

Stimulus Cards (Drawing or Word Description):

None

Manipulatives/Supplies:

A copy of the student response sheet for each student
Pencils

SITES-M Mathematics Challenge

Grade 1–Focus on Addition and Subtraction

Cues/Directions:

Distribute student response sheets. If a student is unable to respond in writing, a scribe may be appointed or verbal answers may be accepted, but these responses will need to be documented for scoring. Students should be directed to look carefully at each figure. Allow students time to answer.

Instruct students to follow along as you read aloud and say: **There is a big desk drawer in Ms. Anson's class that is filled with pencils, crayons, rulers, and paper clips.**

1. Say: **The students are helping to sort and count the items in the drawer. They made a table to show the numbers of pencils and crayons they counted. (TEACHER NOTE:** Students should look at the table.**) How many pencils and crayons did they count in all? Show how you get your answer. (TEACHER NOTE:** Students should write their explanations in the box.**) They counted "blank" pencils and crayons in all. (TEACHER NOTE:** Students should write the correct answer in the blank.**)**

2. **Are there more pencils or more crayons in the drawer? Show how you get your answer. (TEACHER NOTE:** Students should write their explanations in the box.**) Check one: More pencils or more crayons. (TEACHER NOTE:** Students should check the correct box.**) How many more? (TEACHER NOTE:** Students should write their explanations in the box.**) There are "blank" more pencils or crayons. (TEACHER NOTE:** Students should write the correct answers in the blanks.**)**

3. **The students put the paper clips into groups of 5. The picture below shows the groups of paper clips. There were 2 paper clips left after grouping. (TEACHER NOTE:** Students should look at the picture.**) How many paper clips are there in all? Show how you get your answer. (TEACHER NOTE:** Students should write their explanations in the box.**) There are "blank" paper clips in all. (TEACHER NOTE:** Students should write the correct answer in the blank.**)**

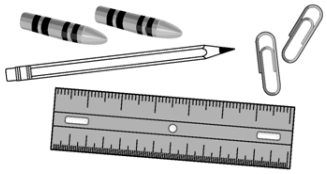
4. **The students counted 8 rulers in the drawer. How many more paper clips than rulers are in the drawer? Show how you get your answer. (TEACHER NOTE:** Students should write their explanations in the box.**) There are "blank" more paper clips than rulers. (TEACHER NOTE:** Students should write the correct answer in the blank.**)**

5. **In the table below, write the number of items the students counted. (TEACHER NOTE:** Students should look at the table.**) How many items in all are in the drawer? Show how you get your answer. (TEACHER NOTE:** Students should write their explanations in the box.**) There are <u>"blank"</u> items in the drawer. (TEACHER NOTE:** Students should write the correct answer in the blank.**)**

6. **Ms. Anson wants to put more rulers in the drawer so that there will be 100 items in the drawer. How many rulers should she put in the drawer? (TEACHER NOTE:** Students should write their explanations in the box.**) She should put <u>"blank"</u> more rulers in the drawer. How do you know? (TEACHER NOTE:** Students should write the correct answer in the blank.**)**

SITES-M Mathematics Challenge

Grade 1–Focus on Addition and Subtraction



SITES-M Mathematics Challenge

Grade 1–Focus on Addition and Subtraction

Student Response Sheet

What's in Your Desk Drawer?

Name: _____ **Date:** _____

There is a big desk drawer in Ms. Anson's class that is filled with pencils, crayons, paper clips, and rulers.

The students are helping to sort and count the items in the drawer. They made a table to show the numbers of pencils and crayons they counted.

PENCILS AND CRAYONS THEY COUNTED

Item	Number
Pencils	46
Crayons	13

1. **How many pencils and crayons did they count in all? Show how you get your answer.**

They counted _____ pencils and crayons in all.

