## SITES-M Mathematics Challenge



Level: Grade One

**Standard:** Number and Operations

Learning Target: Focus on System of Tens

### **Grade Level Expectations**

- **GLE 0106.2.1** Understand and use number notation and place value up to 100.
- **GLE 0106.2.4** Use multiple representations (including groups of ten) to model two-digit addition and subtraction.

### **Checks for Understanding**

**0106.2.15** Represent whole numbers between 10 and 100 in groups of tens and ones.

## SITES-M Mathematics Challenge Grade 1–Focus on System of Tens Cookies at the Bakery

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.

Stage	Step	Task	
	Step 1.	Review the Mathematics Challenge Meeting Protocol	
Planning	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	
	Step 5.	For your own planning and documentation, respond to the Guiding Questions on the Analyzing Student Responses Protocol	
Analysis and Reflection	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	

### **The Mathematics Challenge Process**

### SITES-M Mathematics Challenge Grade 1–Focus on System of Tens Cookies at the Bakery

### **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.



Standard: Number and Operations

Learning Target: Focus on System of Tens

### Claims:

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

- ✓ Represent whole numbers between 10 and 100 in groups of tens and ones;
- ✓ Understand and use number notation and place value up to 100;
- ✓ Use multiple representations to model two-digit addition and subtraction.

### Task Preparation:

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

#### Stimulus Cards (Drawing or Word Description): None

Manipulatives/Supplies:

Pencils

### **Cues/Directions:**

Distribute student response sheets. Students should be directed to look carefully at each figure. Allow students time to answer.

Instruct students to follow along as you read aloud.

- Say: Below are 3 trays of cookies. On the line under each tray, write the number of cookies on the tray. (TEACHER NOTE: Students should write the number of cookies on each tray on the line below the picture.) How many cookies are on all 3 trays combined? (TEACHER NOTE: Students should write their answer on the line.) How do you know? (TEACHER NOTE: Students should write their explanation in the box.)
- 2. The Bakery sells cookies in boxes. Each box has 10 cookies. Here is a tray with 36 cookies. How many boxes can you make with the cookies on the tray? (TEACHER NOTE: Students should write their answer on the line.) How many cookies will be left? (TEACHER **NOTE:** Students should write their answer on the line.) How do you **know?** (TEACHER NOTE: Students should write their explanation in the box.) Here is another tray of cookies. This one has 27 cookies. How many boxes can you make with the cookies on the tray? (Remember – a box has 10 cookies.) (TEACHER NOTE: Students should write their answer on the line.) How many cookies will be left? (TEACHER NOTE: Students should write their answer on the line.) The Bakery will combine both trays of cookies. Remember, one tray has 36 cookies and the other tray has 27 cookies. How many boxes can you make with the cookies on both trays combined? (TEACHER NOTE: Students should write their answer on the line.) How many cookies will **be left?** (**TEACHER NOTE:** Students should write their answer on the line.) How do you know? (TEACHER NOTE: Students should write their explanation in the box.)
- 3. Jackson needs 48 cookies for a class party. He will get boxes filled with 10 cookies from the Bakery. How many boxes should he get? (TEACHER NOTE: Students should write their answer on the line.) Show how you got your answer. (TEACHER NOTE: Students should write their explanation in the box.) Will there be any cookies left over? (TEACHER NOTE: Students should check the correct box.) If yes, how many? (TEACHER NOTE: Students should write their answer on the line.)

- 4. Shawna is getting cookies for her class and for her sister's class. She needs 44 cookies for her class and 46 cookies for her sister's class. How many boxes should she get altogether? (TEACHER NOTE: Students should write their answer on the line.) Show how you got your answer. (TEACHER NOTE: Students should write their explanation in the box.) Will there be any cookies left over? (TEACHER NOTE: Students should check the correct box.) If yes, how many? (TEACHER NOTE: Students should write their answer on the line.)
- 5. The Bakery has a Superbox that can be filled with 100 cookies. It will be filled with cookies from the trays below. Tray A has 36 cookies. Tray B has 27 cookies. Tray C has 38 cookies. Are there enough cookies on trays A, B, and C combined to fill a Superbox? (TEACHER NOTE: Students should check the correct box.) Tell how you got your answer. (TEACHER NOTE: Students should write their explanation in the box.) If you filled 1 Superbox with the cookies on trays A, B, and C, are there enough cookies left to fill a box of 10? (TEACHER NOTE: Students should check the correct box.) How do you know? (TEACHER NOTE: Students should write their explanation in the box.)

