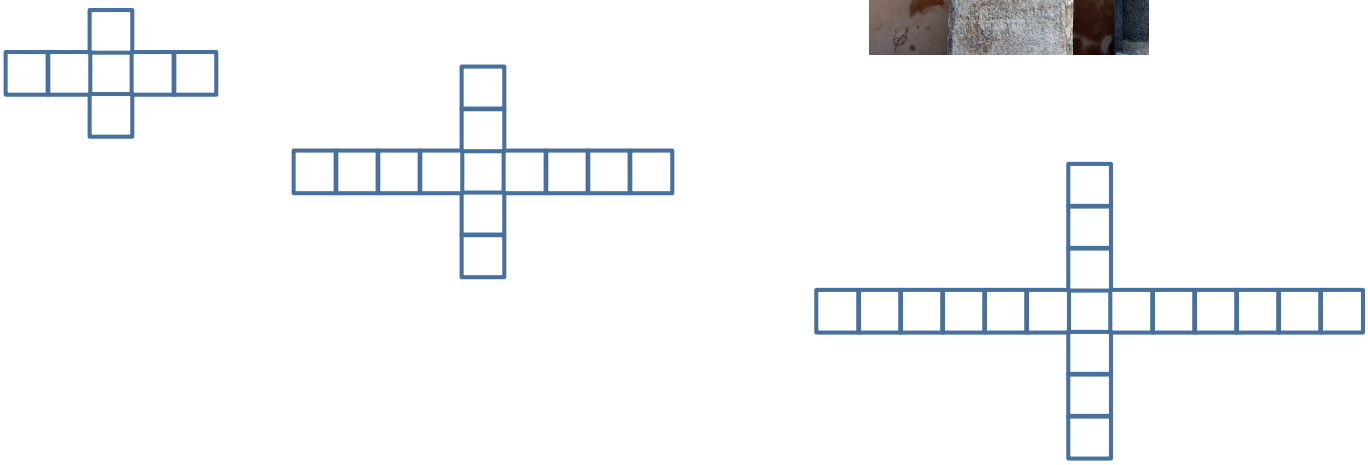
2.5 Making My *Point*

A Solidify Understanding Task

Zac and Sione were working on predicting the number of quilt blocks in this pattern:



When they compared their results, they had an interesting discussion:

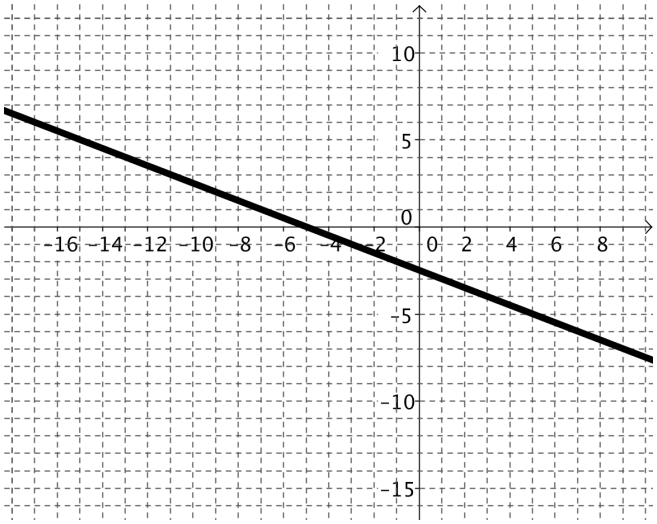
Zac: I got $y = 6n + 1$ because I noticed that 6 blocks were added each time so the pattern must have started with 1 block at $n = 0$.

Sione: I got $y = 6(n - 1) + 7$ because I noticed that at $n = 1$ there were 7 blocks and at $n = 2$ there were 13, so I used my table to see that I could get the number of blocks by taking one less than the n, multiplying by 6 (because there are 6 new blocks in each figure) and then adding 7 because that's how many blocks in the first figure. Here's my table:

1	2	3	n
7	13	19	$6(n-1)+7$

1. What do you think about the strategies that Zac and Sione used? Are either of them correct? Why or why not? Use as many representations as you can to support your answer.

