Section 1.1 – Speaking Mathematically

Partner up

- Pick an integer and write it down.
- Square this integer and write it down.
- Write one less than the original integer.
- Write one more than the original integer.
- Multiply these two (the "one more" and the "one less").

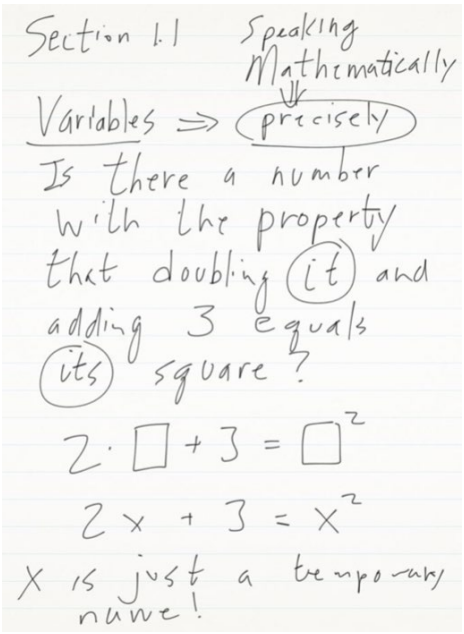
- Try again with a different integer.

- Do you see a pattern?

- Can you represent this mathematically?

$integer$	$integer^2$	$integer + 1$	$integer - 1$	$(integer + 1) * integer - 1$
4	16	5	3	15
-3	9	-2	-4	8
10	100	11	9	99
n	n^2	$n + 1$	$n - 1$	$(n + 1) * (n - 1) = n^2 - 1$

Now, on your own, consider:



What is the number?

$2x + 3 = x^2$

$x^2 - 2x - 3 = 0$

$(x - 3)(x + 1) = 0$

$x = 3,\ x = -1$

Try another:

Given any real number, its square is non-negative.

For any real number $x, x^2 \geq 0$

Or, for any real number $x, x^2 non - negative$

Or, For any real number $x, x^2 \in \mathbb{R}^{non-neg}$

Types of statements:

- Universal Statement – *All*, *For All*, *Every*, ∀
  So, we could also write the above as: For any real number $x, x^2 \geq 0$ more compactly as $\forall x \in \mathbb{R}, x^2 \geq 0$

- Existential Statement – *At Least One*, *There Exists*, *Every*, ∃
  There is a Discrete Mathematics course.

- Conditional Statement – *if-then*, →
  If it is raining, then the grass will grow.

- Universal Conditional Statement
  For all cars x, if x is new then x is expensive.
  Partner up

  Write this statement using more variables and symbols: $\forall\ cars\ x, x\ is\ new \rightarrow x\ is\ expensive$
  $\forall\ \boldsymbol{new}\ cars\ x, x\ is\ expensive$

  Write this statement without any variables or symbols: *All new cars are expensive*
  If a car is new, then it is expensive

- Universal Existential Statement
  Every student has a favorite class.

- Existential Universal Statement
  There is a car faster than all other cars.

In this class we will ***translate*** between ***formal*** and ***informal*** statements. Typically, as we saw above, there could be several equivalent and correct translations.

We define a ***formal*** statement as one with symbols and variables, while an ***informal*** statement has only words.

The statement *All real numbers have non-negative squares* "sounds" formal, but in our definition, it is informal, since there are no symbols or variables.