the nmf weekly

Ask your math friend, James

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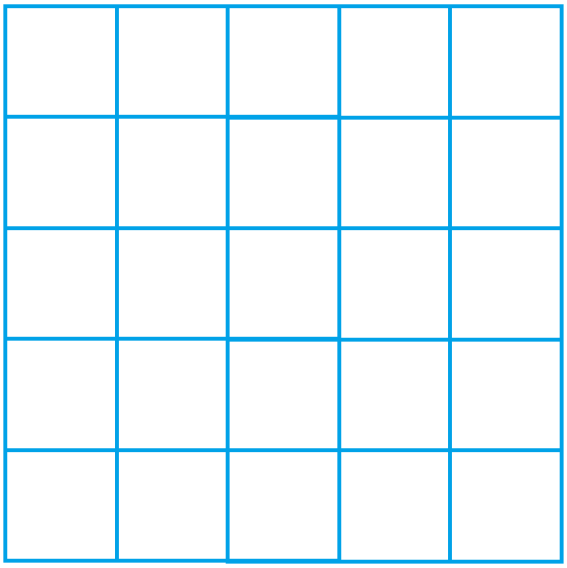
Favorite Math PUZZLE SOLUTIONS

Here are the answers to the puzzles from last time.

puzzle #1

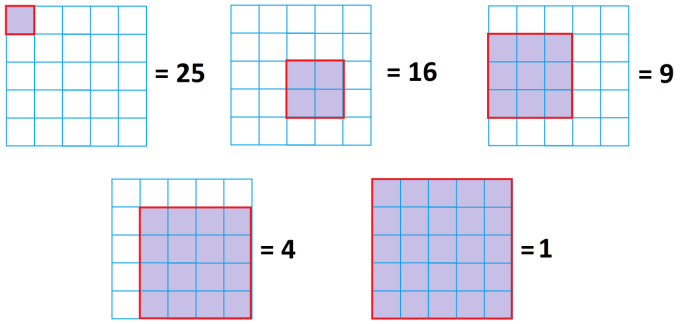
How many squares are there in a five-by-five grid of squares?

(I see more than 25!)



ANSWER TO PUZZLE 1:

There are certainly 25 one-by-one squares in the picture. But you can also count two-by-two squares (I get 16 of those), three-by-three squares (9 of those), four-by-four squares (4 of those), and 1 big five-by-five square. That makes for a total of 25 + 16 + 9 + 4 + 1 = 55 squares.



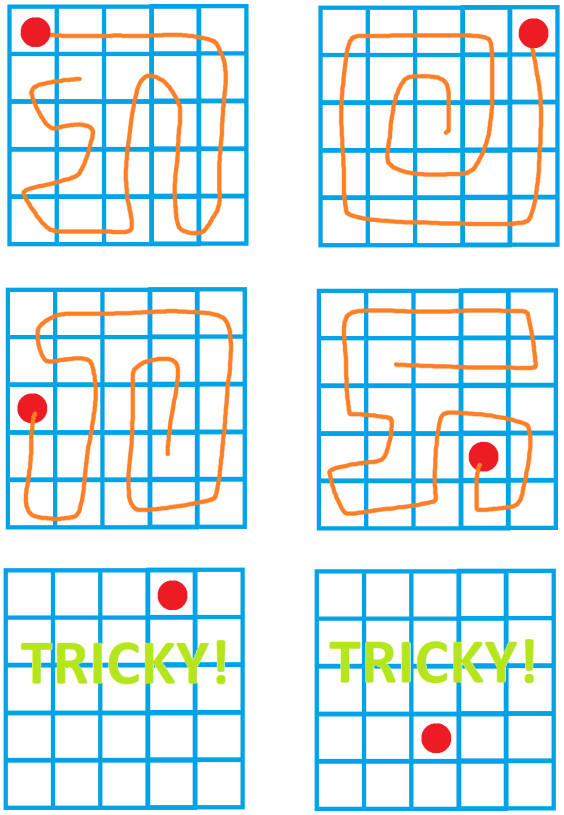
By the way: Do you notice that the count of squares of each size is a square number?

That's curious!

puzzle #2

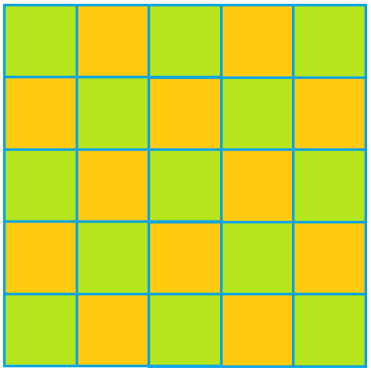
In the grid-walking puzzle, it is possible to stroll a path that visits each and every cells exactly once from some starting points. From other starting points, that task seems tricky.

Are those tricky starting positions actually impossible starting positions?



ANSWER TO PUZZLE 2:

Here's the coloring pattern that flashed into my mind that day as I was walking to school.



All the green cells were "good" starting cells and all the yellow ones were the tricky ones.

Here's why each yellow cell is actually an impossible starting position.

If you start on a yellow cell, you must walk to a green cell next. When on a green cell, you must walk to a yellow cell next. And then to a green cell. And then to a yellow cell. And so on.

So you must walk a journey that alternates in colors: YGYGYGYGYG....

But how many yellow cells are there? 12. How many green cells are there? 13.

Try writing out a sequence YGYGYGYG... using 12 Ys and 13 Gs and you see you run out of Ys before you use up all the Gs. It can't be done. And so no path starting from a yellow cell is possible!

About the Author: Dr. James Tanton

The NMF Weekly is written by mathematician Dr. James Tanton as a resource for friends and fans of the 2021 National Math Festival.

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