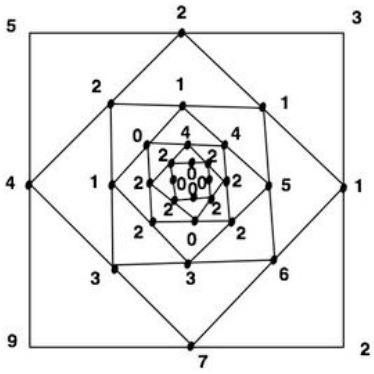
Diffy Squares

Math Concepts: Subtraction, estimation, patterns, strategy

How it Works

Draw a square, and pick four numbers to go in each of the corners. Put a dot on the midpoint of each side, and find the positive difference between the numbers on the closest corner. Now connect the midpoints. Lo and behold, you've got yourself another square! Which means you can repeat the process until you get all zeroes. (See next page for illustration.)



Big Questions:

Will this process always end in all zeroes?
If not, what's the longest it can last?

The Challenge

After you explain the rules and do a couple examples (using small numbers), challenge them to find a diffy square that will last for more "layers," or squares going inward, than any previous. What's the maximum number of squares you can get?

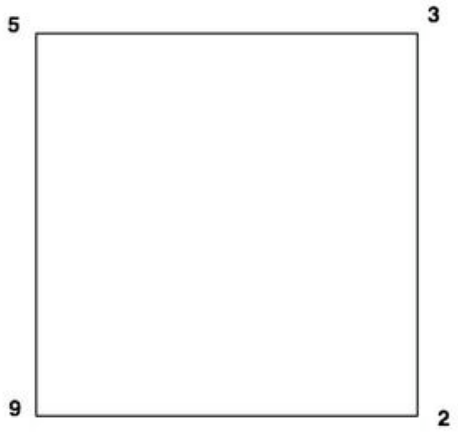
Why it's a great lesson

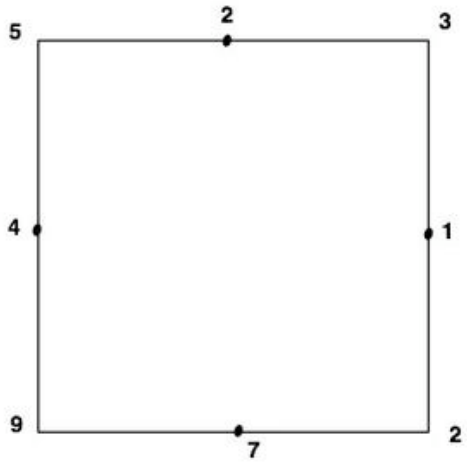
First, it's interesting, engaging, and totally mysterious. Everything seems to go to zero, but there doesn't seem to be any pattern. Because of that, it's a genuine puzzle, and kids will work on it. Happily, while they're working, they'll do an enormous number of subtraction problems, and be motivated to get them correct.

You can also use this as a motivation to teach more sophisticated kinds of subtraction, like multi-digit, decimal, or fraction subtraction. Each new type of subtraction may hold the key to break the old record!

How Diffy Squares Work

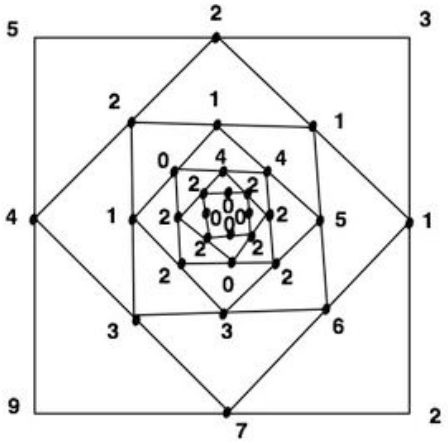
Step 1: Draw a square, and pick a number for each corner.

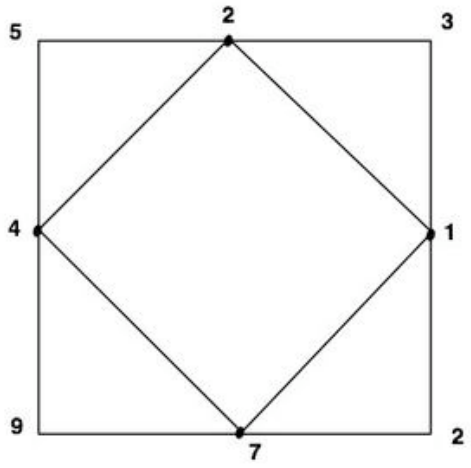




Step 2: Mark the midpoints, and label them with the positive difference of the two numbers on the nearest corners.

Step 3: Connect the midpoints. You get a new square!





Step 4: Continue until you reach all zeroes.

What's the longest you can go before your diffy square reaches all zeroes?
Will they always get to zeroes eventually?