> Student Response Sheet Cookies at the Bakery



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inallic.			

Date: \_\_\_\_

1. Below are 3 trays of cookies. On the line under each tray, write the number of cookies on the tray.







a. How many cookies are on all 3 trays combined?\_\_\_\_\_

How do you know?

- 2. The Bakery sells cookies in boxes. Each box has 10 cookies.
  - a. Here is a tray with 36 cookies.



How many boxes can you make with the cookies on the

tray? \_\_\_\_\_

How many cookies will be left?

How do you know?

b. Here is another tray of cookies. This one has 27 cookies.



How many boxes can you make with the cookies on the

tray? (Remember – a box has 10 cookies.)

How many cookies will be left?

c. The Bakery will combine both trays of cookies. Remember, one tray has 36 cookies and the other tray has 27 cookies.



How many boxes can you make with the cookies on

both trays combined?

How many cookies will be left?

How do you know?

- 3. Jackson needs 48 cookies for a class party. He will get boxes filled with 10 cookies from the Bakery.
  - a. How many boxes should he get?

Show how you got your answer.



b. Will there be any cookies left over?

Check one:	Yes	No
If ves, how many?		

- 4. Shawna is getting cookies for her class and for her sister's class. She needs 44 cookies for her class and 46 cookies for her sister's class.
  - a. How many boxes should she get altogether?

Show how you got your answer.

b. Will there be any cookies left over?

Check one:	Yes	No
If yes, how many?	 	 

5. The Bakery has a Superbox that can be filled with 100 cookies. It will be filled with cookies from the trays below.

Tray A has 36 cookies.

Image: Cookies and the second sec

Tray C has 38 cookies.

a. Are there enough cookies on trays A, B, and C combined to fill a Superbox?

Check one:	Yes	No

Tell how you got your answer.

- b. If you filled 1 Superbox with the cookies on trays A, B, and C, are there enough cookies left to fill a box of 10?

Check one:

Yes

No

How do you know?

## Learning and Teaching Considerations

### Task 1:

A) Be sure students are able to count cookies and/or add groups of numbers to reach 25.

- **B)** 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."
- C) 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 encouraging them to vocalize or write about that knowledge is all they need.
- **D**) The teacher could encourage students to use actual cookies and/or manipulatives such as base 10 blocks or unifix cubes to explore groups of ten.

### Task 2:

- A) Students may indicate actual grouping of cookies in the picture by circling groups of 10, for example.
- **B**) Students may add and/or use repeated addition, such as 10 + 10 + 10 = 30, and then add 6.
- **C)** Students may use mental math by seeing three sets of ten with a left over 6 and may recognize without counting that the total is 36, for example. The teacher could encourage them to draw or write what they were thinking.

### Task 3:

A) Be sure students begin to think about groups of ten things as a unit.

- **B**) Students may distribute the cookies into equal shares, or they may use repeated subtraction, such as subtracting 4 sets of 10 from 48. They may also use repeated addition, such as adding 4 sets of 10 and then adding 8.
- **C**) Students may have the misconception that 8 cookies are left over and that 4 boxes are needed (rather than 5 boxes), for example, misunderstanding the question.

### Task 4:

A) Students may shows addition of 44 + 46, or repeated addition of 10.

**B**) Students may answer that Shawna could buy 9 boxes if the total number from both classes are combined. Or, students may answer that Shawna could buy 10 if each class needs its own group of boxes, with cookies left over in each class.

### Task 5:

- A) Students may show the addition of 36 + 27 + 38, or indicate by grouping on pictures that cookies on trays are being combined.
- **B**) Students may write or describe that 101 100 = 1.
- C) Students may have the misconception that they aren't allowed to add trays A, B ad C together and answer that there aren't enough cookies to fill a Superbox.
- **D**) Students may answer by drawing on the pictures, by creating their own pictures, by using words or symbols (such as the addition symbol), by using numbers, or by using manipulatives. The teacher can also encourage them to link these strategies and/or representations to each other as a way to provide a convincing solution.



