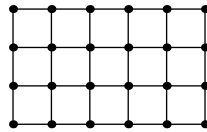




Try these problems before watching the lesson.

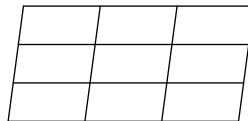
1. The dots in the grid below are equally spaced vertically and horizontally, with each dot 1 unit from its closest neighbors. How many different segments with length 1 unit are there with both endpoints among the dots in the grid?



2. In the figure shown, there are parallelograms of many sizes. How many total parallelograms are there in the diagram?



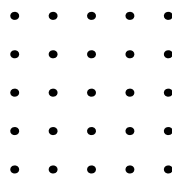
In the figure shown, there are parallelograms of many sizes. How many total parallelograms are there in the diagram?



 Follow-up Problems

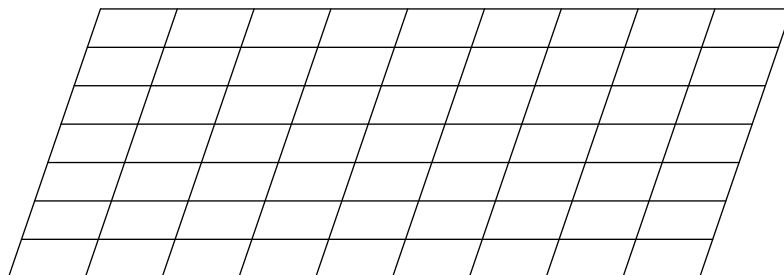
Do not use a calculator on the following problems.


- In Quadland, the alphabet has exactly 4 different letters. Every word in the Quadland language has no more than 4 letters. How many different words are possible? (A word can use a letter more than once, and 0 letters does not count as a word.)
- How many pairs of positive integers (m, n) satisfy the equation $m^2 + n < 31$?
- In the video, Richard explained why there are $\frac{4 \cdot 3}{2}$ ways to choose two horizontal lines in the grid, and $\frac{4 \cdot 3}{2}$ ways to choose two diagonal lines. Find a counting explanation for why there are $1 + 2 + 3$ ways to choose two horizontal lines, and $1 + 2 + 3$ ways to choose two diagonal lines.
- The dots in the grid below are equally spaced vertically and horizontally, with each dot 1 unit from its closest neighbors. How many different squares of any size can be formed by connecting four of the dots in the grid? (*Warning:* This is not quite the same as the parallelogram problem in the video!)



 Further Exploration

- In the figure shown, there are parallelograms of many sizes. How many total parallelograms are there in the diagram?



 *Share Your Thoughts*

Have some thoughts about the video? Want to discuss the problems on the Activity Sheet? Visit the MATHCOUNTS Facebook page or the Art of Problem Solving Online Community (www.artofproblemsolving.com).