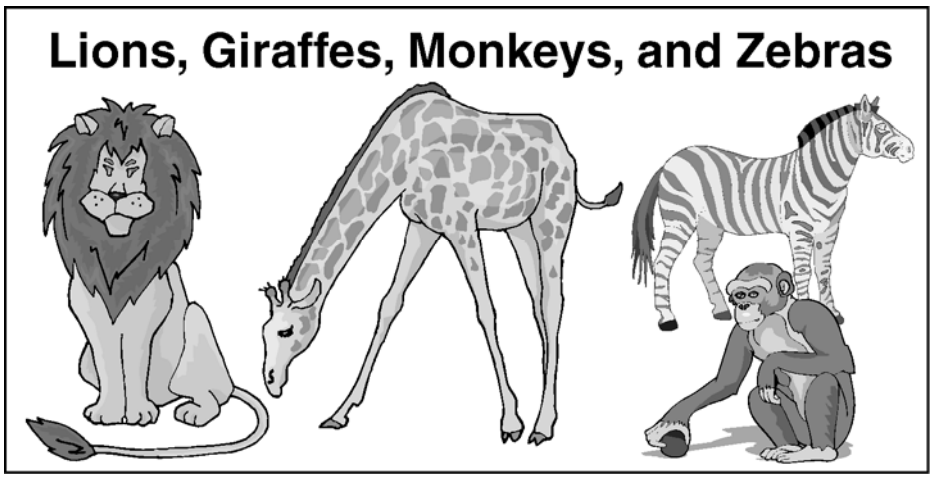
SITES-M Mathematics Challenge



Level: Kindergarten

Standard: Number and Operations

Learning Target: Focus on Addition and Subtraction

Checks for Understanding

0006.2.1	Count objects to 25 using one-two-one correspondence and identify the quantity in the counted group.
0006.2.13	Add and subtract single-digit numbers whose total or difference is between 0 and 10.
0006.2.14	Understand add as “put together” or “count on” and solve addition problems with sums less than 20.
0006.2.15	Understand subtraction as “break apart” or “take away” and solve subtraction problems using numbers 1 through 10.

TSM20009

SITES-M Mathematics Challenge

Grade K–Focus on Addition and Subtraction
Lions, Giraffes, Monkeys, and Zebras

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 K–Focus on Addition and Subtraction
Lions, Giraffes, Monkeys, and Zebras

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.

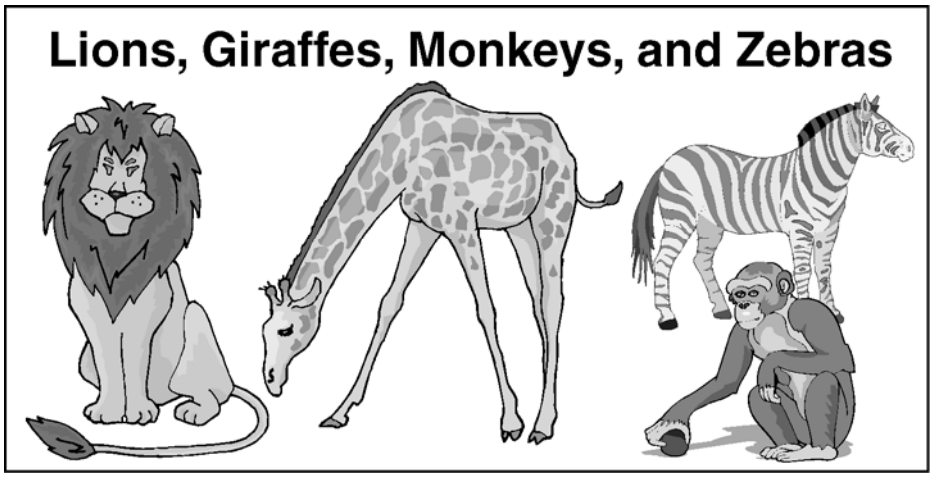
Guiding Questions for Implementing the Mathematics Challenges

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 K–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 objects to 25 using one-to-one correspondence and identify the quantity in the counted group;
- ✓ Add and subtract single-digit numbers whose total or difference is between 0 and 10;
- ✓ Understand add as "put together" or "count on" and solve addition problems with sums less than 20;
- ✓ Understand subtraction as "break apart" or "take away" and solve subtraction problems using numbers 1 through 10.

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 K–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 the 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: **Mr. Carter's class went to the zoo. They saw lions. The pictures below show the number of lions they saw.**

1. Say: **Count the lions. How many lions did the class see? (TEACHER NOTE:** Students should write the correct answer in the blank.**) Mr. Carter's class also saw giraffes.**

2. **The pictures below show the number of giraffes they saw. Count the giraffes. How many giraffes did the class see? (TEACHER NOTE:** Students should write the correct answer in the blank.**)**

3. **How many lions and giraffes did the class see in all? Show how you get your answer. (TEACHER NOTE:** Students should write their explanations in the box.**) They saw "blank" lions and giraffes in all (TEACHER NOTE:** Students should write the correct answer in the blank.**)**

4. **Did the class see more lions or more giraffes? Show how you get your answer. (TEACHER NOTE:** Students should write their explanations in the box.**) Check one: more lions or more giraffes? (TEACHER NOTE:** Students should check the correct box.**) How many more? Show how you get your answer. (TEACHER NOTE:** Students should write their explanations in the box.**) There were "blank" more "lions or giraffes". (TEACHER NOTE:** Students should write the correct answer in the both blanks.**)**

5. **Mr. Carter's class also saw monkeys and zebras. The pictures below show the number of monkeys and zebras they saw. Count the monkeys. How many monkeys did the class see? (TEACHER NOTE:** Students should write the correct answer in the blank.**) Count the zebras. How many zebras did the class see? (TEACHER NOTE:** Students should write the correct answer in the blank.**)**