2. Are there more pencils or more crayons in the drawer?

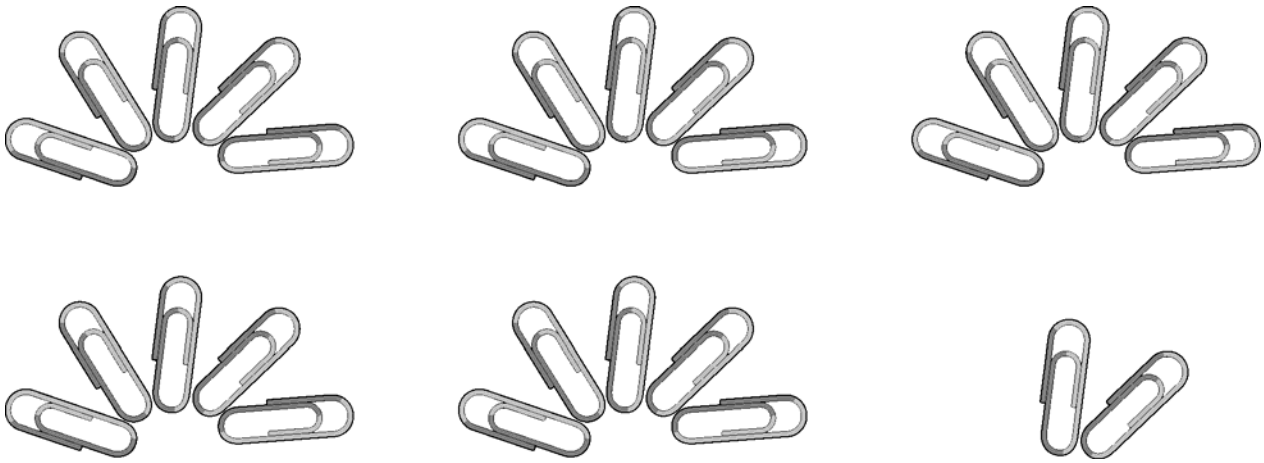
Show how you get your answer.

Check one: ☐ **More pencils** ☐ **More crayons**

How many more?

There are _____ more _____.
(pencils or crayons)

3. The students put the paper clips into groups of 5. The picture below shows the groups of paper clips. There were 2 paper clips left after grouping.



How many paper clips are there in all?
Show how you get your answer.

There are _____ paper clips in all.

4. The students counted 8 rulers in the drawer. How many more paper clips than rulers are in the drawer?

Show how you get your answer.

There are _____ more paper clips than rulers.

5. In the table below, write the number of items the students counted.

ITEMS IN THE DRAWER

Items	Number
Pencils	
Crayons	
Paper clips	
Rulers	

How many items in all are in the drawer?

Show how you get your answer.

There are _____ items in the drawer.

6. Ms. Anson wants to put more rulers in the drawer so that there will be 100 items in the drawer.

How many rulers should she put in the drawer?

She should put _____ more rulers in the drawer.

How do you know?

Learning and Teaching Considerations

Task 1:

A) Be sure that students understand that the words "in all" generally signify the addition operation.

B) Students may answer in words, symbols, or with a number line. They may also add traditionally, add the tens and ones separately and then add the subtotals, add in chunks, or add the tens first and then the ones. Be sure that they understand that they can get the correct answer using any of the strategies, though some are more efficient.

C) Be sure that students understand that not only does $46 + 13 = 59$ and $13 + 46 = 59$ but also $59 = 46 + 13$ and $59 = 13 + 46$. Using a balance scale may help.

D) Be sure that students understand that it helps to first determine what a reasonable answer would be for a problem. Estimation is often a helpful strategy. For this task, $46 + 13$ can be estimated as $50 + 10 = 60$.

E) Be sure that students understand that as you move right (→) on a number line, the numbers increase in value. As you move left (←), the numbers decrease in value.

F) If a student says or writes, "I just know," prompt him or her by saying something like "I'm glad you know, but it's important in math to be able to explain your answers so other people can understand what you're thinking." (That applies to the other tasks, as well.)

G) If a student says or writes, "I don't know," say something positive like "Let's start with what you do know about this problem." Students often know more than they think or say, and getting them to vocalize or write about that knowledge is all they need. (That applies to the other tasks, as well.)

Task 2:

A) Be sure that students understand that the word "more" generally signifies comparing numbers or amounts to find out which is greater, the focus of the first question. Determining how many more generally signifies subtracting one number or amount from the other–the focus of the second question.

