8th grade  Task 4  Dots and Squares

<table>
<thead>
<tr>
<th>Student Task</th>
<th>Find and table number patterns in a geometric content. Find and use rules or formulas to answer questions.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Idea 3</td>
<td>Understand relations and functions, analyze mathematical situations, and use models to solve problems involving quantity and change.</td>
</tr>
</tbody>
</table>
| Algebra and Functions | • Use tables to analyze the nature of changes on quantities in linear relationships  
• Recognize and generate equivalent forms of simple algebraic expressions and solve linear equations.  
• Represent, analyze, and generalize a linear relationship (7th grade)  
• Use symbolic algebra to represent situations to solve problems (7th grade) |
| Core Idea 2  | Employ forms of mathematical reasoning and justification appropriately to the solution of a problem. |
| Mathematical Reasoning | • Use mathematical language and representations to make situations easier to understand |

Eighth Grade – 2003
Dots and Squares

This problem gives you the chance to:
- tabulate and find number patterns in a geometric context
- find and use rules or formulas

Sally draws squares of different sizes and counts the dots inside each square.

Sally makes a table showing the length of one side of each square (S), the perimeter of each square (P), and the number of dots inside each square (I).

<table>
<thead>
<tr>
<th>S</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Fill in the empty boxes in Sally’s table.

2. Write a rule or a formula for finding the number of dots inside a square when you know the length of a side of the square.

3. There are 49 dots inside a square. What is the length of one side of the square? Explain your reasoning.
Tom draws rectangles and counts the dots inside.

He makes a table showing the length of each rectangle (L), the width of each rectangle (W), and the number of dots inside (I).

<table>
<thead>
<tr>
<th>L (in squares)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>W (in squares)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I</td>
<td>0</td>
<td>2</td>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Fill in the empty boxes in the table above.

5. Write a rule or formula for finding the number of dots inside a rectangle (I) when you know the length (L) and the width (W) of the rectangle.

6. There are 63 dots inside a rectangle.

What is the length of the rectangle?

What is the width of the rectangle?
# Dots and Squares

The core elements of performance required by this task are:

- tabulate and find number patterns in a geometric context
- find and use rules or formulas

Based on these, credit for specific aspects of performance should be assigned as follows:

<table>
<thead>
<tr>
<th>Points</th>
<th>Section Points</th>
</tr>
</thead>
</table>

1. **Correctly completes the table:**

```
<table>
<thead>
<tr>
<th>P</th>
<th>4</th>
<th>8</th>
<th>12</th>
<th>16</th>
<th>20</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>9</td>
<td>1</td>
<td>4</td>
<td>9</td>
<td>16</td>
<td>25</td>
</tr>
</tbody>
</table>
```

*Allow 1 point for each two correct values.*

2. **Gives correct answer as:**

\[ I = (8 - 1)^2 \]

*Accept verbal equivalents.*

3. **Gives correct answer such as:**

The length of the side of the square is 8.

Gives explanation such as:

\[ 49 = 7^2 \]

4. **Correctly completes the table:**

```
<table>
<thead>
<tr>
<th>L (in square)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>W (in square)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>0</td>
<td>6</td>
<td>12</td>
<td>24</td>
</tr>
</tbody>
</table>
```

*2 × 1*

5. **Gives correct answer as:**

\[ I = (W - 1)(L - 1) \text{ (or equivalent)} \]

*Accept verbal equivalents.*

6. **Gives correct answer as:**

The length of the rectangle is 10. *(accept 22 or 64)*

The width of the rectangle is 8. *(accept 4 or 2)*

\[ 63 = 9 \times 7 \text{ or } 21 \times 3 \text{ or } 63 \times 1. \]

Both answers correct.

**Total Points**

10

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Eighth Grade – 2003