The next problem Zac and Sione worked on was to write the equation of the line shown on the graph below.



When they were finished, here is the conversation they had about how they got their equations:

Sione: It was hard for me to tell where the graph crossed the y axis, so I found two points that I could read easily, (-9, 2) and (-15, 5). I figured out that the slope was $-\frac{1}{2}$ and made a table and checked it against the graph. Here's my table:

x	-15	-13	-11	-9	n
$f(x)$	5	4	3	2	$-\frac{1}{2}(n+9)+2$

I was surprised to notice that the pattern was to start with the *n*, add 9, multiply by the slope and then add 2.

I got the equation: $f(x) = -\frac{1}{2}(x + 9) + 2$.

Zac: Hey—I think I did something similar, but I used the points, (7,-6) and (9,-7).

I ended up with the equation: $f(x) = -\frac{1}{2}(x - 9) - 7$. One of us must be wrong because yours says that you add 9 to the *n* and mine says that you subtract 9. How can we both be right?

2. What do you say? Can they both be right? Show some mathematical work to support your thinking.

Zac: My equation made me wonder if there was something special about the point (9, -7) since it seemed to appear in my equation $f(x) = -\frac{1}{2}(x - 9) - 7$ when I looked at the number pattern. Now I'm noticing something interesting—the same thing seems to happen with your equation, $f(x) = -\frac{1}{2}(x + 9) + 2$ and the point (-9, 2)

3. Describe the pattern that Zac is noticing.

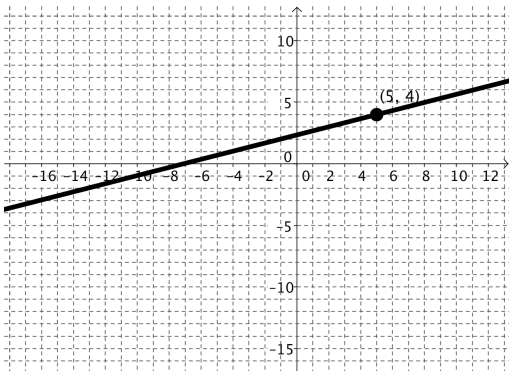
4. Find another point on the line given above and write the equation that would come from Zac's pattern.

5. What would the pattern look like with the point (a, b) if you knew that the slope of the line was m?

6. Zac challenges you to use the pattern he noticed to write the equation of line that has a slope of 3 and contains the point (2,-1). What's your answer?

   Show a way to check to see if your equation is correct.

7. Sione challenges you to use the pattern to write the equation of the line graphed below, using the point (5, 4).



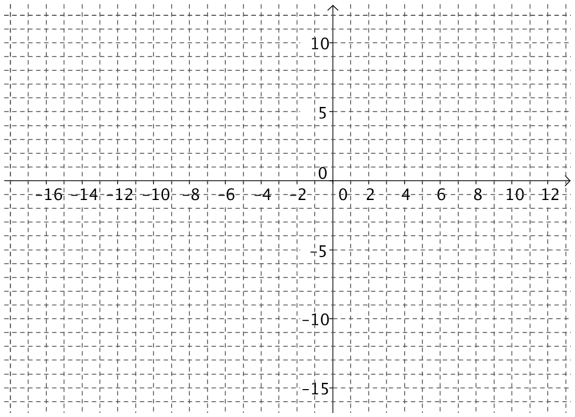
   Show a way to check to see if your equation is correct.

8. **Zac:** "I'll bet you can't use the pattern to write the equation of the line through the points (1,-3) and (3,-5). Try it!"

   Show a way to check to see if your equation is correct.

9. **Sione:** I wonder if we could use this pattern to graph lines, thinking of the starting point and using the slope. Try it with the equation: $f(x) = -2(x + 1) - 3$.
   Starting point: Slope:

   Graph:



10. Zac wonders, "What is it about lines that makes this work?" How would you answer Zac?

11. Could you use this pattern to write the equation of any linear function? Why or why not?