

## Title: Number and Operations: Webbing Our Way Through Numbers

### **Brief Overview:**

The students will understand ways of representing numbers, relationships among numbers and number systems. The students will demonstrate an understanding of operations and how they relate to one another. They will compute and make reasonable estimates.

### **NCTM Content Standard/National Science Education Standard:**

#### Number and Operations Standard

- Understand and recognize ways of representing numbers
- Develop an initial understanding of place value
- Develop a sense of whole numbers
- Understand various meanings of addition and subtraction of whole numbers and the relationship between the two operations
- Make reasonable estimates

### **Grade/Level:**

These lessons are intended for 2<sup>nd</sup> graders.

### **Duration/Length:**

Three 50 to 60 minute lessons.

### **Student Outcomes:**

Students will:

- Recognize how many are in a set of objects.
- Use multiple models to develop initial understandings of place value and base ten number system.
- Develop a sense of whole number and represent and use them in flexible ways.
- Understand various meanings of addition and subtraction.
- Develop and use strategies for whole number computations, with a focus on addition and subtraction.
- Make reasonable estimates.

**Materials and Resources:**

Resource Sheet—

SR1—Spider Template 1

SR2—Spider Snacks Chart (Place Value Chart)

SR3—Spider Template 2

SR4—Egg Sac Template

SR5—Spider Sense Assessment

SR6—Spider Sense BCR

TR1—Answer Key to Spider Assessment

TR2—Answer Key to BCR

- Vertical Line with Spider—15 foot rope hanging from ceiling with a spider on top
- Writing utensils
- Three bags of small beans (at least 2 pound bags each) in containers
- Masking tape
- Index A and B cards with spider questions—for activity related to arachnid and entomologist
- Plastic wrap
- Rubber bands
- 2 Large boxes of Nerds (enough for each child to have at least a teaspoon)
- Two sets of measuring teaspoons
- Plastic spider rings (enough for each student)
- Box of paper clips
- Pack of 3x5 index cards cut in half for student's number estimations
- Skein of yarn—to make spider web

**Development/Procedures:****Lesson 1****Preassessment-**

- Distribute SR1 “ Spider Template 1” to each student. Pass out SR2 “Spider Snacks Chart”. Ask each pair to estimate how many small beans will fit in the spider's body. Have the recorder write the number on the place value chart under the estimate column.

**Launch –**

- Have students reveal their estimates. Have students write their estimates on an index card and paper clip them on the vertical spider line that is hanging from the ceiling in ascending order.

**Teacher Facilitation –**

- Prepare the classroom by placing desks in pairs, placing SR1 “ Spider Template 1” on one desk and a sticker on the other desk. Explain to the students that they will be investigating numbers and their meaning through the use of spiders. Prepare a vertical line hanging from a spider and have containers of small beans.

### **Student Application-**

- Have child take a handful of small beans from the teacher's bowl as each pair is visited. Request the students to place their beans on the template. One student will be the counter and the other will be the recorder. Have the pair count and record the number of beans in the body of the spider. Ask "How many beans did your spider eat?" Ask the class to record the actual beans counted in the body of the spider under the Actual column of the SR2 "Spider Snacks Chart". Working in pairs the students will each compare their estimate column and their actual column by using greater than, lesser than or equal symbols. Model displaying the numbers in the place value chart by using hundreds, tens and ones. Have the students write their numbers on their own SR2 "Spider Snacks Chart" in the appropriate columns. Collect all of the students' papers (Charts) for Lesson 2 class discussion.

### **Embedded Assessment –**

- Observe students' progress and their ability to understand numbers. Informally assess how students are constructing and decomposing numbers on the SR2 "Spider Snacks Chart". Observe students' ability to count and write numbers, understand place values, and demonstrate an understanding of comparison of numbers.

### **Reteaching/Extension –**

- Any pairs having difficulty with the above concepts will work directly with the teacher.
- For those pairs who have understood the lesson, they will repeat the activity with a different handful of beans.

## **Lesson 2**

### **Note:**

Prepare the classroom by placing desks in pairs, placing SR3 "Spider Template 2" on each pair of desks. Explain to the students that they will be demonstrating an understanding of the meaning of operations and how they relate to one another. Prepare a vertical spider line hanging in front of the room and have containers with small beans. Have two sets of measuring teaspoons (because these spiders' bodies are much smaller, a handful may be too much). Two large circles taped on the floor to represent spiders for the launch activity.

### **Preassessment—**

- Give each pair of students the SR3 "Spider Template 2". Pass out SR2 "Spider Snacks Chart" to each pair. Ask each pair to estimate how many small beans will fit into each of the spiders' bodies. Have the recorder write the sum of those estimates on SR2 "Spider Snacks Chart" under the estimate column and write their estimate on one half of an index card. Place the index card on the vertical spider line. Have the class discuss why their estimates would be different from

yesterday's lesson. Guide their discussion to realize that the area of the small spider is reduced to half the size of the large spider.

#### **Launch—**

- Create two spider bodies with tape on the floor. Ask the class to estimate how many students can fit into the two spider bodies. Have students line up and fill the spider bodies. Record their estimates on your chalkboard or dry erase board. Have students line up and fill the spider bodies. Record the results as a number sentence and then ask the children for the sum (i.e. there are 15 students in body #1 and 14 students in body #2 totaling 29 student;  $15 + 14 = 29$ ). Explain that they will be demonstrating the use of addition and subtraction comparing their estimation and their actual answer through their roles as either an arachnid or entomologist.

