LESSON 3.2b

Multiplying Complex Numbers

Yesterday you:

- Learned about ***imaginary numbers***, and ***complex numbers***
- Added and subtracted complex numbers
- Practiced using English to describe math processes and equations

Today you will:

- Multiply complex numbers
- Practice using English to describe math processes and equations

Multiplying complex number is easy!

To multiply complex numbers, simply use the Distributive Property or FOIL the two together:

- $n(a+bi) = n \cdot a + n \cdot bi$
- $(a+bi)(c+di) = ac + a \cdot di + bi \cdot c + bi \cdot di$

Multiply. Write the answer in standard form.

a. $4i(-6 + i)$ **b.** $(9 - 2i)(-4 + 7i)$

STUDY TIP

When simplifying an expression that involves complex numbers, be sure to simplify i^2 as -1.

SOLUTION

a. $4i(-6 + i)$

$= -24i + 4(-1)$ Use $i^2 = -1$.

$= -4 - 24i$ Write in standard form.

b. $(9 - 2i)(-4 + 7i)$

$= -36 + 71i - 14(-1)$ Simplify and use $i^2 = -1$.

$= -36 + 71i + 14$ Simplify.

$= -22 + 71i$ Write in standard form.

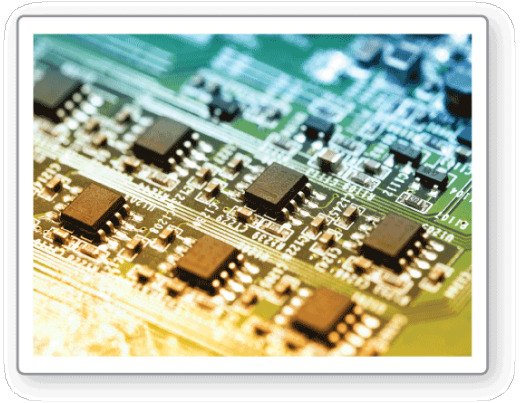
Multiply and write the answer in standard form:

$15i(-1+2i)$

$= 15i \cdot (-1) + 15i \cdot 2i$
$= -15i + 30i^2$
$= -15i + 30(-1)$
$= -15i - 30$
$= -30 - 15i$

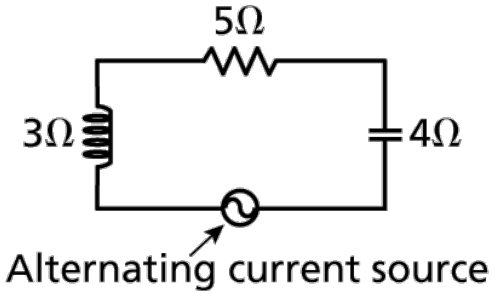
$(4-12i)(11+8i)$

$= 44 + 32i - 132i - 96i^2$
$= 44 - 100i - 96(-1)$
$= 44 - 100i + 96$
$= 140 - 100i$



Electrical circuit components, such as resistors, inductors, and capacitors, all oppose the flow of current. This opposition is called *resistance* for resistors and *reactance* for inductors and capacitors. Each of these quantities is measured in ohms. The symbol used for ohms is Ω, the uppercase Greek letter omega.

Component and symbol	Resistor 	Inductor 	Capacitor 
Resistance or reactance (in ohms)	R	L	C
Impedance (in ohms)	R	Li	$-Ci$



The impedance of a circuit is the sum of its individual resistance and reactance values. The table shows the relationship between a component's resistance or reactance and its contribution to impedance. A *series circuit* is also shown with the resistance or reactance of each component labeled. The impedance for a series circuit is the sum of the impedances for the individual components. Find the impedance of the circuit.

SOLUTION

The resistor has a resistance of 5 ohms, so its impedance is 5 ohms. The inductor has a reactance of 3 ohms, so its impedance is 3i ohms. The capacitor has a reactance of 4 ohms, so its impedance is $-4i$ ohms.

Impedance of circuit $= 5 + 3i + (-4i) = 5 - i$

The impedance of the circuit is $(5 - i)$ ohms.

Homework

Pg 108, #33-48