6. **How many monkeys and zebras did the class see in all? Show how you get your answer. (TEACHER NOTE:** Students should write their explanations in the box.**) They saw "blank" monkeys and zebras in all. (TEACHER NOTE:** Students should write the correct answer in the blank.**)**

SITES-M Mathematics Challenge

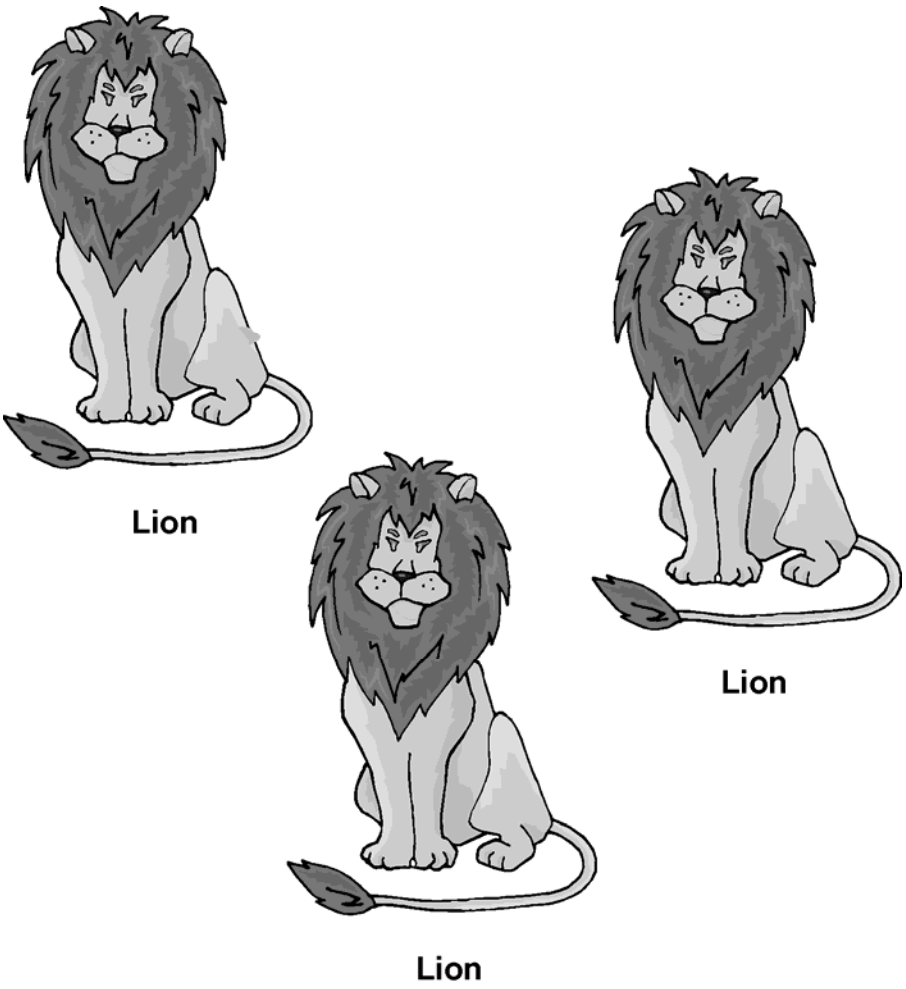
Grade K–Focus on Addition and Subtraction

Student Response Sheet

Lions, Giraffes, Monkeys, and Zebras

Name: _____ **Date:** _____

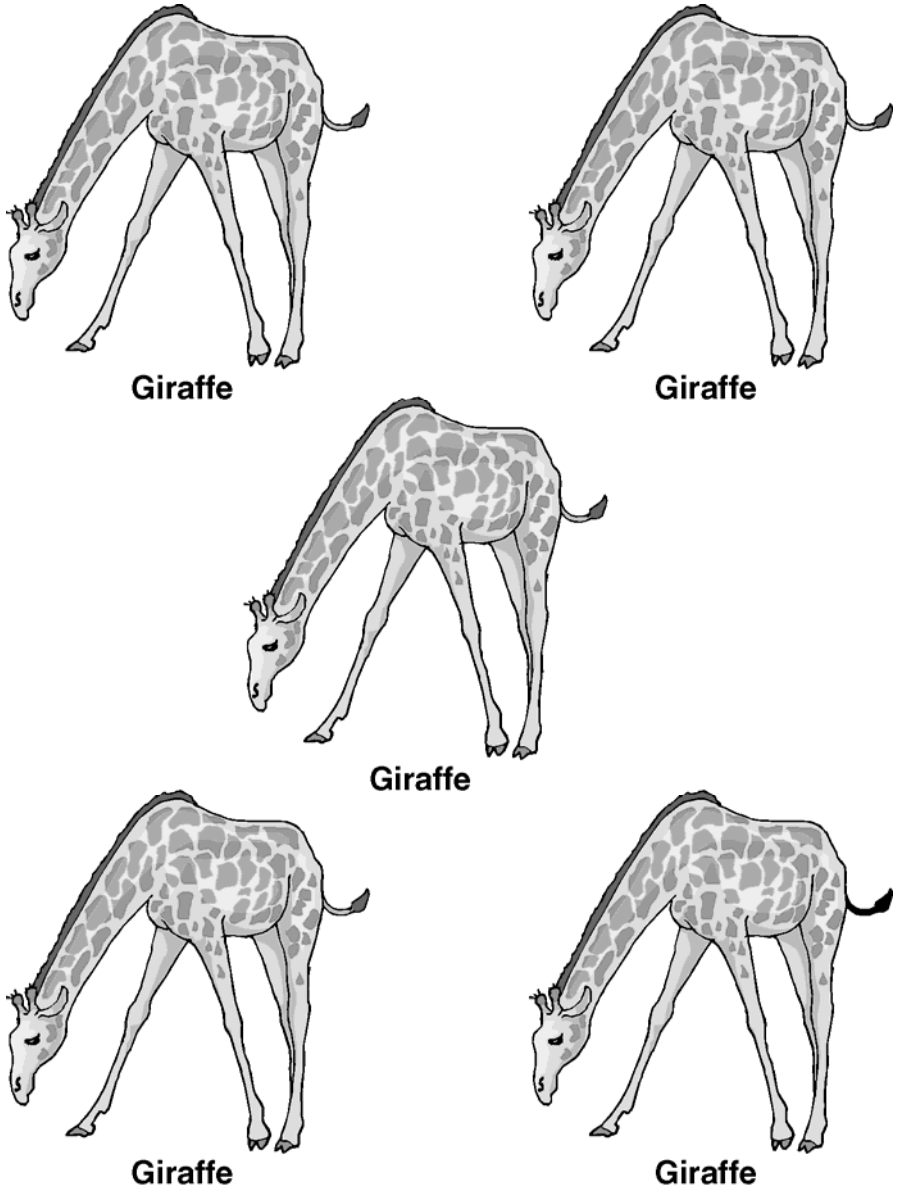
Mr. Carter's class went to the zoo. They saw lions. The pictures below show the number of lions they saw.



