**Warm Up 3.9H**

Zac and Sione went back to work on an extension of the quilt problem they were working on before. Now they have this pattern:

**Zac:** This one works a lot like the last quilt pattern to me. The only difference is that the pattern is doubling, so I knew it was exponential. I thought that it starts with 7 blocks and doubles, so the equation must be $f\left(x\right)=3.5(2)^{x}$.

**Sione**: I don’t know about that. I agree that it is an exponential function—just look at that growth pattern. But, I made this table:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *x* | 1 | 2 | 3 | 4 |
| *f(x)* | 7 | 14 | 28 | 56 |

I used the numbers in the table and got this equation: $f\left(x\right)=7(2)^{x-1}$.

**Mark:** Very good work. I think those are both great and I think we can create a bunch more equations that will also work. See, $f\left(x\right)=14(2)^{x-2}$ , $f\left(x\right)=28(2)^{x-3}$ all create that same thing on my calculator.

1. How did Zac get 3.5 in the equation?
2. How did Sione get an x-1 in her equation?
3. Is Mark correct? Can you use any of the equations? Why?

The students started 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 $y=6\left(n-1\right)+7$ 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 | 4 | *n* |
| 7 | 6+7 = 13 | 6+6+7=19 | 6+6+6+7 = 25 | 6(*n*-1) +7 |

**Mark**: Again, I think we can make a lot of equations that will work. I have these on my calculator and they are all the same: *y* = 6(*n*-2) +13, *y* = 6(*n*-3) +19, *y* = 6(*n*-4) +25

1. Can all of the equations the students suggest work? Why or Why not?
2. If they all can work then make another one that would work?