#### **Teacher Facilitation/Student Application-**

- Ask the class to line up and pass out an index card labeled A or B to each student. Ask students to find the answer to the question on their index card by using the information placed around the room. Ask the students to work silently. As soon as they find the answer, they will be asked to return to their seat to work with their partner. Lead a short class discussion, discussing the scientific terminology as it relates to spiders in order for them to determine their measuring tool to feed the spiders. If you are an arachnid, you will scoop two half teaspoons of small beans to feed spider A. If you are an entomologist, you will scoop four-quarter teaspoons of small beans to feed spider B. Have students add and record the total number of beans on SR2 "Spider Snacks Chart". Have them compare their sum to their estimate using subtraction. Class discussion will then reveal similarities and differences between their estimate and actual answer. Pull out students' Lesson 1 Charts that can be reviewed to discuss how many actual beans the large spider had versus the two small spiders. Discuss their findings.

#### **Embedded Assessment—**

- Observe students' progress and their ability to demonstrate an understanding of numbers. Assess the students' ability to reasonably estimate. Observe students' abilities to demonstrate the process of addition and subtraction.

#### **Reteaching/Extension**

- Any pairs having difficulty with the above concepts will work directly with the teacher.
- For those pairs who have understood the lesson, they will repeat the activity with different measuring spoons of beans.

### **Lesson 3**

#### **Note:**

Prepare in advance the spider sacs using a teaspoon of Nerds for each sac. Place the Nerds in the middle of the piece of plastic wrap, and then enclose the Nerds with a rubber

band. Slide plastic spider ring over top portion of spider sac, creating the illusion that the spider is sitting on its sac. Arrange desks in groups of four. Place one SR2 "Spider Snacks Chart" and one SR4 "Egg Sac Template" per group. Use the vertical spider line. Have index cards available for the estimations. Prepare manipulative baskets for each group.

#### **Preassessment-**

- Have student sit down next to a spider egg sac, within the teacher made spider web from yarn. Under each spider egg sac there will be an index card, students will silently record an estimation of how many eggs they believe are in their coordinating egg sac.

#### **Launch –**

- Direct class discussion of the estimations and have each student paper clip their estimate on to the vertical spider line in ascending order. Explain to the students that today's activity will make them increase their abilities to compute addition, subtraction and estimation problems.

#### **Teacher Facilitation/Student Application –**

- Direct students to return to a seat bringing their spider sac with them. Have student record their estimate on SR2 "Spider Snacks Chart". Direct students to carefully open their spider egg sac, so as not to lose any spiderling, and then count the number of spiderlings within each sac. Spiderlings should stay on the sac (plastic wrap). Have students record the actual number of spiderlings on their SR2 "Spider Snacks Chart" and find the difference between their estimate and their actual count. Each group of four will record their estimate and actual count on the Spider Snacks Chart (SRS2). Will then compare their estimate and actual count by using the symbols ( $<$ ,  $>$ ,  $=$ ). Have them return to the spider web on the floor. Have the class discuss the processes they used to complete the task. Invite each student, one at a time, to the board to record his/her actual count of spiderlings. Discuss what computation strategy he/she used to come up with their use of the symbol ( $<$ ,  $>$ ,  $=$ ). Have students return to their seats and eat their spiderlings!.

#### **Embedded Assessment-**

- Observe students' progress in computation and estimation.

#### **Reteaching/Extension-**

- Any students having difficulty with the above concepts will work directly with the teacher using a variety of manipulative to reinforce these concepts.
- For those students who have mastered the lesson, they may experiment using these concepts with beans on SR4 "Egg Sac Template".

#### **Summative Assessment:**

The students will complete a written assessment activity, SR5 "Spider Sense". They will answer multiple-choice questions, as well as, select and create responses applying their