1. **Count the lions.**

   How many lions did the class see? _____

Mr. Carter's class also saw giraffes. The pictures below show the number of giraffes they saw.



2. Count the giraffes.

How many giraffes did the class see? _____

3. How many lions and giraffes did the class see in all?

Show how you get your answer.

They saw _____ lions and giraffes in all.

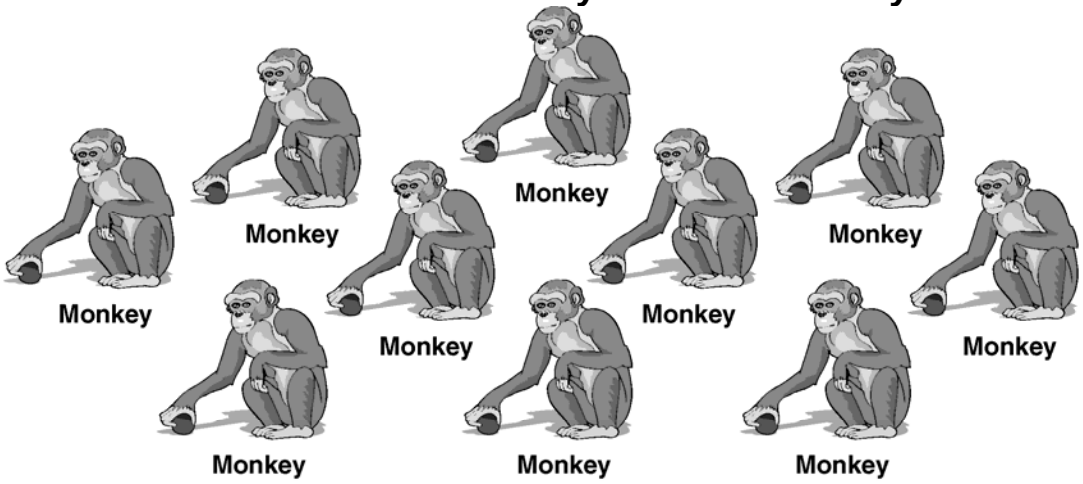
4. Did the class see more lions or more giraffes? Show how you get your answer.

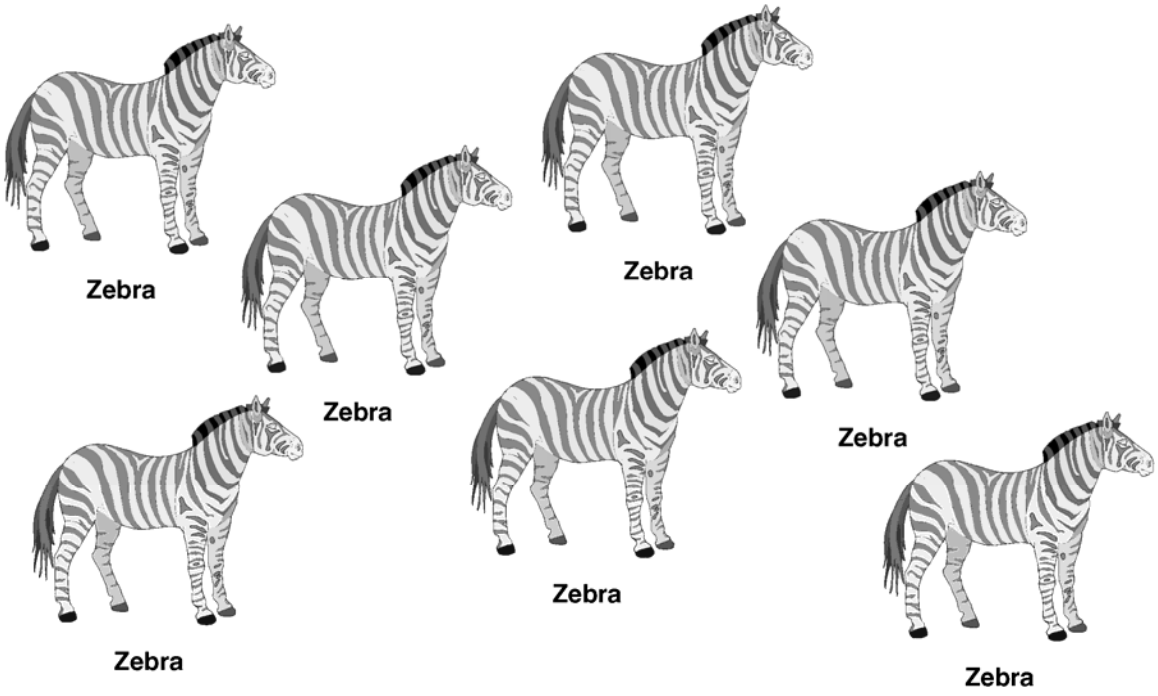
Check one: ☐ **More lions** ☐ **More giraffes**

How many more?
Show how you get your answer.

