

One method in which students can develop an understanding of the imaginary number i is by utilizing prior knowledge of transformational geometry (scale factors and rotations). The following is taken from lesson 37 of [Engage NY Algebra II, Module 1](#).

Recall that multiplying by i rotates the number line in the plane by 90° about the point i .

Think about the equation $x^2 = 4$.

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Which transformation x , when applied two times in a row will turn a 1 into a 4? Scale by 2 or scale by -2. What if the equation was $x^2 = -4$.

Is there a number we can multiply by that corresponds to a 90° rotation?

Such a number i map the number line to itself, so we must i^2 another number line that is a 180° rotation of the original:

This is like the coordinate plane. However, how should we label the points on the vertical axis?

Well, since we

What happens if we multiply a point on the vertical number line by $\frac{1}{2}$? We rotate that point by 90 degrees counterclockwise.

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Examples of operations involving complex numbers:

1. Express in simplest form:

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