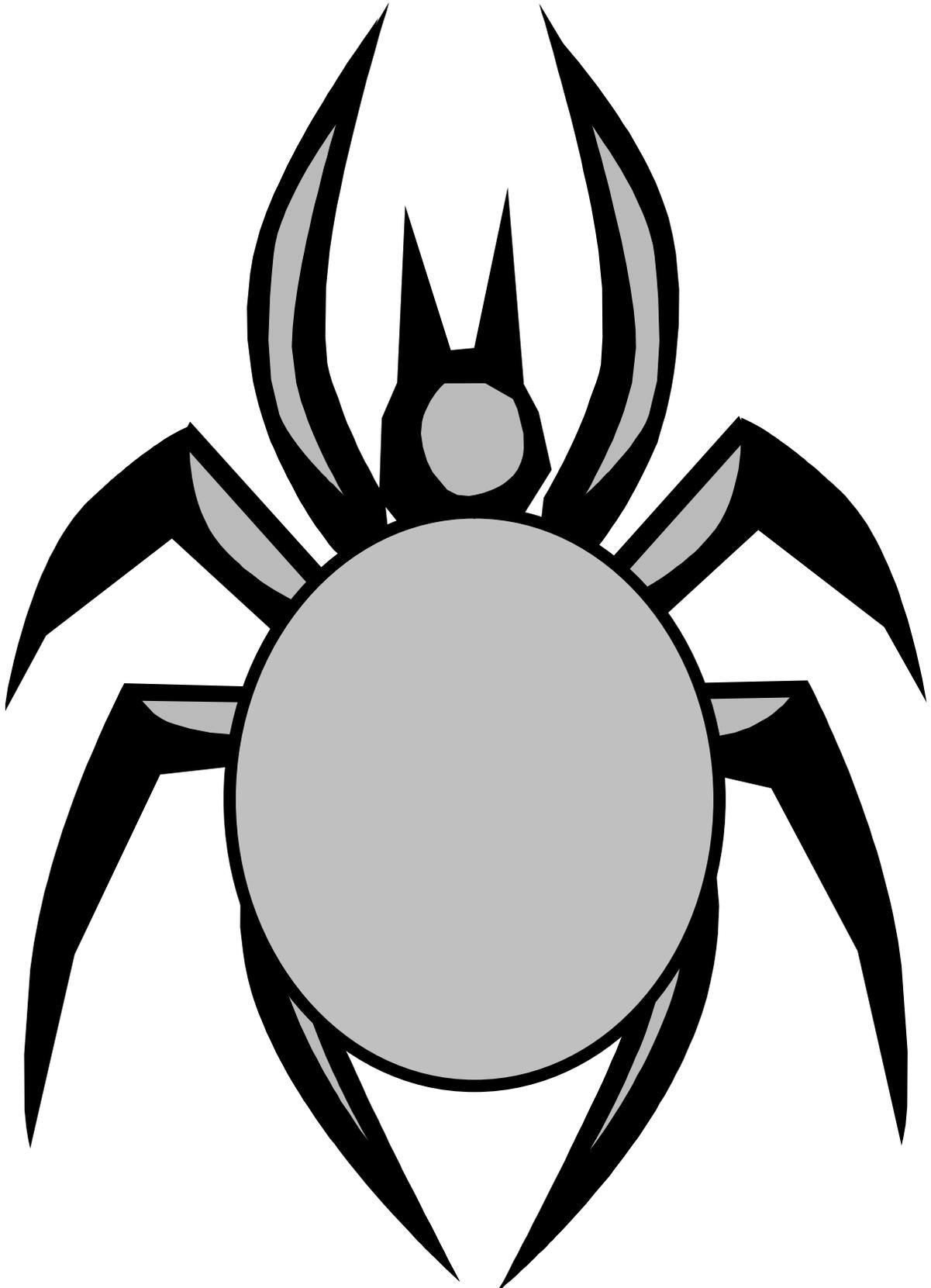
knowledge of addition and subtraction, computation, and estimation (Student Resource Sheet 5). Answers can be found on Teacher Resource Sheet 1.