There were _____ more _____.
(write number) (lions or giraffes)

Mr. Carter's class also saw monkeys and zebras. The pictures below show the number of monkeys and zebras they saw.





5. Count the monkeys.

How many monkeys did the class see? _____

Count the zebras.

How many zebras did the class see? _____

6. How many monkeys and zebras did the class see in all?

Show how you get your answer.

They saw _____ monkeys and zebras in all.

Learning and Teaching Considerations

Tasks 1 and 2:

A) Be sure that students understand that the word "count" generally signifies that there is a one-to-one correspondence between the numbers and the objects. Some students who touch the pictures may skip or double touch one or more of them.

B) Be sure that students understand that the words "how many" generally signify an amount. They should know that the number they say signifies how many or the amount of objects they are considering. They should also know that the number they end on when counting represents the total amount of objects. The concept is known as of "cardinality"–the idea that number means amount.

C) Students may answer in words, symbols (digits, dots, dashes, base-10 block representations, L's, G's, etc.), or by using manipulatives (blocks, cubes). They may also count on their fingers, count out loud, use number lines, or touch each picture as they count. Be sure they understand that they can get the correct answer using any of the strategies, though some are more efficient.

D) As students count, note which picture they start with. Be sure that they understand that they can get the correct amount or the correct number starting with any picture. Students should know that the amount or number of objects is the same no matter where they start counting or how the objects are arranged.

E) 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. (That applies to the other tasks, as well.)

Task 3:

A) Be sure that students understand that the words "in all" generally signify the addition operation. They should also know that addition means put together or count on.

B) Students may answer in words, symbols (digits, dots, dashes, base-10 block representations, L's, G's, etc.), or by using manipulatives (blocks, cubes). They may also count on their fingers, count out loud, use number lines, or recall addition facts. Be sure they understand that they can get the correct answer using any of the strategies, though some are more efficient.

C) If students count, note whether they start with 3 and add 5 or vice versa. Be sure that they understand that they can get the correct answer using either method, but starting with 5 may be more efficient. (Some students may also start back at 1.)

D) Be sure that students understand that not only does $3 + 5 = 8$ and $5 + 3 = 8$ but also $8 = 5 + 3$ and $8 = 3 + 5$. Many textbooks and teachers have a tendency to write equations only one way, and so students are confused when they see them written differently. Using a balance scale may help.

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.)

Task 4:

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. They should also know that subtraction means break apart or take away.

B) Students may answer in words, symbols, or by using manipulatives. They may also count on their fingers, use number lines, add on, or recall number sense and subtraction facts. 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 they can check their answers by adding; for example, $5 - 3 = 2$ means $5 = 3 + 2$.

D) Be sure that students understand that $5 - 3 = 2$ is the same as $2 = 5 - 3$. Using a balance scale may help.

E) Some students may have the misconception that $5 - 3$ is the same as $3 - 5$, like addition. Working with manipulatives and number lines may help.

Task 5:

A) Be sure that students understand that the word "count" generally signifies that there is a one-to-one correspondence between the numbers and the objects. Some students who touch the pictures may skip or double touch one or more of them.

B) Be sure that students understand that the words "how many" generally signify an amount. They should know that the number they say signifies how many or the amount of objects they are considering. They should also know that the number they end on when counting represents the total amount of objects. The concept is known as cardinality–the idea that number means amount.

C) Students may answer in words, symbols (digits, dots, dashes, base-10 block representations, M's, Z's, etc.), or by using manipulatives (blocks, cubes). They may also count on their fingers, count out loud, use number lines, or touch each picture as they count. Be sure that they understand that they can get the correct answer using any of the strategies, though some are more efficient.

D) As they count, note which picture they start with. Be sure they understand that they can get the correct amount or the correct number starting with any picture. Students should know that the amount or number of objects is the same no matter where they start counting or how the objects are arranged.

Task 6:

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

B) Students may answer in words, symbols (digits, dots, dashes, base-10 block representations, M's, Z's, etc.), or by using manipulatives (blocks, cubes). They may also count on their fingers, count out loud, use number lines, or recall addition facts. Be sure that they understand that they can get the correct answer using any of the strategies, though some are more efficient.

C) If students count, note whether they start with 7 and add 10 or vice versa. Be sure that they understand that they can get the correct answer using either method, but starting with 10 may be more efficient. (Some students may also start back at 1.)

D) Be sure that students understand that not only does $7 + 10 = 17$ and $10 + 7 = 17$ but also $17 = 7 + 10$ and $17 = 10 + 7$. Many textbooks and teachers have a tendency to write equations only one way, and so students are confused when they see them written differently. Using a balance scale may help.

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.

Name: ANSWER KEY Date: _____

Mr. Carter's class went to the zoo. They saw lions. The pictures below show the number of lions they saw.