Date:

1. Below are 3 trays of cookies. On the line under each tray, write the number of cookies on the tray.



a. How many cookies are on all 3 trays combined?\_\_\_\_\_

How do you know?



2. The Bakery sells cookies in boxes. Each box has 10 cookies.





b. Here is another tray of cookies. This one has 27 cookies.

How many boxes can you make with the cookies on the

tray? (Remember - a box has 10 cookies.)

How many cookies will be left?

c. The Bakery will combine both trays of cookies. Remember, one tray has 36 cookies and the other tray has 27 cookies.



How many boxes can you make with the cookies on



- 3. Jackson needs 48 cookies for a class party. He will get boxes filled with 10 cookies from the Bakery.
  - a. How many boxes should he get?

Show how you got your answer.





4. Shawna is getting cookies for her class and for her sister's class. She needs 44 cookies for her class and 46 cookies for her sister's class.



Show how you got your answer.





5. The Bakery has a Superbox that can be filled with 100 cookies. It will be filled with cookies from the trays below.



a. Are there enough cookies on trays A, B, and C combined to fill a Superbox?

Check one:



No

Tell how you got your answer.



b. If you filled 1 Superbox with the cookies on trays A, B, and C, are there enough cookies left to fill a box of 10?

Check one:	Yes	X No
		-

How do you know?



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. <u>Task 1</u> . Student answers 10, 10, and 5. Student answers there are 25 cookies on all three trays and explains how 25 is obtained. <u>Task 2</u> . Student answers that 3 boxes can be made with 6 remaining. In part (a), student is able to write or verbalize that the cookies can be put into 3 groups of 10 each. In part (b), student answers that 2 boxes can be made with 7 remaining. In part (c), student answers that 6 boxes can be made with 3 remaining. Student is able to write or verbalize that when the trays are combined, 6 groups of 10 can be made. <u>Task 3</u> . In part (a), student answers 5. Student shows a grouping of 10, or repeated addition of 10, or shows 50 – 48. In part (b), student answers yes, 2. <u>Task 4</u> . In part (a), student answers 9 boxes with none remaining or 10 boxes with some remaining for each class. In part (b), student answers no and 0, or answers yes with an appropriate reason. <u>Task 5</u> . Student answers yes to part (a) and is able to write or verbalize that there are 101 cookies on the three trays combined. Student answers no to part (b) and explains why.	Response shows evidence in only 4 of the tasks described in category 4.	Response shows evidence in only 3 of the tasks described in category 4.	Response shows evidence in 2 or fewer of the tasks described in category 4.

		•	•	4
	4	3	2	1
Strategy and St	Student typically uses an efficient and effective	Student typically	Student sometimes uses	Student rarely uses
procedures st	trategy to solve the problem(s).	uses an effective	an effective strategy to	an effective strategy
		strategy to solve	solve the problem(s),	to solve the
		the problem(s).	but not consistently.	problem(s).
Re tas <u>Ta</u> ar <u>Ta</u> 6, pio stu gr be <u>Ta</u> sh <u>Ta</u> sh <u>Ta</u> ini tra	Response shows evidence in ALL of the following asks. <b>ask 1</b> . Student shows addition of $10 + 10 + 5$ or my type of grouping by 10. <b>ask 2</b> . Student shows addition of $10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 $	Response shows evidence in only 4 of the tasks described in category 4.	Response shows evidence in only 3 of the tasks described. in category 4	Response shows evidence in 2 or fewer of the tasks described in category 4.

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 tasks. <u>Task 1</u> . Student explains that all cookies were counted from 1 to 25 or describes an addition process to reach 25. <u>Task 2</u> . In part (a), student explains that there are 3 groups of 10 with 6 remaining. In part (c), student explains that the leftover cookies on each tray can be combined to make an additional group of 10. <u>Task 3</u> . Student explains that Jackson will need to purchase at least 5 boxes, or 50 cookies, to obtain 48. <u>Task 4</u> . Student gives appropriate explanation for number of boxes. Shawna could buy 9 boxes if the total number from both classes are combined. Or Shawna could buy 10 boxes if each class needs it own group of boxes. <u>Task 5</u> . Student explains that there will be 10 groups of 10 when the trays are combined. Student also explains why there will not be enough cookies remaining to fill a box.	Response shows evidence in ALL of the tasks, but may lack detail in explanation; e.g., student answers "I counted" for all or many explanations.	Response shows evidence in only 3 or 4 explanations as described in category 4.	Response shows evidence in 2 or fewer explanations as described in category 4.

