BORDERS PROBLEM FINAL ASSESSMENT (EXEMPLAR)

PART 1

My expression is (*d* x 4) + 1, where "*d*" represents the number of boxes in one arm of the plus sign shape (not including the center). This is also the same as the diagram #, which makes it easier to use because you don't actually ever have to count anything in order to find the number of boxes a shape has.

I found this answer because I wrote an expression for diagram one – (1 x 4) + 1 – and figured out that as the diagram grows, the first "1" in the parentheses will grow bigger as well (because the arms of the plus sign get longer). I knew the "x 4" part would stay the same because there will always only be 4 arms to the plus sign and I knew the "+ 1" would stay the same because there is only one center box. In order to write an expression that would work for ANY size plus sign shape, I knew I had to replace the part that changes with a variable. I chose to call it ***d*** because it equals the diagram number.

PART 2

In my diagram, the *d* represents the number of boxes in one arm of the plus sign (shaded). The "x 4" represents that there are 4 arms, each with *d* boxes, so multiplying by 4 will count ALL of the arms. (also shaded, and numbered next to them to show there are 4). The "+ 1" represents counting the center box (striped).

PART 3

To figure out how many boxes are in Diagram # 100, I knew that I'd have to figure out what my variable, *d*, equaled for Diagram # 100. I wasn't sure at first, so I made a table to see if I could find a pattern.

Diagram #	What *d* equals
1	1
2	2
3	3
4	4

I noticed that in every diagram, *d* equaled the same thing as the diagram number, and thought this made sense because when the Diagram # increases by 1, the length of the arms increase by 1 as well. Therefore, I thought the Diagram # and *d* would always be the same and that Diagram # 100 must have 100 boxes in an arm.

Using my expression, I replaced *d* with 100 and got: (100 x 4) + 1. After calculating, I found that Diagram # 100 of this plus sign shape should have 401 boxes in it.