B) Students may answer in words, symbols, or with a number line. They may also subtract traditionally, subtract the tens and the ones separately and then add the subtotals, or they may subtract in chunks. Be sure that they understand that they can get the correct answer using any of these strategies, though some are more efficient.

C) Be sure that students understand that "addition" is assumed in the definition of subtraction, so that they can obtain or can check their answers by adding; for example, $46 - 13 = 33$ means $46 = 13 + 33$.

D) Be sure that students understand that $46 - 13 = 33$ is the same as $33 = 46 - 13$. Using a balance scale may help.

E) Some students may have the misconception that $46 - 13$ is the same as $13 - 46$, like addition. Working with manipulatives and number lines may help.

Task 3:

A) Be sure that students understand that grouping items is a quick way to add them together. It is a precursor to multiplication.

B) Students may answer in words, symbols, or with a number line. They may skip count by fives, count the groups and multiply, or count the individual paper clips. Be sure that they understand that they can get the correct answer using any of the strategies, though some are more efficient.

C) Some students may have the misconception that when adding groups of items, each group counts as 1 whole; for example, 5 (groups of five paper clips) + 2 (extra clips) = 7. Working with manipulatives may help.

Task 4:

A) Students may answer in words, symbols, or by using manipulatives. They may also use number lines, recall number sense, subtract traditionally, add two to each number and then subtract, add on, or subtract in chunks. Be sure that they understand that they can get the correct answer using any of these strategies, though some are more efficient.

B) Be sure that students understand that addition is assumed in the definition of subtraction, so that they can obtain or can check their answers by adding; for example, $27 - 8 = 19$ means $27 = 8 + 19$.

C) Be sure that students understand that $27 - 8 = 19$ is the same as $19 = 27 - 8$. Using a balance scale may help.

D) Some students may have the misconception that $27 - 8$ is the same as $8 - 27$, like addition. Working with manipulatives and number lines may help.

Task 5:

A) Be sure that students understand that task 5 is a two-step problem. They first have to write in the numbers of items the students counted. Then they need to determine how many items there were in all (addition).

B) Students may answer in words, symbols, or by using manipulatives. They may also add traditionally, add the tens and the ones separately and then add the subtotals, add in chunks, or add the tens first, followed by the ones. They may also add the middle two numbers to get 40 and then add the other two numbers to get 54 (or any other combination). Be sure that they understand that they can get the correct answer using any of the strategies, though some are more efficient.

C) Be sure that students understand that not only does $46 + 13 + 27 + 8 = 94$, but $94 = 46 + 13 + 27 + 8$. Using a balance scale may help. They should also know that adding the four numbers in any combination will still result in 94.

D) Some students may have the misconception that when adding two numbers that require carrying a ten, a hundred, etc., you write the entire number and continue adding; for example, $27 + 8$ is 215 because ($7 + 8 = 15$) or $13 + 27$ is 310, for a similar reason. Working with base-10 blocks may help.

E) Be sure that students understand that it helps to first determine what a reasonable answer would be for a problem. Estimation is often a helpful strategy. For this task, $46 + 13 + 27 + 8$ can be estimated as $50 + 10 = 60$ and $25 + 10 = 35$, giving $60 + 35$, or 95. Such an estimate should raise a red flag for students who obtain either 215 or 310 as a partial answer.

Task 6:

A) Be sure that students understand that determining how many more generally signifies subtracting one number or amount from the other–the focus of the question.

B) Students may answer in words, symbols, or by using manipulatives. They may also use number lines, recall number sense, subtract traditionally, add on from 94, or subtract in chunks. Be sure that they understand that they can get the correct answer using any of the strategies, though some are more efficient.

C) Be sure that students understand that addition is assumed in the definition of subtraction, so that they can obtain or can check their answers by adding; for example, $100 - 94 = 6$ means $100 = 94 + 6$.

