Activity Sheet for the February, 2017, MATHCOUNTS Mini
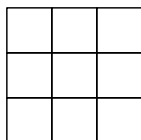
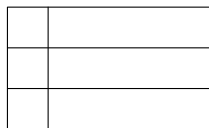## Warm-Up!

Try these problems before watching the lesson.

1. How many different squares of any size are there on the 3x3 board below?

2. Jamie has 2 dimes, 4 nickels and 8 pennies. In how many different ways can she make 26 cents?

3. 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?

4. 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: How many rectangles of any size are in the grid shown here?

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Second Problem: Eight blue and five orange tiles are arranged in an ordered line such that the tile on the left must be blue and every tile must be adjacent to at least one tile of the same color. For example, if an arrangement of four tiles was made, the only possibilities would be *BBBB* or *BBOO*. How many different arrangements are possible if all thirteen tiles must be used?

Follow-up Problems

5. 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?

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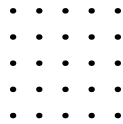
6. On the grid below, Beatrice draws all the lines with integer y-intercepts and slope 1 or -1. The lines form many intersection points. How many of these intersection points lie in the interior of the shaded region?
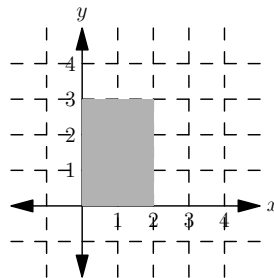
7. How many collections of six positive, odd integers have a sum of 18? Note that $1+1+1+3+3+9$ and $9+1+3+1+3+1$ are considered to be the same collection.

8. A bag contains ten identical blue marbles and ten identical green marbles. In how many distinguishable ways can five of these marbles be put in a row if there are at least two blue marbles in the row and every blue marble is next to at least one other blue marble?

Wow! 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).