An Imaginary Number, when squared, gives a negative result.

\[ \text{imaginary}^2 \rightarrow \text{negative} \]
Try

Let's try squaring some numbers to see if we can get a negative result:

- $2 \times 2 = 4$
- $(-2) \times (-2) = 4$ (because a negative times a negative gives a positive)
- $0 \times 0 = 0$
- $0.1 \times 0.1 = 0.01$
... but imagine that there is such a number (call it $i$ for imaginary) that could do this:

$$i \times i = -1$$

Would it be useful, and what could we do with it?
\[ i = \sqrt{-1} \]
Example: What is the square root of $-9$?

\[
\sqrt{-9} = \sqrt{9 \times -1} \\
= \sqrt{9} \times \sqrt{-1} \\
= 3 \times \sqrt{-1} \\
= 3i
\]

(see [how to simplify square roots](#))
\sqrt(-x) = i\sqrt{x}
Example: Solve \( x^2 + 1 = 0 \)
Imaginary Numbers are not "Imaginary"

Imaginary Numbers were once thought to be impossible, and so they were called "Imaginary" (to make fun of them).

But then people researched them more and discovered they were actually useful and important because they filled a gap in mathematics ... but the "imaginary" name has stuck.

And that is also how the name "Real Numbers" came about (real is not imaginary).