Dots Problem

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Summary	We present to the students a problem dealing with a growing pattern over time. To begin, there is one dot. With each passing minute four more dots are drawn around the previous dot(s).
Goals	1. To discover and understand the underlying function explaining the growth over time of a pattern. In this class we will deal with functions, variables, and patterns.
Materials	Overheads, White Board or Chart Paper, Handouts
Keywords	Contextualized Situations Equivalence Full Class Discussion Interpretation of Visual Patterns Linear Functions Production of Equations Production of Tables Small Group Work

Activity Plan:

Introducing the Dots Problem

1. Representing a verbal problem [Whole Class]

Draw a dot at the center of an overhead or on chart paper. Then draw 4 more dots around the first dot, letting students know that this is what happens after one minute.

Ask the children to imagine that this image grows every minute. By how many dots did the figure grow each minute?

Draw dots corresponding to minutes 2 and 3. Discuss the image with the students. Ask: What does this image look like? What is happening in this image? How is it happening? How do you know? Do you see a

pattern? By how many dots is it growing each time? How do these points relate to each other?

Discuss different interpretations that students present. When appropriate, suggest drawing a box linking the four dots for each minute.

Review with them that the image began with only one dot. After one minute, the image grew to have 5 dots. After two minutes, it had 9 dots, etc.

2. Representing in a table [Whole Class]

Begin constructing a table on an overhead slide (page 2), with columns for minutes and total number of dots. Students will likely grapple with whether the pattern grows by 4 or 5 dots. Students will continue working on a table in their individual work (also page 2).

3. Small Group Work

Have the children work on their handout (page 1) individually or in pairs. Encourage them to explore the dots at diverse times:

- Can we figure out how many dots there will be after 6 minutes? After 10 minutes? After 100 minutes?

- Can you think of another way of showing what is happening, that is not using dots? (e.g., with numbers)

- How can you quickly find out how many dots there will be after 100 minutes?

- Write a message explaining what happens every minute. Say how you figured out the number of dots for 10 minutes.

4. Whole Class Discussion

Show different answers, ask children to explain how they got them, and discuss the answers with the class.

Fill in a table of values from 0 to 10 minutes and for 100 minutes.

How could we figure out the number of dots there would be for any number of minutes? Use *N* or *X* for any number of minutes. Guide the students to develop an equation from the relationship between minutes and dots.

5. Homework (Page 3)

Overhead and Handout **(Page 1)**

Name: _____ Date: _____

1. How many dots will there be after 10 minutes? Show how you found this out.

2. Draw a table showing what happened from 0 to 10 minutes.

3. Write a message explaining what happens after each minute.

4. How many dots will there be after exactly 100 minutes? Show how you found this out.

Overhead and Handout: The Table **(Page 2)**

Name: _____ Date: _____

Minutes	Total Number of Dots

Overhead and Homework: Represent the Problem, Step by Step **(Page 3)**

Name: _____ Date: _____

Linette wants to save money for a trip to an amusement park. She had $5 in her piggy bank. She then started delivering papers and earns $3 per day. Each day she puts the $3 in her piggy bank.

How much money will she have in total at the end of one day?

_____

At the end of 2 days? _____

At the end of 3 days? _____

At the end of 10 days? _____

Explain how you figured out the amount at the end of 10 days:

Linette has not spent any money. How much money will she have after 100 days of delivering newspapers? How would you explain to somebody how you thought about it.

How could you find out Linette's total amount of money for any number of days? Use numbers, letters, or words to explain.