

Warm-Up!

Try these problems before watching the lesson.

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



2. A dresser has five drawers stacked vertically. To be able to reach the contents in an open drawer, the drawer that is directly above the open drawer may not be open at the same time. In how many ways can one or more drawers be open so that the contents in each of the open drawers can be reached?
3. How many non-congruent triangles are there with sides of integer length having at least one side of length five units and having no side longer than five units?

The Problems

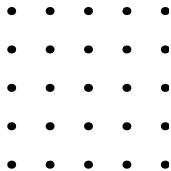
First Problem: The First National Bank of Zyzlvaria requires each customer to choose a code comprising four distinct digits from 1 to 5, inclusive, where the positive difference between any two consecutive digits must be at least 2. How many such codes are possible?

Second Problem: Four 1-cm cubes are joined face-to-face in all possible ways to form geometric solids. Two such solids are considered the same if one can be obtained from the other by rotation. How many such solids are possible?



Follow-up Problems

4. How many pairs of positive integers (m, n) satisfy the equation $m^2 + n < 31$?
5. How many ways can all seven numbers in the set $\{4, 3, 2, 8, 12, 1, 6\}$ be ordered so that a comes before b whenever a is a divisor of b ?
6. 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?



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).