Name: ANSWER KEY Date: _____

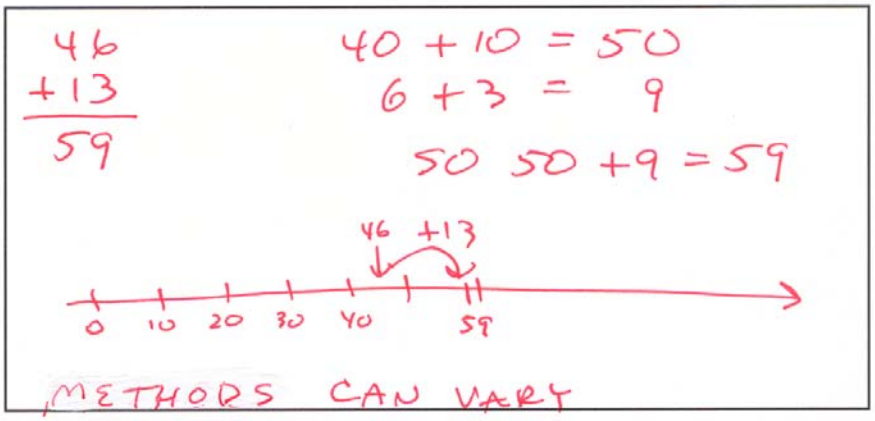
There is a big desk drawer in Ms. Anson's class that is filled with pencils, crayons, paper clips, and rulers.

The students are helping to sort and count the items in the drawer. They made a table to show the numbers of pencils and crayons they counted.

PENCILS AND CRAYONS THEY COUNTED

Item	Number
Pencils	46
Crayons	13

1. **How many pencils and crayons did they count in all? Show how you get your answer.**



They counted 59 **pencils and crayons in all.**

2. Are there more pencils or more crayons in the drawer?

Show how you get your answer.

46 > 13

OR 46 IS A BIGGER NUMBER THAN 13.

Check one: ☒ **More pencils** ☐ **More crayons**

How many more?

$$\begin{array}{r} 46 \\ -13 \\ \hline 33 \end{array}$$

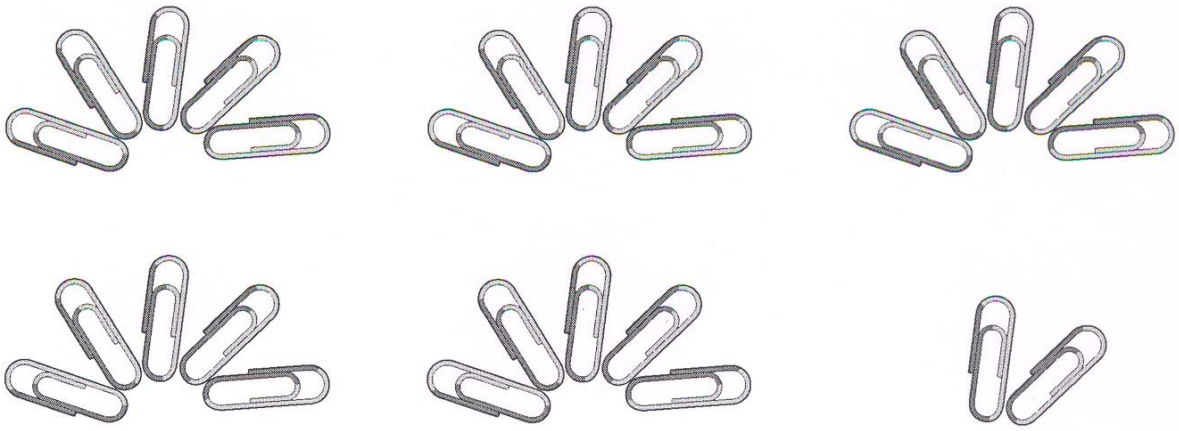
13 + 33 = 46

33 MORE PENCILS

METHODS CAN VARY.

There are 33 **more** PENCILS **.**
(pencils or crayons)

3. The students put the paper clips into groups of 5. The picture below shows the groups of paper clips. There were 2 paper clips left after grouping.



How many paper clips are there in all?
Show how you get your answer.

