

Looking for Shortcuts: Part 2

Consider: Say we want to expand and simplify the expression $(x + 1)^2$.

Using the distributive property, from last class, we could figure out the answer this way:

$$\begin{aligned}(x + 1)^2 &= (x + 1)(x + 1) \\ &= x^2 + x + x + 1 \\ &= x^2 + 2x + 1\end{aligned}$$

Hmm.
That looks like a lot of work.
Could there be a better (faster) way?

Let's find a better way. We can use [Photomath](#), to save time when investigating.

1. Using Photomath, expand the expressions in section **A** and **B** below.

How to do this is shown at right.

A

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

$$(x + 2)^2 = x^2 + 4x + 4$$

$$(x + 3)^2 = x^2 + 6x + 9$$

$$(x + 4)^2 = x^2 + 8x + 16$$

$$(x + 5)^2 = x^2 + 10x + 25$$

B

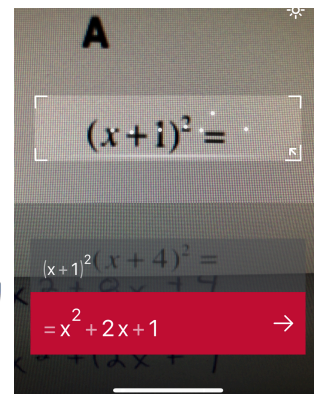
$$(x - 1)^2 = x^2 - 2x + 1$$

$$(x - 2)^2 = x^2 - 4x + 4$$

$$(x - 3)^2 = x^2 - 6x + 9$$

$$(x - 4)^2 = x^2 - 8x + 16$$

$$(x - 5)^2 = x^2 - 10x + 25$$



REFLECT: Describe any patterns you see. Note the signs of terms in your answers!

- sign of middle term in answer matches sign inside brackets
- square first term to get first term
- square second term to get final term
- middle term is product of first two terms, then doubled.

2. Using Photomath, expand the expressions shown in parts **C** and **D**.

$$(2x + 2)^2 = 4x^2 + 8x + 4$$

$$(2x + 3)^2 = 4x^2 + 12x + 9$$

$$(2x - 2)^2 = 4x^2 - 8x + 4$$

$$(2x - 3)^2 = 4x^2 - 12x + 9$$

PREDICT: Don't use Photomath. What will $(3x + 2)^2$ be? How about $(4x - 3)^2$?

MAKE RULES: If $(a + b)^2$ then the answer is...

$$a^2 + 2ab + b^2$$

If $(a - b)^2$ then the answer is...

$$a^2 - 2ab + b^2$$

This is a shortcut for **squaring binomials**

Now, [go to this IXL page](#) and earn a 100% SmartScore. You can do it!