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# *Spider Template 1*

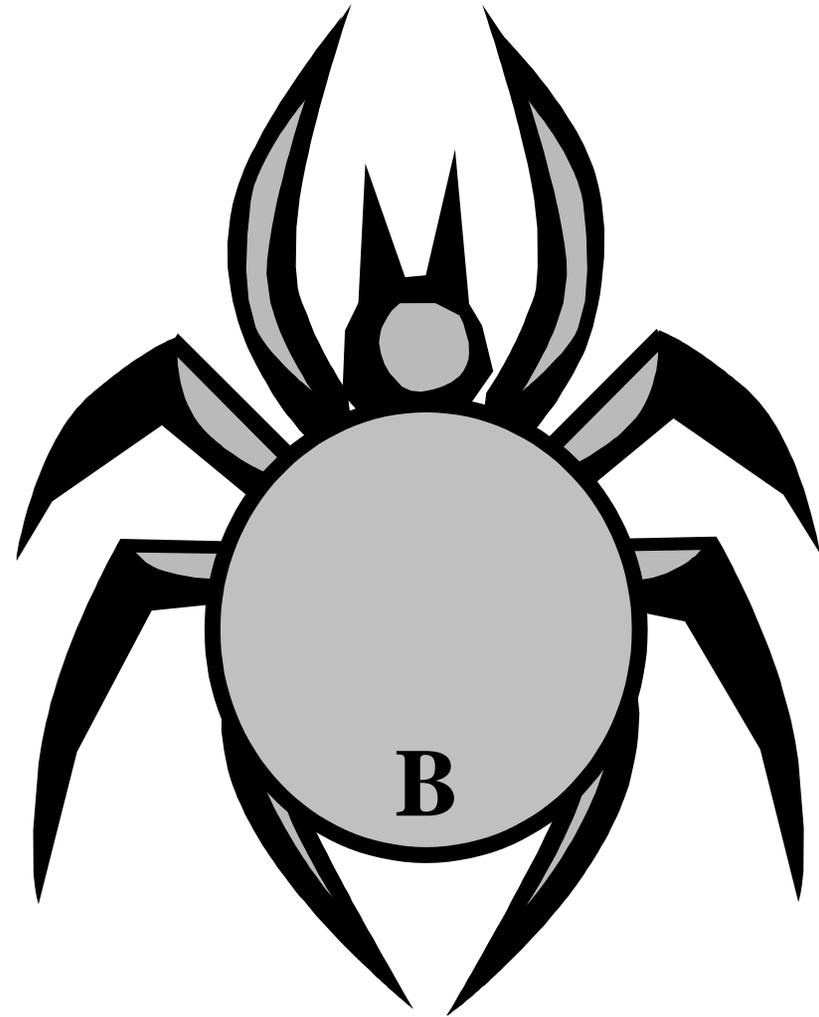
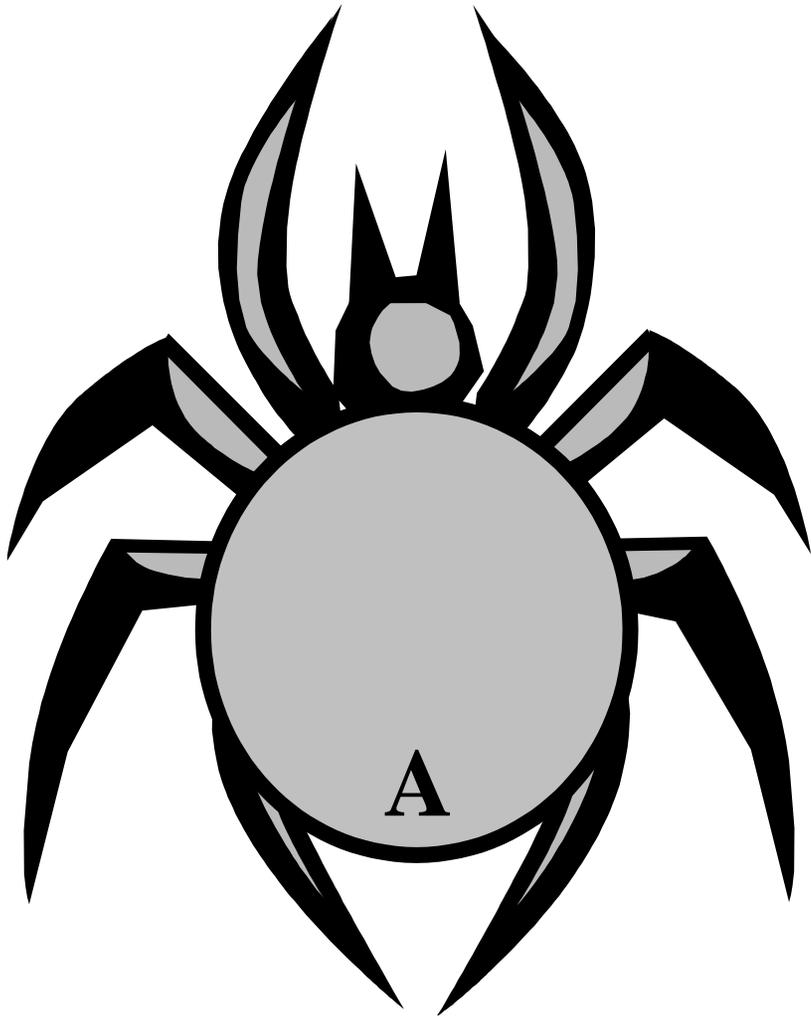


