

# The Queen's Dilemma

## Unit 7: Calculate and Evaluate

### Grade Level

Grade 2

### Overview

In this task, students will use arrays to solve multiplication problems.

### Key Standards

**M2N3. Students will understand multiplication, multiply numbers, and verify results.**  
b. Use repeated addition, arrays, and counting by multiples (skip counting) to correctly multiply 1-digit numbers and construct the multiplication table.

### Possible Materials

- *A Remainder of One* by Elinor J. Pinczes (Houghton Mifflin Co., 1995)
- Array recording sheet (per group)
- Half sheet of chart paper (per group)
- Various manipulatives (pop cubes, counters, tiles, etc.)

### Task

The queen of the Bethlehem Ant Colony has 16 ants in her army. She doesn't always need all the soldiers to march in the parades. Sometimes she is trying to find some other group sizes of soldiers that can march evenly without having any soldiers left over. (She doesn't want them to march in single file, and she must have at least four in the parade.) Use the manipulatives to experiment with different amounts of ants to find how many possible ways the queen could arrange the soldiers. Use the chart to record your results.

### *Notes*

This lesson begins with a review of arrays. The teacher shares pictures of arrays that can be seen in the real world and discusses the difference between a row and a column. The teacher then reads aloud the book, *A Remainder of One*. Throughout the book, the teacher discusses the arrays with the students, focusing on the number of rows and columns and the product of each array. After reading the book, the teacher shares the task with the students (see task below). The students work with a partner to experiment with different arrays that the queen could create when arranging the ants. The students use manipulatives to create their arrays. They then draw their arrays on the chart paper and record the equation on the recording sheet. The lesson closes with a share time, where several groups share their discoveries and noticings. The teacher or students can record the arrays the students have found on a larger version of the array recording sheet.

### Sample Questions

1. What manipulatives are you using to help solve this problem?
2. Why are you arranging the tiles in that way?
3. What are some ways the queen could arrange 6 ants? 10? 16? etc.
4. How many rows does this array have?
5. How many columns does this array have?
6. How can you tell the difference between rows and columns?
7. What strategies are you using to help figure out ways the queen could arrange the ants?
8. How could you use repeated addition to help you solve this problem?
9. Could this number be arranged in a different way?
10. How would the equation be different if this array were rotated a  $\frac{1}{2}$  turn?
11. How are you communicating the results you have found?
12. What patterns are you noticing from your chart?
13. Do any of the arrays you have made have the same product?

### Sample Solutions

(The questions above are probing questions to ask students throughout the work session. These questions have no right or wrong answer and will vary depending on the child and the array in which he or she is working.)

### Assessment Ideas

- While students are working, have them explain the arrays they are creating. Utilize a checklist to keep track of who seems to have a solid understanding of the use of arrays in solving multiplication problems.
- After students have completed the activity, assess whether they have correctly shown their multiplication in pictures, writing, and equations.
- The next day, give students a similar problem in which they must solve independently. For example: Mrs. Brown has 20 students in her class. She wants to arrange their desks in an array. What are some possibilities of desk arrangements Mrs. Brown could use in her classroom?