

# Multiplying Complex Numbers

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## WHAT'S COVERED

This tutorial covers how to multiply complex numbers, through the definition and discussion of:

1. [Imaginary and Complex Numbers](#)
2. [Multiplying Imaginary and Complex Numbers](#)

## 1. Imaginary and Complex Numbers

To review, the square root of a negative number is non-real, or an imaginary number. The imaginary unit  $i$  is defined as the square root of -1.



### FORMULA TO KNOW

**Imaginary Number**

$$i = \sqrt{-1}$$

If you were to square both sides of this equation, you would have  $i^2$  on the left side, and -1 on the right side, so you also know that  $i^2$  is equal to -1.

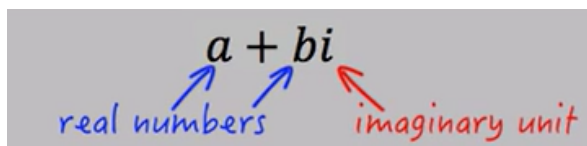


### FORMULA TO KNOW

**Imaginary Number**

$$i^2 = -1$$

A complex number is a value in the form below, in which  $a$  and  $b$  are real numbers, and  $i$  is the imaginary unit.


$$a + bi$$

real numbers      imaginary unit



### DID YOU KNOW

Complex numbers are used in fields such as engineering and physics.

## 2. Multiplying Imaginary and Complex Numbers

Suppose you want to multiply an imaginary number by a complex number, as in the example:

$$2i(5 + 3i)$$

You would begin by multiplying these numbers together using distribution, which provides:

$$\begin{aligned} 2i(5 + 3i) &= \\ 2i(5) + 2i(3i) &= \\ 10i + 6i^2 & \end{aligned}$$

Next, you can simplify by remembering that  $i^2$  is equal to -1, so you can rewrite your expression as:

$$10i + 6(-1)$$

Multiplying 6 times -1 gives you the complex number below, which you would rewrite in standard form with the real part first, -6, and the imaginary part second, 10i, to provide your final answer:

$$\begin{aligned} 10i - 6 &= \\ -6 + 10i & \end{aligned}$$



### SUMMARY

Today you reviewed **imaginary numbers**, recalling that the square root of a negative number is non-real, or an imaginary number; the imaginary unit  $i$  is equal to the square root of -1. You also reviewed the definition of a **complex number**, which is a value in the form  $a$  plus  $bi$ , where  $a$  is the real part and  $b$  times  $i$  is the imaginary part of the complex number. You also learned that when **multiplying an imaginary and a complex number** together, you use distribution.

Source: This work is adapted from Sophia author Colleen Atakpu.



### FORMULAS TO KNOW

#### Imaginary Number

$$\begin{aligned} i &= \sqrt{-1} \\ i^2 &= -1 \end{aligned}$$