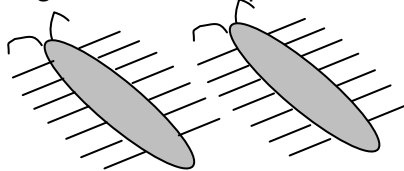| Task: Insect Collections	3rd Grade

Sage likes to collect and study insects. She found two woodlice (roly-poly) in a rotten log in her back yard. Her mother tells her that the two woodlice (roly-polies) have 28 legs combined.   Sage wants to know how many legs would be on just one woodlouse (roly-poly).

A. Show her how to use a drawing to solve this problem.

B. Write 2 equations, one with multiplication and one with division to solve this problem.

C. Explain your thinking by writing about how you answered her question.

Teacher Notes:

The common name for a woodlouse is "roly-poly". It is a small grayish-brown bug, approximately one centimeter long that rolls into a ball when disturbed.

Common Core State Standards for Mathematical Content	Common Core State Standards for Mathematical Practice
3. OA.A.1 Interpret products of whole numbers, e.g., interpret 5×7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as 5×7.* 3. OA.A.3 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. 3. OA.B.5 Apply properties of operations as strategies to multiply and divide. *Example: If $6 \times 4 = 24$ is known, then $4 \times 6 = 24$ is also known. (Commutative property of multiplication.) $3 \times 5 \times 2$ can be found by $3 \times 5 = 15$, then $15 \times 2 = 30$, or by $5 \times 2 = 10$, then $3 \times 10 = 30$. (Associative property of multiplication.) Knowing that $8 \times 5 = 40$ and $8 \times 2 = 16$, one can find 8×7 as $8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56$. (Distributive property.)* 3.0A.B.6 Understand division as an unknown-factor problem. For example, find $32 \div 8$ by finding the number that makes 32 when multiplied by 8.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

Essential Understandings

- Division is defined by its inverse relationship with multiplication.
- Division can be used to find how many equal groups (measurement – repeated subtraction) or how many are in each group (partitive – sharing).
- Multiplication can be used to find the total number of objects when there are a specific number of groups with the same number of objects.
- Each multiplicative expression developed in the context of a problem situation has an accompanying explanation, and different representations and ways of reasoning about a situation can lead to different expressions or equations.

Explore Phase

Possible Solution Paths	Assessing and Advancing Questions

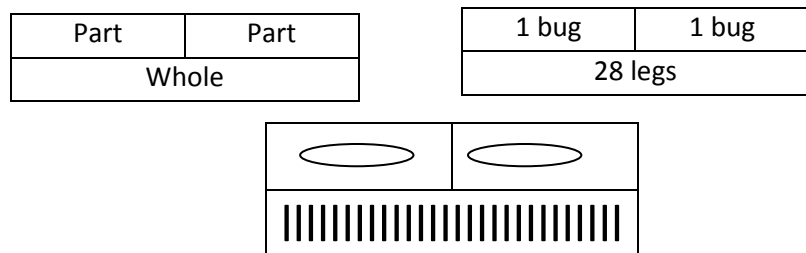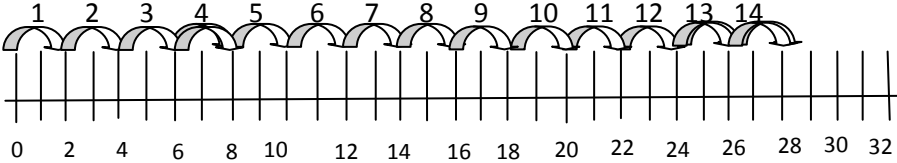|	
Drawing two bugs and distribute/partition the 28 legs evenly. 	Assessing Question: Why did you draw two woodlice to find out how many legs were on only one? Advancing Question: Create a table/chart showing how many legs are on 3, 4, 5 or more bugs?
Repeated Subtraction The student subtracts 2 from 28 and explains that the two represents one leg for each bug. 28 - 2 = 26 14 - 2 = 12 26 – 2 =24 12 - 2 = 10 24 - 2 = 22 10 - 2 = 8 22 - 2 = 20 8 - 2 = 6 20 - 2 = 18 6 - 2 = 4 18 - 2 = 16 4 - 2 = 2 16 - 2 = 14 2 - 2= 0 Two was subtracted 14 times so each bug has 14 legs.	Assessing Question: Why did you subtract 2 every time? Advancing Question: How could you have used another number to subtract? Can you show a way to use addition to solve this problem?
Using the division algorithm to divide the number 28 (legs) into two equal sets. 14 2) 28	Assessing Question: How did you decide to use division to show the number of legs on one woodlouse? Advancing Question: Write a multiplication equation showing the number of legs on 7 woodlice?
  Student moves one leg at a time until all legs are distributed.	Assessing Question: Why did you use 28 as the whole? Advancing Question: Show another way that you divided the whole into the two parts?

Student uses numbers that he/she can easily divide by two. Break 28 into 20 + 8 or 10 + 10+ 8. Resulting in 10 + 4 or 5 + 5 + 4 both equaling 14 legs per bug.	Assessing Question: Why did you select those numbers? Advancing Question: How can you show a way to use a number larger than 28 to solve this problem?
Count up by twos until you reach 28. Know that the number of skips represents the number of legs on each woodlouse. 	Assessing Question: Why did you skip count by two? Advancing Question: How long would your number line need to be to show the legs on 4 bugs? Will you show an equation to prove this?

Possible Student Misconceptions

Student may draw two bugs with 28 legs each or 1 bug with 28 legs. Students may multiply 2 x 28 or add 2 + 28 because they did not make sense of the task.	Assessing Questions: Let's read this problem together. What does it want you to find? What does the number 28 represent in this problem? Advancing Question: How do you think their legs are arranged on each side of their body? Does your answer make sense?

Entry/Extensions	Assessing and Advancing Questions
If students can't get started….	Assessing Question: Explain to me what Sage wants to find out? What information do you have to work with? Advancing Question: Can you show a way to draw the woodlice and put 28 legs on them?
If students finish early….	Show how you could write an equation that will let us find out how many legs are on three woodlice? Any number of woodlice? Explain all of the ways you were able to solve this problem and how they are related.

Discuss/Analyze

Whole Group Questions

How are the legs arranged on a woodlouse?   (on the sides) Is there a pattern and if so what is it? (same number on each side)
Select and sequence student strategies to be shared so that multiple ways to solve the problem are presented.

How did you use the numbers given to make the legs on each woodlouse the same?
Who can explain what this problem wants us to find?
What does the number 28 represent in this problem?
Are any of the solution paths we used similar? If so, how are they similar?
Do the pictures you drew and equations you wrote represent the same thing?
What is the connection between the division and multiplication used in this problem?