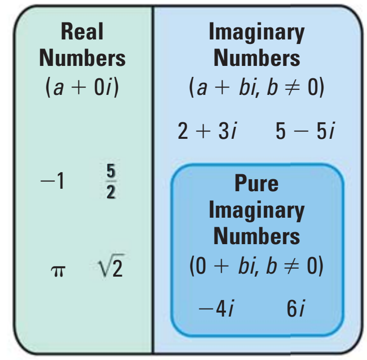
COMPLEX NUMBERS A **complex number** written in **standard form** is a number $a + bi$ where a and b are real numbers. The number a is the *real part* of the complex number, and the number bi is the *imaginary part*.

If $b \neq 0$, then $a + bi$ is an **imaginary number**. If $a = 0$ and $b \neq 0$, then $a + bi$ is a **pure imaginary number**. The diagram shows how different types of complex numbers are related.

Two complex numbers $a + bi$ and $c + di$ are equal if and only if $a = c$ and $b = d$. For example, if $x + yi = 5 - 3i$, then $x = 5$ and $y = -3$.

Complex Numbers ($a + bi$)



KEY CONCEPT *For Your Notebook*

Sums and Differences of Complex Numbers

To add (or subtract) two complex numbers, add (or subtract) their real parts and their imaginary parts separately.

Sum of complex numbers: $(a + bi) + (c + di) = (a + c) + (b + d)i$

Difference of complex numbers: $(a + bi) - (c + di) = (a - c) + (b - d)i$

EXAMPLE 2 Add and subtract complex numbers

Write the expression as a complex number in standard form.

a. $(8 - i) + (5 + 4i)$ **b.** $(7 - 6i) - (3 - 6i)$ **c.** $10 - (6 + 7i) + 4i$

Solution

a. $(8 - i) + (5 + 4i) = (8 + 5) + (-1 + 4)i$ — **Definition of complex addition**

$= 13 + 3i$ — **Write in standard form.**

b. $(7 - 6i) - (3 - 6i) = (7 - 3) + (-6 + 6)i$ — **Definition of complex subtraction**

$= 4 + 0i$ — **Simplify.**

$= 4$ — **Write in standard form.**

c. $10 - (6 + 7i) + 4i = [(10 - 6) - 7i] + 4i$ — **Definition of complex subtraction**

$= (4 - 7i) + 4i$ — **Simplify.**

$= 4 + (-7 + 4)i$ — **Definition of complex addition**

$= 4 - 3i$ — **Write in standard form.**

✓ GUIDED PRACTICE for Example 2

Write the expression as a complex number in standard form.

7. $(9 - i) + (-6 + 7i)$ **8.** $(3 + 7i) - (8 - 2i)$ **9.** $-4 - (1 + i) - (5 + 9i)$