**SPIDER SNACKS CHART (PLACE VALUE CHART)**

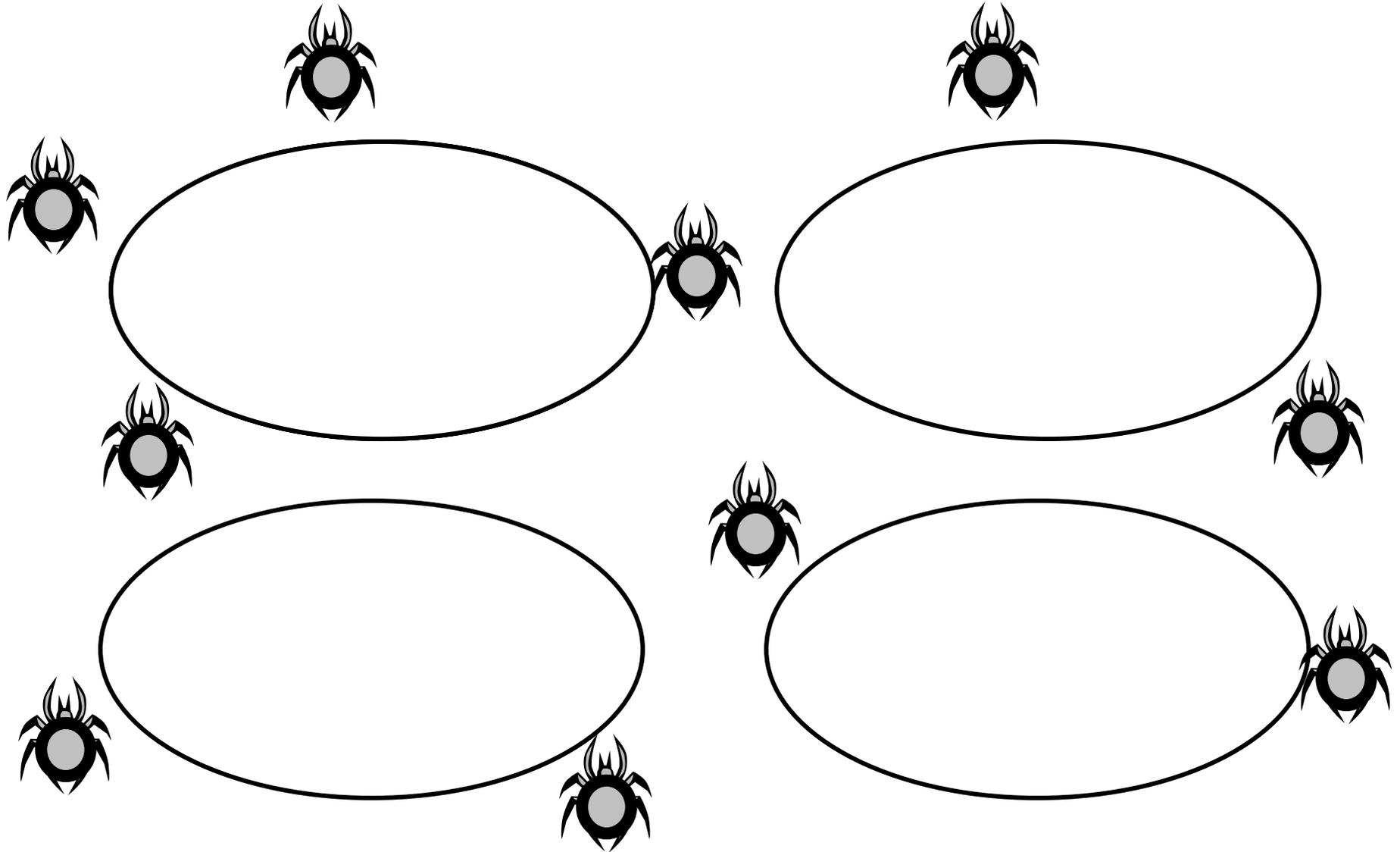
*Student Resource Sheet 2*

<b>Hundreds</b>	<b>Tens</b>	<b>Ones</b>	<b>Estimate</b>		<b>Actual Answer</b>
				○	
				○	
				○	
				○	

# Spider Template 2



# Egg Sac Template



**Total number of spiderlings \_\_\_\_\_**

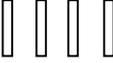
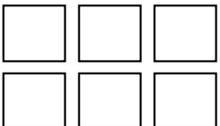
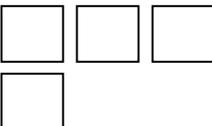
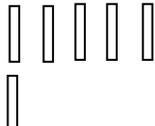


# Spider Sense

## Summative Assessment



1-4 Write the standard form of the number displayed on the chart.

Hundreds	Tens	Ones	Actual Number
			
			
			
			

**Add**

5)  $15 + 14 = \underline{\quad}$

- A 28
- B 42
- C 29
- D 22

6)  $62 + 31 = \underline{\quad}$

- A 31
- B 93
- C 82
- D 75

**Subtract**

7)  $74 - 31 = \underline{\quad}$

- A 43
- B 105
- C 40
- D 78

8)  $122 - 41 = \underline{\quad}$

- A 61
- B 165
- C 72
- D 81

## BCR for Spider Sense Assessment

Look at the number sentences in the area below.

$7 + 3 = \underline{\quad}$

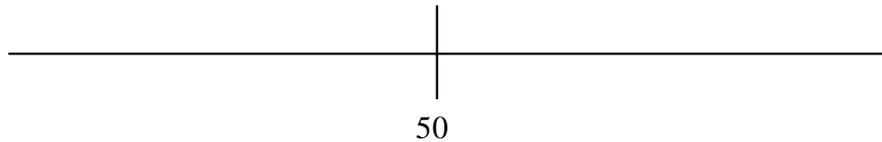
$60 - 31 = \underline{\quad}$

$14 + 3 = \underline{\quad}$

$74 - 31 = \underline{\quad}$

### Part A

Using the space provided, solve the above number sentences and place your answers on the number line.



### Part B

Use your understanding of numbers, addition, and subtraction to explain how you solved the problems and why you placed the numbers where you did on the number line.

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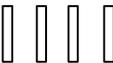
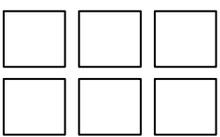
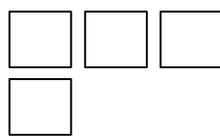
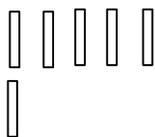


# Spider Sense

## Summative Assessment



1-4 Write the standard form of the number displayed on the chart.

Hundreds	Tens	Ones	Actual Number
			<b>142</b>
			<b>635</b>
			<b>321</b>
			<b>469</b>

Add

5)  $15 + 14 = \underline{\quad}$

- A 28
- B 42
- C 29
- D 22

6)  $62 + 31 = \underline{\quad}$

- A 31
- B 93
- C 82
- D 75

Subtract

7)  $74 - 31 = \underline{\quad}$

- A 43
- B 105
- C 40
- D 78

8)  $122 - 41 = \underline{\quad}$

- A 61
- B 165
- C 72
- D 81

## Answer Key for BCR for Spider Sense Assessment

Look at the number sentences in the area below.

$7 + 3 = \underline{(10)}$

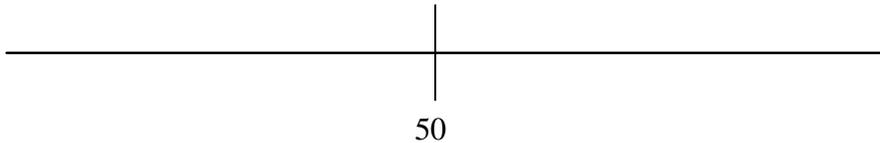
$60 - 31 = \underline{(29)}$

$14 + 3 = \underline{(17)}$

$74 - 31 = \underline{(43)}$

### Part A

Using the space provided, solve the above number sentences and place your answers on the number line.