		2	•	
CATEGORY	4	3	2	1
Mathematical	All or almost all of the steps	Most of the steps and	Some of the steps and	Few of the steps and
accuracy	and solutions have no	solutions have no	solutions have no	solutions have no
, , , , , , , , , , , , , , , , , , ,	mathematical errors.	mathematical errors.	mathematical errors.	mathematical errors.
	Student provides correct	Student provides correct	Student provides correct	Student provides correct
	answers for ALL of the	answers for only 4 of the	answers for only 3 of the	answers for 2 or fewer of the
	following tasks.	tasks described in category	tasks described in category	tasks described in category 4.
	Task 1. Student answers 10,	4.	4.	
	10, 5.			
	Task 2. Student answers 3			
	and 6 for part (a), 2 and 7 for			
	part (b), and 6 and 3 for part			
	(C).			
	Task 3. Student answers 5			
	and 2.			
	Task 4. Student answers 9			
	and 0, or students answers 10			
	with 6 and 4 remaining.			
	Task 5. Student answers yes			
	for part (a) and no for part (b).			

### **Scoring Notes Checklist**

Task	Check Yes	Category
Task 1		
Student answers 10, 10, and 5. Student answers there are 25 cookies on all three trays and explains how 25 is obtained.		Concept
Student shows addition of $10 + 10 + 5$ or any type of grouping by 10.		Strategy
Student explains that all cookies were counted from 1 to 25 or describes an addition process to reach 25.		Explanation
Student answers 10, 10, 5, as shown on answer sheet.		Accuracy
Task 2		, ,
Student answers that 3 boxes can be made with 6 remaining. In part (a), student is able to write or verbalize that the cookies can be put into 3 groups of 10 each. In part (b), student answers that 2 boxes can be made with 7 remaining. In part (c), student answers that 6 boxes can be made with 3 remaining. Student is able to write or verbalize that when the trays are combined, 6 groups of 10 can be made.		Concept
Student shows addition of 10 + 10 + 10 + 6, or student indicates actual grouping of cookies in picture; such as circling groups of 10. In part (c), student indicates either by addition problem or by grouping in picture that cookies from two trays are being combined.		Strategy
In part (a), student explains that there are 3 groups of 10 with 6 remaining. In part (c), student explains that the leftover cookies on each tray can be combined to make an additional group of 10.		Explanation
Student answers 3 and 6 for part (a), 2 and 7 for part (b), and 6 and 3 for part (c).		Accuracy
Task 3		
In part (a), student answers 5. Student shows a grouping of 10, or repeated addition of 10, or shows 50 – 48. In part (b), student answers yes, 2.		Concept
Student shows subtraction of $50 - 48$ or shows repeated addition of $10 + 10 + 10 + 10$ .		Strategy
Student explains that Jackson will need to purchase at least 5 boxes, or 50 cookies, to obtain 48		Explanation
Student answers 5 and 2.		Accuracy
Task 4		
In part (a), student answers 9 boxes with none remaining or 10 boxes with some remaining for each class. In part (b), student answers no and 0, or answers yes with an appropriate reason.		Concept
Student shows addition of 44 + 46 or shows repeated addition of 10.		Strategy
Student gives appropriate explanation for number of boxes. Shawna could buy 9 boxes if the total number from both classes are combined. Or Shawna could buy 10 boxes if each class needs it own group of boxes.		Explanation
Student answers 9 and 0, or students answers 10 with 6 and 4 remaining.		Accuracy

Task 5	
Student answers yes to part (a) and is able to write or verbalize	Concept
that there are 101 cookies on the three trays combined. Student	1
answers no to part (b) and explains why.	
Student shows addition of 36 + 27 + 38, or indicates by grouping	Strategy
on pictures that cookies on trays are being combined. Student	0.
indicates that $101 - 100 = 1$ .	
Student explains that there will be 10 groups of 10 when the trays	Explanation
are combined. Student also explains why there will not be enough	1
cookies remaining to fill a box.	
Student answers yes for part (a) and no for part (b).	Accuracy

## SITES-M Mathematics Challenge Grade 1–Focus on System of Tens <u>Analyzing Student Responses Protocol</u>

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:**

- 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.