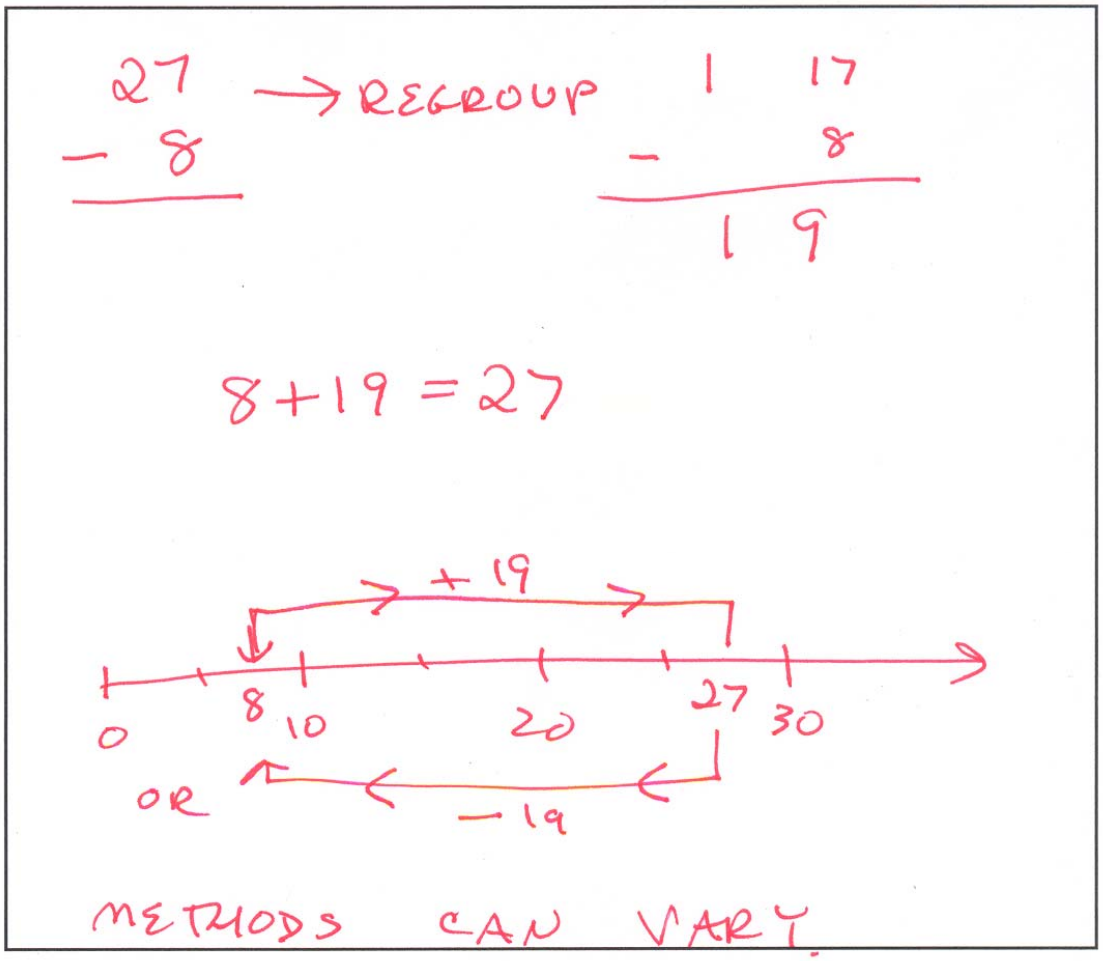
5 10 15
20 25 25+2 =27

METHODS CAN VARY, BUT COUNTING BY 5s IS EFFICIENT.

There are 27 **paper clips in all.**

4. The students counted 8 rulers in the drawer. How many more paper clips than rulers are in the drawer?

Show how you get your answer.



There are 19 **more paper clips than rulers.**

5. In the table below, write the number of items the student s counted.

ITEMS IN THE DRAWER

Items	Number
Pencils	46
Crayons	13
Paper clips	27
Rulers	8

How many items in all are in the drawer?

Show how you get your answer.

$\begin{array}{r} 46 \\ +13 \\ \hline 59 \end{array}$ $\begin{array}{r} 59 \\ +27 \\ \hline 86 \end{array}$ $\begin{array}{r} 86 \\ +8 \\ \hline 94 \end{array}$

SUCCESSIVE ADDITION

OR

$\begin{array}{r} {}^{2}46 \\ 13 \\ 27 \\ 8 \\ \hline 94 \end{array}$

METHODS CAN VARY.