### Part B

Use your understanding of numbers, addition, and subtraction to explain how you solved the problems and why you placed the numbers where you did on the number line.

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*Congratulations! You did such a great job today  
being a hard working pirate that you have earned  
your second clue. Clue #2: The treasure is in \_\_\_\_\_*

\_\_\_\_\_.





Number Line

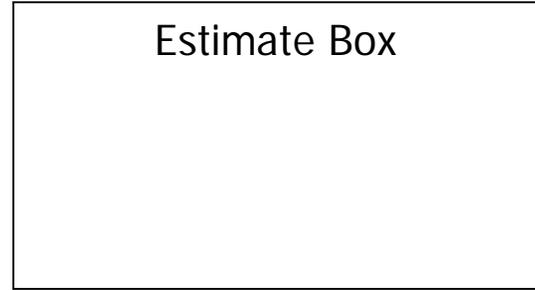
**SR-10**



Partial Products



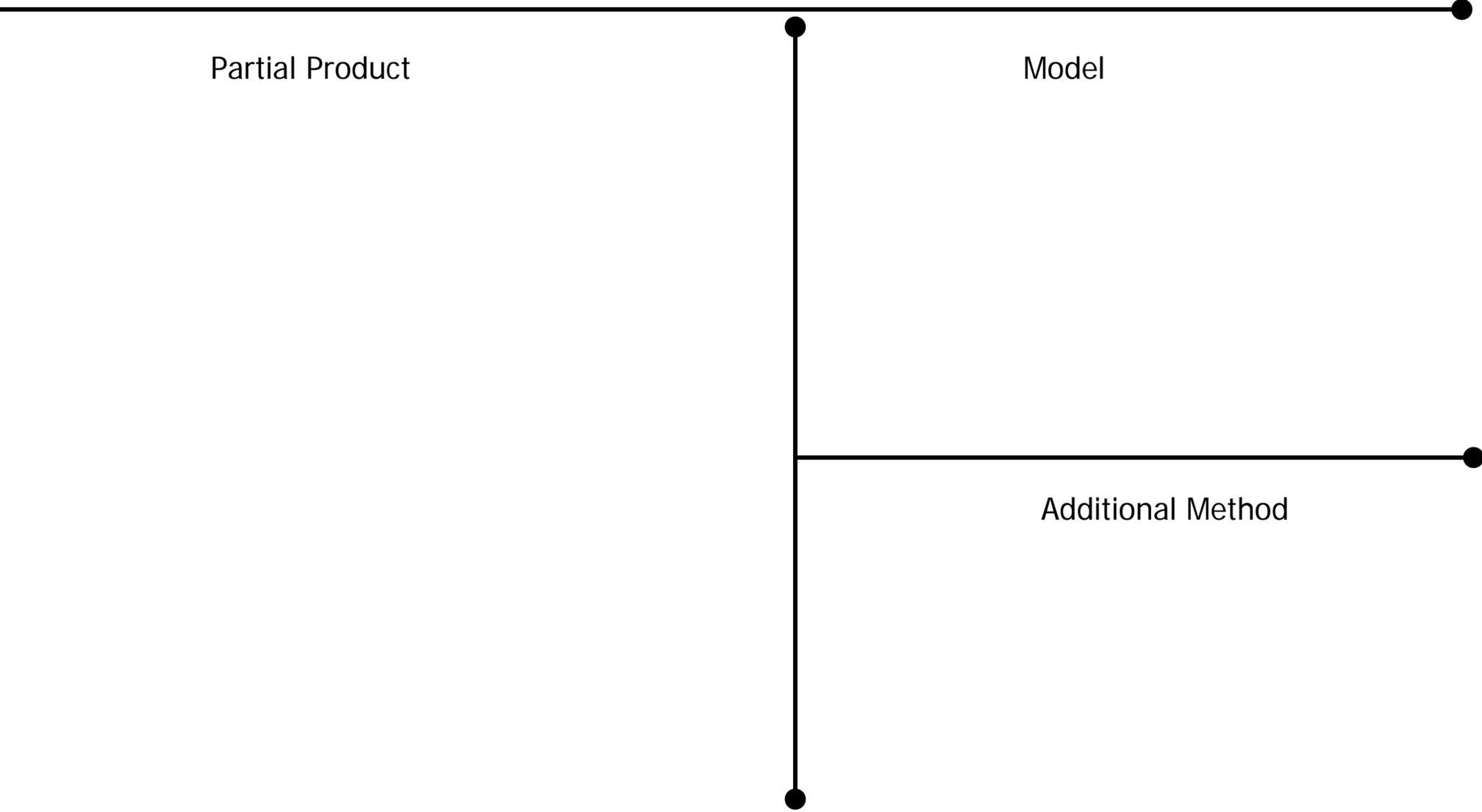
Estimate Box



Partial Product

Model

Additional Method





- Provide students with several 3 digit times 1-digit problems.
- Students must select one problem in which they will illustrate steps on how to solve the problem using partial products and one other selected method (models, repeated addition, or the shorter algorithm).