Lion

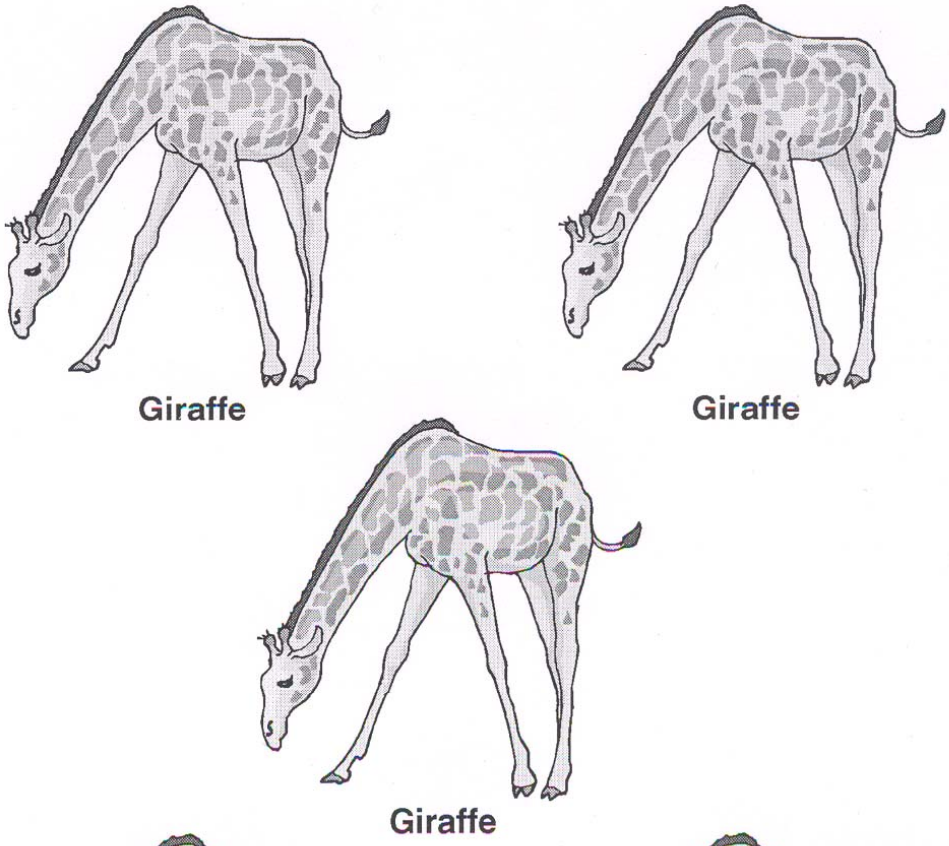
Lion

Lion

1. Count the lions.

How many lions did the class see? 3

Mr. Carter's class also saw giraffes. The pictures below show the number of giraffes they saw.