There are 94 **items in the drawer.**

6. Ms. Anson wants to put more rulers in the drawer so that there will be 100 items in the drawer.

How many rulers should she put in the drawer?

She should put 6 **more rulers in the drawer.**

How do you know?

94 + 6 = 100

OR 100 − 6 = 94

OR COUNTING UP FROM 94:

95 96 97 98 99 100
1 2 3 4 5 6

METHODS CAN VARY

Grade 1–Focus on Addition and Subtraction
Rubric

CATEGORY	4	3	2	1
Mathematical concepts	**Response shows complete understanding of the mathematical concepts used to solve the problem(s).**	**Response shows substantial understanding of the mathematical concepts used to solve the problem(s).**	**Response shows some understanding of the mathematical concepts needed to solve the problem(s).**	**Response shows very limited understanding of the underlying concepts needed to solve the problem(s), OR the response is not written.**
	Response shows evidence in ALL of the following tasks. **Task 1**. Student shows evidence of understanding addition of two-digit numbers. **Task 2**. Student shows evidence of understanding subtraction to determine how many more things are in one group than in another. **Task 3**. Student shows evidence of understanding counting by 5s. **Task 4**. Student shows evidence of understanding subtraction to determine how many more things are in one group than in another. **Task 5**. Student shows evidence of counting on or adding numbers to find a total. **Task 6**. Student shows evidence of subtraction or of counting on from a number to reach a desired total.	Response shows evidence in only 4 or 5 of the tasks described in category 4.	Response shows evidence in only 2 or 3 of the tasks described in category 4.	Response shows evidence in only 1 or none of the tasks described in category 4.

SITES-M Mathematics Challenge

Grade 1–Focus on Addition and Subtraction
Rubric

CATEGORY	4	3	2	1
Strategy and procedures	**Student typically uses an efficient and effective strategy to solve the problem(s).**	**Student typically uses an effective strategy to solve the problem(s).**	**Student sometimes uses an effective strategy to solve the problem(s), but not consistently.**	**Student rarely uses an effective strategy to solve the problem(s).**
	Response shows evidence in ALL of the following tasks. **Task 1**. Student shows evidence of adding 46 + 13. **Task 2**. Student shows evidence of subtracting 46 – 13. **Task 3**. Student shows evidence of counting by 5s to reach 25 and then adding 2. **Task 4**. Student shows evidence of subtracting 27 – 8. **Task 5**. Student shows evidence of adding 46 + 13 + 27 + 8. **Task 6**. Student shows evidence of counting from 94 to reach 100 or shows evidence of subtracting 100 – 94.	Response shows evidence in only 4 or 5 of the tasks described in category 4.	Response shows evidence in only 2 or 3 of the tasks described in category 4.	Response shows evidence in only 1 or none of the tasks described in category 4.

SITES-M Mathematics Challenge

Grade 1–Focus on Addition and Subtraction
Rubric

CATEGORY	4	3	2	1
Explanation and communication	**Explanation is detailed and clear; uses appropriate terminology and/or notation.**	**Explanation is clear; uses some appropriate terminology and/or notation.**	**Explanation is a little difficult to understand, but includes critical components; shows little use of appropriate terminology and/or notation.**	**Explanation is difficult to understand, is missing several components, and does not use or include appropriate terminology and/or notation.**
	Response shows evidence in ALL of the following explanations. **Task 2**. Student explains that there are more pencils by using a subtraction argument or by explaining how many more crayons are needed to reach the number of pencils. **Task 3**. Student shows evidence of counting by 5s instead of counting 27 individual paper clips. **Task 6**. Student explains that 6 rulers are needed by using a subtraction argument, or by explaining that if one begins counting at 94, another 6 counts are needed to reach 100.	Response shows evidence in only 2 explanations described in category 4.	Response shows evidence in only 1 explanation described in category 4.	Responses may show calculations, but shows no evidence of explanation as described in category 4.