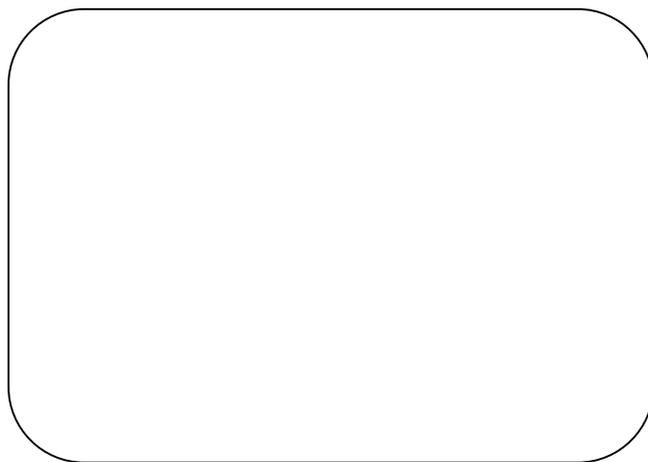
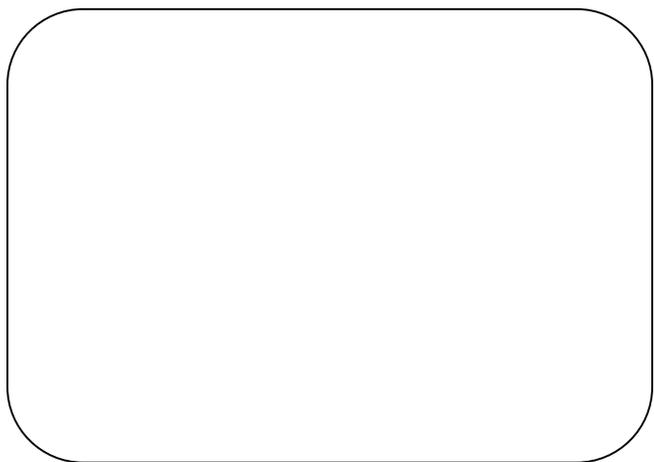
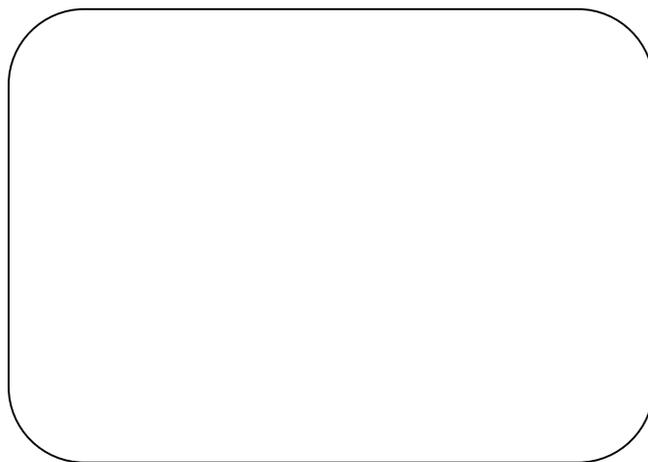
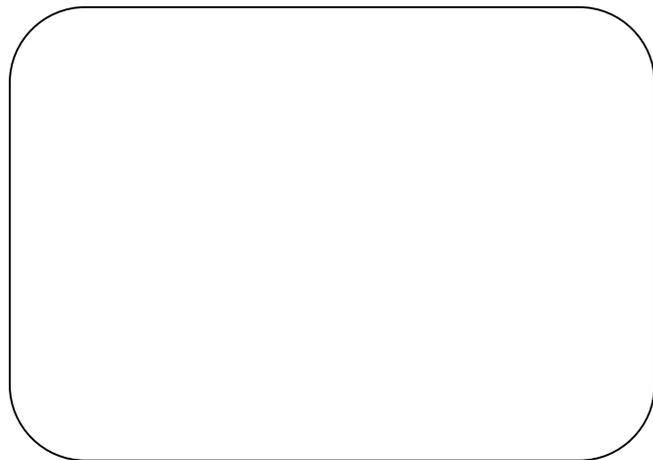
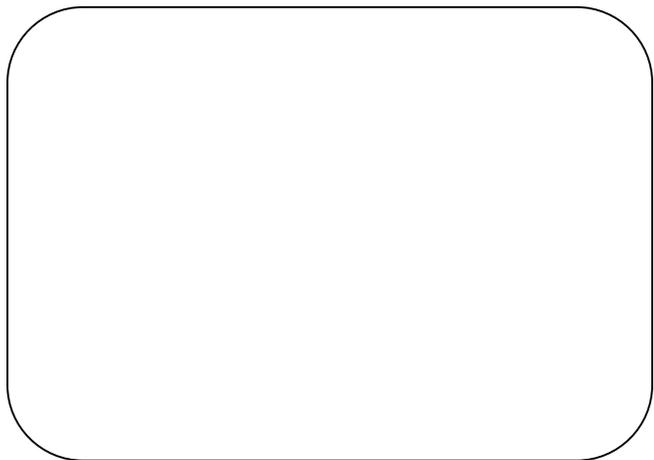
In the slide show students must:

- Effectively show the partial product strategy.
- Demonstrate another strategy for solving 2 to 3 digit multiplication times 1 digit.
- Give clear and logical steps to arrive at the product.
- Use math vocabulary to clearly explain terminology.
- Use numbers, words, symbols or pictures (or a combination of them) to show how they solved the problem.



Review Kid Speak Brief Constructed Rubric

⇒ ⇒ *slide show* ⇒ ⇒ SR-12 ⇒ ⇒





### Ship's Journal-Day3

Today was the third day of the treasure hunt. We all worked very hard. Reflect back on what we did in class today.