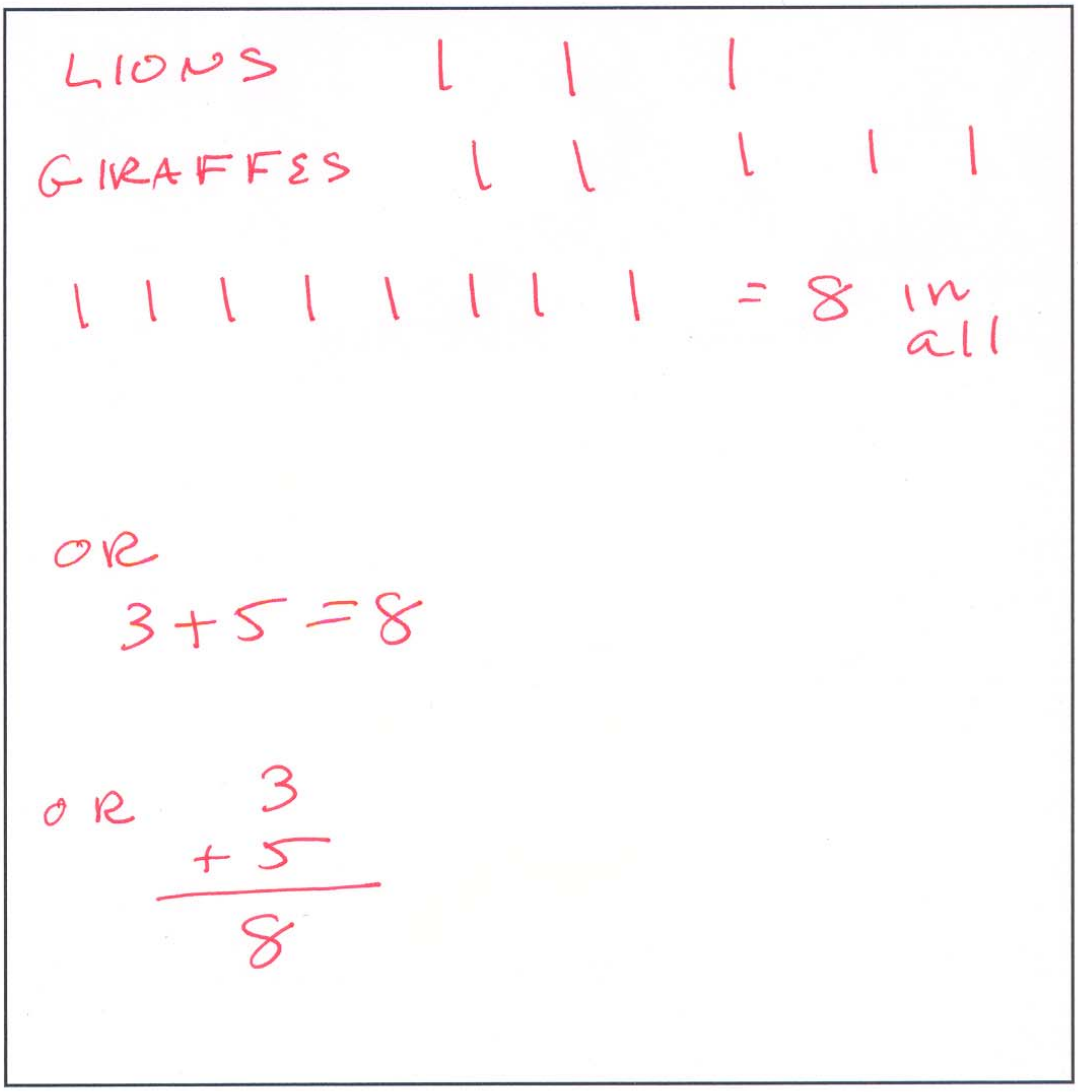


2. Count the giraffes.

How many giraffes did the class see? 5

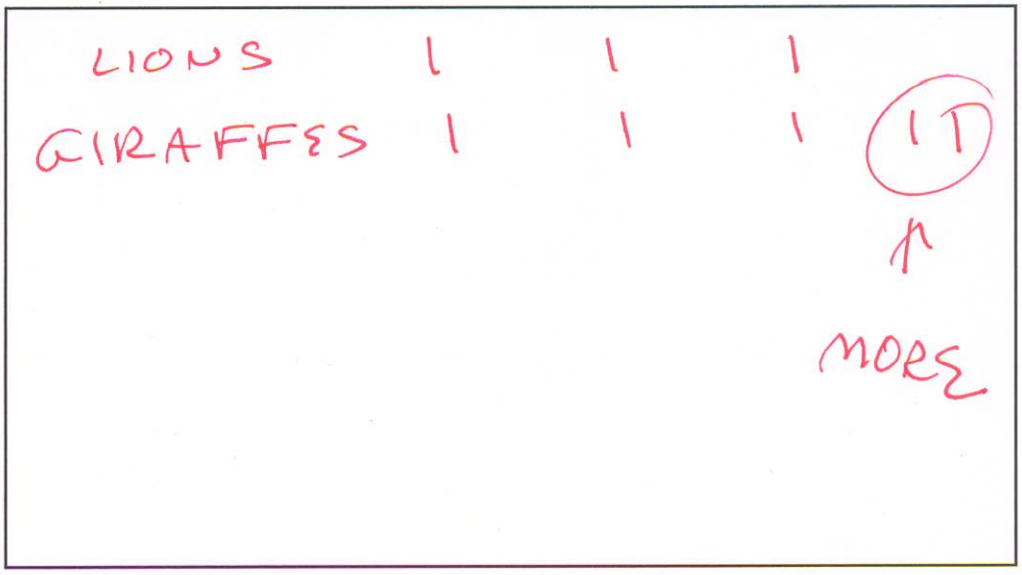
3. How many lions and giraffes did the class see in all?

Show how you get your answer.



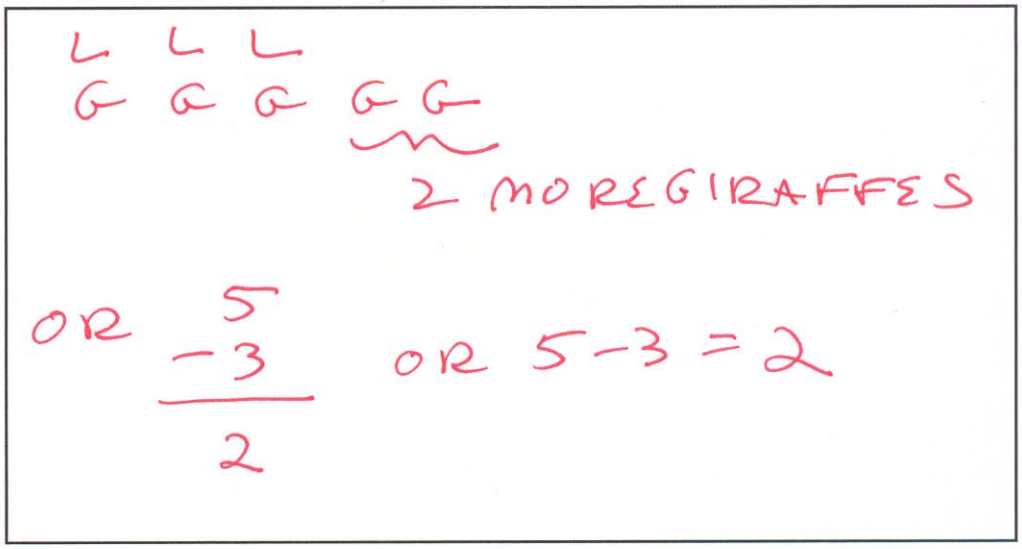
They saw 8 **lions and giraffes in all.**

4. Did the class see more lions or more giraffes?
Show how you get your answer.



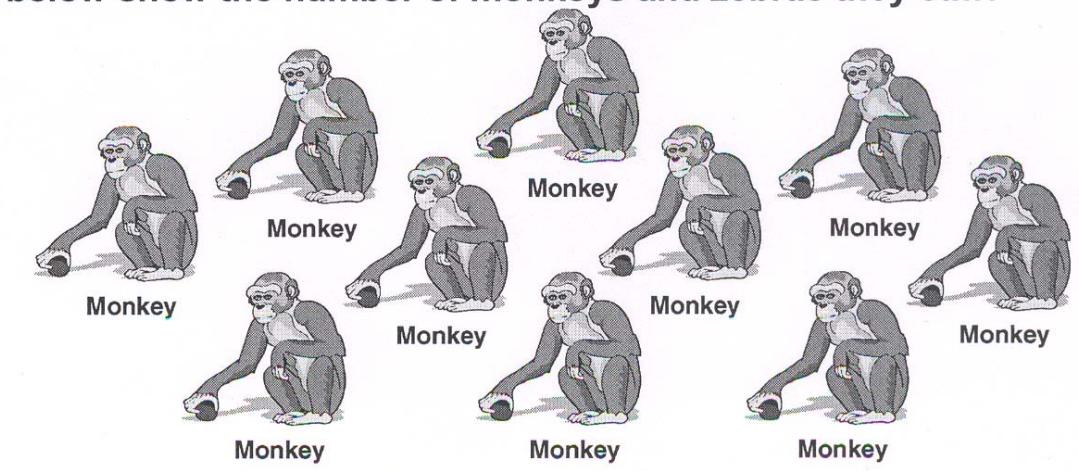
Check one: ☐ **More lions** ☒ **More giraffes**