SITES-M Mathematics Challenge

Grade 1–Focus on Addition and Subtraction
Rubric

CATEGORY	4	3	2	1
Mathematical accuracy	**All or almost all of the steps and solutions have no mathematical errors.**	**Most of the steps and solutions have no mathematical errors.**	**Some of the steps and solutions have no mathematical errors.**	**Few of the steps and solutions have no mathematical errors.**
	Student provides correct answers for ALL of the following tasks. **Task 1**. Student answers 59. **Task 2**. Student checks box for more pencils and answers 33. **Task 3**. Student answers 27. **Task 4**. Student answers 19. **Task 5**. Student completes table, as shown on answer sheet, and answers 94. **Task 6**. Student answers 6.	Student provides correct answers for only 4 or 5 of the tasks described in category 4.	Student provides correct answers for only 2 or 3 of the tasks described in category 4.	Student provides a correct answer for only 1 or none of the tasks described in category 4.

SITES-M Mathematics Challenge

Grade 1–Focus on Addition and Subtraction

Scoring Notes Checklist

Task	Check Yes	Category
Task 1		
Student shows evidence of understanding addition of two-digit numbers.		Concepts
Student shows evidence of adding 46 + 13.		Strategy
Student answers 59.		Accuracy
Task 2		
Student shows evidence of understanding subtraction to determine how many more things are in one group than in another.		Concepts
Student shows evidence of subtracting 46 – 13.		Strategy
Student explains that there are more pencils by using a subtraction argument or by explaining how many more crayons are needed to reach the number of pencils.		Explanation
Student checks box for more pencils and answers 33.		Accuracy
Task 3		
Student shows evidence of understanding counting by 5s.		Concepts
Student shows evidence of counting by 5s to reach 25 and then adding 2.		Strategy
Student shows evidence of counting by 5s instead of counting 27 individual paper clips.		Explanation
Student answers 27.		Accuracy
Task 4		
Student shows evidence of understanding subtraction to determine how many more things are in one group than in another.		Concepts
Student shows evidence of subtracting 27 – 8.		Strategy
Student answers 19.		Accuracy
Task 5		
Student shows evidence of counting on or adding numbers to find a total.		Concepts
Student shows evidence of adding 46 + 13 + 27 + 8.		Strategy
Student completes table, as shown on answer sheet, and answers 94.		Accuracy
Task 6		
Student shows evidence of subtraction or of counting on from a number to reach a desired total.		Concepts
Student shows evidence of counting from 94 to reach 100 or shows evidence of subtracting 100 – 94.		Strategy
Student explains that 6 rulers are needed by using a subtraction argument, or by explaining that if one begins counting at 94, another 6 counts are needed to reach 100.		Explanation
Student answers 6.		Accuracy

SITES-M Mathematics Challenge

Grade 1–Focus on Addition and Subtraction

Analyzing Student Responses Protocol

The purpose of the Mathematics Challenges is to provide opportunities for students to develop and demonstrate understanding of important mathematical concepts and standards. They include extended responses, open-ended tasks, and tasks that require higher-order thinking skills. Because these types of tasks may be novel for students and they will have varying levels of understanding, the student responses will vary.

The guiding questions below were designed to assist you in analyzing your class' response to the Challenge and determining appropriate next steps for your teaching and learning. Responses to these questions are for your reflection and documentation and will not be collected.

Guiding Questions for Analyzing Student Responses to the Mathematics Challenges

1. When completing the Challenge, what did your students do well? How do you know?

2. When completing the Challenge, what did your students struggle with? How do you know?

3. When your students completed the Challenge, did they implement multiple correct solutions strategies? What insightful approaches to problem solving did you observe?

4. What, if any, patterns (e.g., common errors/misconceptions) did you observe across your student responses?

5. What questions or concerns did your students have when working through this Challenge or a particular task? Are these things you should address for the class as a whole?

6. What, if any, feedback did you provide to your class? How did you provide it?

7. What did you learn about your students' mathematical understanding based on their responses to this Challenge?

Reminders:

1) After you have completed the Challenge with your class and responded to these Guiding Questions for Analyzing Student Responses, please complete the Challenge Feedback Log. A link to this Log is e-mailed to you each month. Responses will be used to improve the Challenges and to provide recommendations for teachers implementing the Challenges in future years.

2) Please provide copies of all student work to the Assessment Coordinator.