#### Part A

What is the product of  $246 \times 5$ ?

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#### Part B

Use what you know about multiplication to explain why your answer is correct. Use numbers, pictures, and/or words in your explanation.

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*Congratulations! You did such a great job today being a hard working pirate that you have earned your third clue. Clue #3: If you were \_\_\_\_\_*




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### Ship's Journal-Day3

Today was the third day of the treasure hunt. We all worked very hard. Reflect back on what we did in class today.

#### Part A

What is the product of  $246 \times 5$  ?

1230

#### Part B

Use what you know about multiplication to explain why your answer is correct. Use numbers, pictures, and/or words in your explanation.

At this point answers should be fluent with ideas of partial products. Students should be able to use math vocabulary and the partial product algorithm to explain their answer.

Congratulations! You did such a great job today being a hard working pirate that you have earned your third clue. Clue #3: If you were \_\_\_\_\_





## Last Entry in the Ship's Journal

We are so close to finding out treasure, but before we get our last clue, Pirate Pete and friends need some more multiplication help.

1. The captain of the ship asked Pirate Pete to gather supplies for the mateys. Each pirate needs 4 eye patches. There are 17 pirates. Use numbers and/or pictures to help Pirate Pete solve  $17 \times 4$ .

2. Each pirate needs 6 parrots. There are 34 pirates. Use numbers and/or pictures to help Pirate Han Yung solve  $34 \times 6$ .

3. Each pirate needs 2 wooden legs. There are 156 pirates. Use numbers and/or pictures to help Pirate Fubara solve  $156 \times 2$ .

4. Each pirate needs 3 gold earrings. There are 67 pirates. Pirate Mariela needs your help!

A. Solve  $67 \times 3 =$

B. Use what you know about multiplication to explain how you found the answer to part A. Use math vocabulary, pictures, numbers, and/or drawings in your explanation.

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*You did it! Here is your last clue: The treasure is in \_\_\_\_\_*

*Where do you think the treasure is? \_\_\_\_\_*





## Last Entry in the Ship's Journal

We are so close to finding out treasure, but before we get our last clue, Pirate Pete and friends need some more multiplication help.

1. The captain of the ship asked Pirate Pete to gather supplies for the mateys. Each pirate needs 4 eye patches. There are 17 pirates. Use numbers and/or pictures to help Pirate Pete solve  $17 \times 4$ .

*Students should find the product of 68. Look for student's understanding in their use of models, algorithms, and vocabulary.*

2. Each pirate needs 6 parrots. There are 34 pirates. Use numbers and/or pictures to help Pirate Han Yung solve  $34 \times 6$ .

*Students should find the product of 204. Look for student's understanding in their use of models, algorithms, and vocabulary*

3. Each pirate needs 2 wooden legs. There are 156 pirates. Use numbers and/or pictures to help Pirate Fubara solve  $156 \times 2$ .

*Students should find the product of 312. Look for student's understanding in their use of models, algorithms, and vocabulary*

4. Each pirate needs 3 gold earrings. There are 67 pirates. Pirate Mariela needs your help!

B. Solve  $67 \times 3 = 201$

B. Use what you know about multiplication to explain how you found the answer to part A. Use math vocabulary, pictures, numbers, and/or drawings in your explanation.

Sample responses: I found that Pirate Mariela needs 201 gold earrings. I used partial products to find this. 3 groups of 7 equal 21 and 3 groups of 60 equal 180. 180 plus 21 equals 201. Therefore, I know Pirate Mariela needs 201 gold earrings. Student responses should include strategies such as base ten modeling or partial products algorithm. Students should use math vocabulary to express their ideas.

You did it! Here is your last clue: The treasure is in \_\_\_\_\_

\_\_\_\_\_

Where do you think the treasure is? \_\_\_\_\_

\_\_\_\_\_



**MSA Brief Constructed Response “Kid Speak”  
Mathematics Rubric  
Grades 1 through 8**

Score	
<b>2</b>	<p><b>My answer shows I completely understood the problem and how to solve it:</b></p> <ul style="list-style-type: none"> <li>• I used a very good, complete strategy to correctly solve the problem.</li> <li>• I used my best math vocabulary to clearly explain what I did to solve the problem. My explanation was complete, well organized and logical.</li> <li>• I applied what I know about math to correctly solve the problem.</li> <li>• I used numbers, words, symbols or pictures (or a combination of them) to show how I solved the problem.</li> </ul>
<b>1</b>	<p><b>My answer shows I understood most of the problem and how to solve it:</b></p> <ul style="list-style-type: none"> <li>• I used a strategy to find a solution that was partly correct.</li> <li>• I used some math vocabulary and most of my reasons were correct to explain how I solved the problem. My explanation needed to be more complete, well organized or logical.</li> <li>• I partly applied what I know about math to solve the problem.</li> <li>• I tried to use numbers, words, symbols or pictures (or a combination of them) to show how I got my answer, but these may not have been completely correct.</li> </ul>
<b>0</b>	<p><b>My answer shows I didn’t understand the problem and how to solve it:</b></p> <ul style="list-style-type: none"> <li>• I wasn’t able to use a good strategy to solve the problem.</li> <li>• My strategy wasn’t related to what was asked.</li> <li>• I didn’t apply what I know about math to solve the problem.</li> <li>• I left the answer blank.</li> </ul>