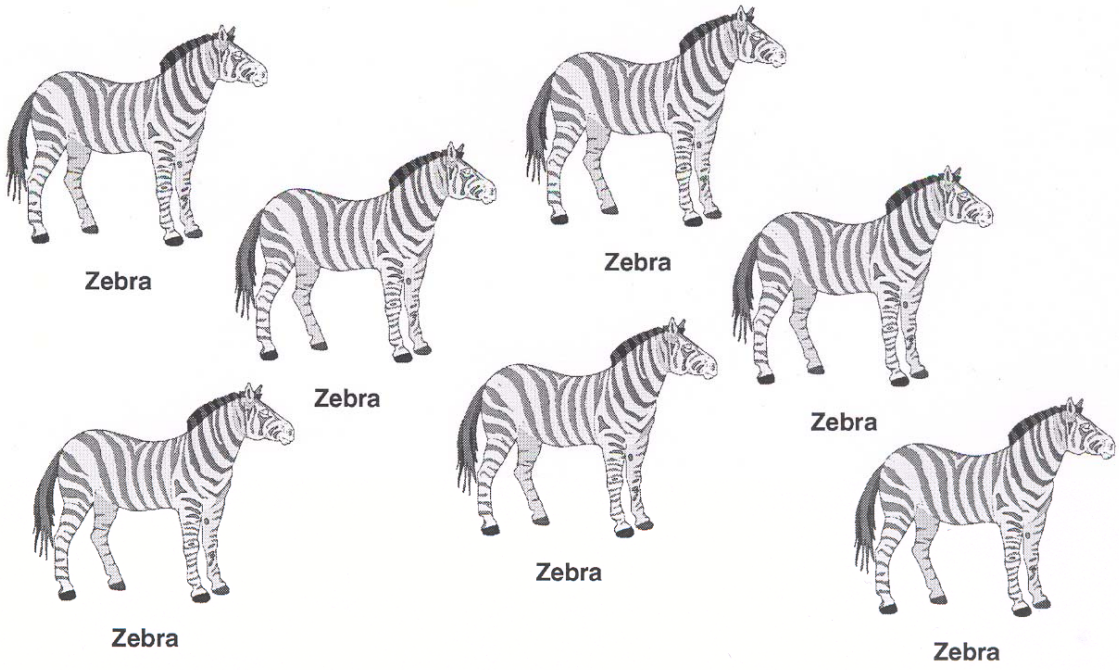
How many more?
Show how you get your answer.



There were 2 **(write number) more** GIRAFFES **(lions or giraffes).**

Mr. Carter's class also saw monkeys and zebras. The pictures below show the number of monkeys and zebras they saw.





5. **Count the monkeys.**

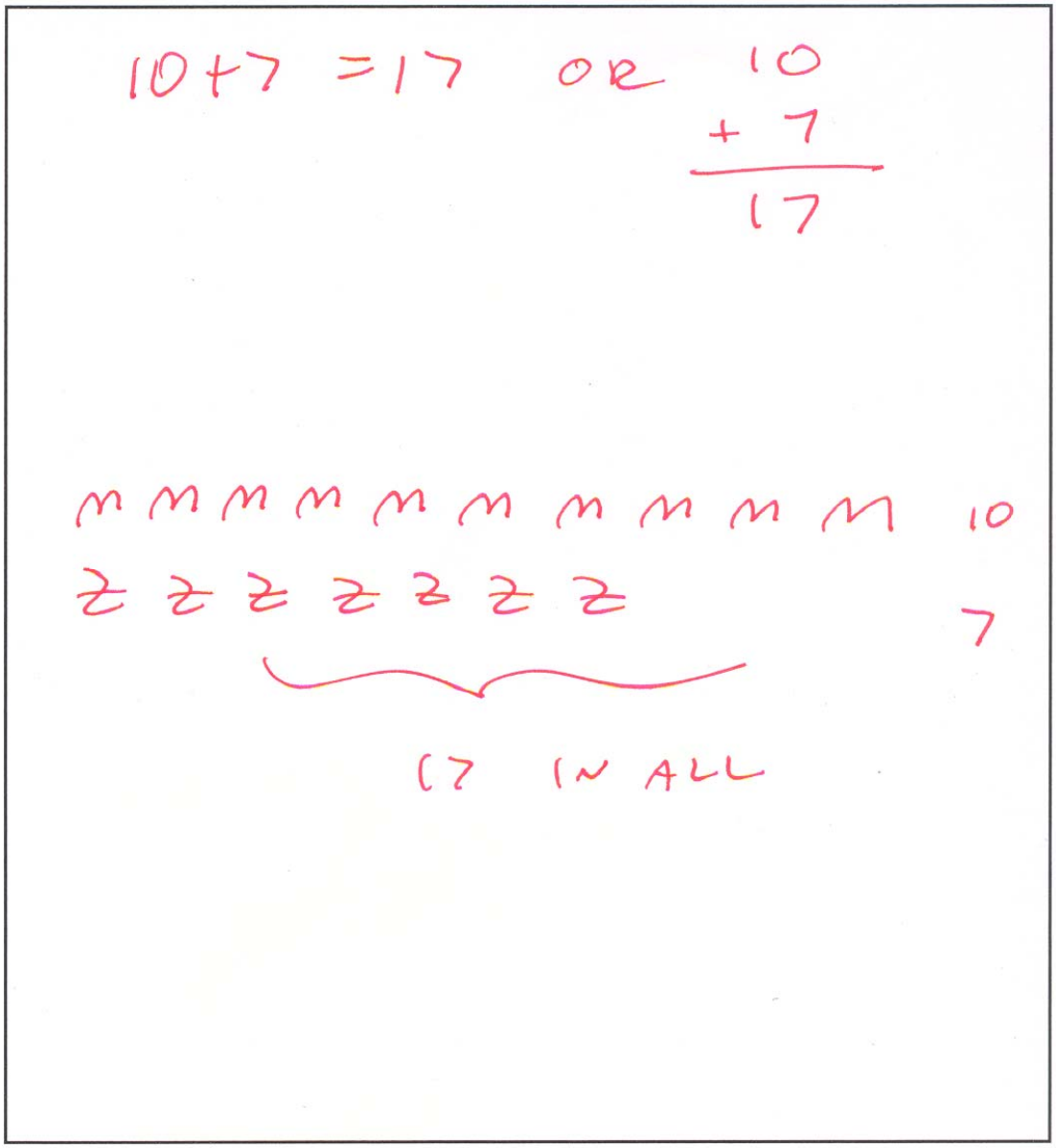
   How many monkeys did the class see? 10

