Motivating Algebra with Numerical Squares

EXAMPLE 1

$3^2 = 9$

$4^2 = (3+1)^2 = (3+1)(3+1)$ * F.O.I.L. ☺

$= 3^2 + 3 + 3 + 1$

$= 9 + 3 + 3 + 1$

$= 9 + 3 + 4 = 16$

OR

$= 9 + 2(3) + 1 = 9 + 6 + 1 = 16$

EXAMPLE 2

$4^2 = 16$

$5^2 = (4+1)^2 = (4+1)(4+1)$ * F.O.I.L. ☺

$= 4^2 + 4 + 4 + 1$

$= 16 + 4 + 4 + 1$

$= 16 + 4 + 5 = 25$

OR

$= 16 + 2(4) + 1 = 16 + 8 + 1 = 25$

What patterns do you see?

The square of a number, $(n+1)^2$, is the sum of

- the *square* of the previous one,
- the previous number, and
- the number

Let's generalize that using algebra.

$(n+1)^2 = n^2 + n + (n+1)$

OR

The square of a number, $(n+1)^2$, is the sum of

- the *square* of the previous one,
- *two times* the previous number, plus
- one

Let's generalize this approach using algebra.

$(n+1)^2 = n^2 + 2n + 1$

* note that in both answers above that $(n+1)$ is "the number", i.e., n itself is not the number, but the previous number