   Count the zebras.

   How many zebras did the class see? 7

6. How many monkeys and zebras did the class see in all?

Show how you get your answer.



They saw 17 **monkeys and zebras in all.**

SITES-M Mathematics Challenge

Grade K–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. (Teacher may need to note such evidence on response sheet.) **Tasks 1 and 2**. Student shows evidence of understanding counting with numbers less than 10. **Task 3**. Student shows evidence of understanding addition or putting together two counts. **Task 4**. Student shows evidence of understanding subtraction or taking apart two counts. **Task 5**. Student shows evidence of understanding counting with numbers between 10 and 20. **Task 6**. Student shows evidence of addition.	Response shows evidence in only 4 or 5 of the tasks described in category 4. OR Response shows evidence of understanding of concepts of addition and subtraction throughout, but errors are made.	Response shows evidence in only 2 or 3 of the tasks described in category 4.	Response shows evidence in only 1 or fewer of the tasks described in category 4.

SITES-M Mathematics Challenge

Grade K–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. **Tasks 1 and 2**. Teacher should indicate on response sheet if student is able to count the number of lions and giraffes. **Task 3**. Student shows evidence of adding 3 + 5 or shows evidence of counting group of animals to reach 8. **Task 4**. Student shows evidence of subtracting 5 – 3 or shows evidence of 1-to-1 pairing of giraffes and lions with 2 giraffes remaining. **Task 5**. Teacher should indicate on response sheet if student is able to count the number of monkeys and zebras. **Task 6**. Student shows evidence of adding 10 + 7 or shows evidence of counting groups of animals to reach 17.	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 fewer of the tasks described in category 4.

SITES-M Mathematics Challenge

Grade K–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 3**. Student shows or explains how addition, putting together, or counting on is needed to get the total number of lions and giraffes. **Task 4**. Student shows or explains why there are more giraffes than monkeys. Student may show the need for subtraction, breaking apart, or taking away the numbers, or student may explain that if one lion is paired with one giraffe, there will be 2 giraffes left. **Task 6**. Student shows or explains how addition, putting together, or counting on is needed to get the total number of monkeys and zebras.	Response shows evidence in only 2 explanations described in category 4.	Response shows evidence in only 1 explanation described in category 4.	Response shows no evidence of the explanations described in category 4.

SITES-M Mathematics Challenge

Grade K–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 3. **Task 2**. Student answers 5. **Task 3**. Student answers 8. **Task 4**. Student checks the box for more giraffes and student answers that there are 2 more giraffes. **Task 5**. Student answers 10 monkeys and 7 zebras. **Task 6**. Student answers 17.	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 fewer of the tasks described in category 4.

Scoring Notes Checklist

Task	Check Yes	Category
Task 1		
Student shows evidence of understanding counting with numbers less than 10.		Concepts
Teacher should indicate on response sheet if student is able to count the number of lions and giraffes.		Strategy
Student answers 3.		Accuracy
Task 2		
Student shows evidence of understanding counting with numbers less than 10.		Concepts
Teacher should indicate on response sheet if student is able to count the number of lions and giraffes.		Strategy
Student answers 5.		Accuracy
Task 3		
Student shows evidence of understanding addition or putting together two counts.		Concepts
Student shows evidence of adding 3 + 5 or shows evidence of counting group of animals to reach 8.		Strategy
Student shows or explains how addition, putting together, or counting on is needed to get the total number of lions and giraffes.		Explanation
Student answers 8.		Accuracy
Task 4		
Student shows evidence of understanding subtraction or taking apart two counts.		Concepts
Student shows evidence of subtracting 5 – 3 or shows evidence of 1-to-1 pairing of giraffes and lions with 2 giraffes remaining.		Strategy
Student shows or explains why there are more giraffes than monkeys. Student may show the need for subtraction, breaking apart, or taking away the numbers, or student may explain that if one lion is paired with one giraffe, there will be 2 giraffes left.		Explanation
Student checks the box for more giraffes and student answers that there are 2 more giraffes.		Accuracy
Task 5		
Student shows evidence of understanding counting with numbers between 10 and 20.		Concepts
Teacher should indicate on response sheet if student is able to count the number of monkeys and zebras.		Strategy
Student answers 10 monkeys and 7 zebras.		Accuracy
Task 6		
Student shows evidence of addition.		Concepts
Student shows evidence of adding 10 + 7 or shows evidence of counting groups of animals to reach 17.		Strategy
Student shows or explains how addition, putting together, or counting on is needed to get the total number of monkeys and zebras.		Explanation
Student answers 17.		Accuracy

SITES-M Mathematics Challenge

Grade K–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.