Objective: Add, Subtract, and Multiply Complex Numbers

Concept

Adding and Subtracting Complex Numbers

1. Remove Parentheses by applying the operation before the parentheses to the terms inside the parentheses. Remember, subtracting a quantity is the same as adding its opposite!
2. Combine Like Terms
3. Write the answer in $a + bi$ form.

Objective: Add, Subtract, and Multiply Complex Numbers

Ex) Simplify each expression.

$$(-3+5i)+(12-4i)$$

① $-3+5i+12+-4i$

② $-3+12 \quad +5i+-4i$

$1i$

$\boxed{9+i}$ ③ a+bi form

Objective: Add, Subtract, and Multiply Complex Numbers

Ex) Simplify each expression.

$$(4-8i)-(3-5i)$$

① $4-8i-3-(-5i)$

$+5i$

② $4+-3+-8i+5i$

$\boxed{1-3i}$ ③ a+bi form

Objective: Add, Subtract, and Multiply Complex Numbers

Ex) Simplify each expression.

$$(-5+3i)-(6-11i)+(2-4i)$$

① ★ add/subtract from left to right

$-5+3i-6-(-11i)$

$+11i$

$-11+14i+(2-4i)$ ②

$-11+14i+2+-4i$

$-9+10i$ ③ a+bi form

Objective: Add, Subtract, and Multiply Complex Numbers

Concept

Recall: The imaginary unit is called i and represents the value of $\sqrt{-1}$.

We learned in the previous lesson how to use this definition to find the square root of negative real numbers.

$$\sqrt{-25} = 5i$$

So, if $i = \sqrt{-1}$, then $i^2 =$

$$i^2 = \left(\sqrt{-1}\right)^2 = -1$$

Objective: Add, Subtract, and Multiply Complex Numbers

Ex) Simplify each expression.

$$-4i(5i)$$

$-4 \cdot i \cdot 5 \cdot i$

$-4 \cdot 5 \cdot i \cdot i$

$-20 \cdot i^2$

$-20 \cdot -1$

$\boxed{20}$

Objective: Add, Subtract, and Multiply Complex Numbers

Concept

Multiplying Two Complex Numbers: $(a + bi)(c + di)$

1. Distribute twice. $a(c + di) + bi(c + di)$
2. Simplify the i^2 term.
3. Combine like terms.
4. Write the result in $a + bi$ form.

Objective: Add, Subtract, and Multiply Complex Numbers

Ex) Simplify each expression.

$$(2+3i)(1-4i)$$

* distribute twice

① $2(1-4i) + 3i(1-4i)$

$2\cdot 1 \quad 2\cdot -4i \quad + 3i\cdot 1 \quad + 3i\cdot -4i$

$3\cdot -4\cdot i\cdot i$

$2 - 8i + 3i - 12i^2$ ②

$-12\cdot -1$

$+12$

③ $2 + 12 \quad -8i + 3i$

$\boxed{14 - 5i}$

Objective: Add, Subtract, and Multiply Complex Numbers

Ex) Simplify each expression.

$$(-5-2i)(6-8i)$$

① $-5(6-8i) + -2i(6-8i)$

$-5 \cdot 6 \quad -5 \cdot -8i \quad -2i \cdot 6 \quad -2i \cdot -8i$

$-2 \cdot -8 \cdot i \cdot i$

$-30 + 40i \quad -12i + 16i^2$ ②

$16 \cdot -1$

-16

③ $-30 + -16 \quad +40i + -12i$

$\boxed{-46 + 28i}$ $a+bi$ form

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Closure

Anthony simplified the expression $(3 + 4i) + (9 - i)$. His teacher said he didn't do the problem correctly. Explain what Anthony did wrong and find the correct answer.

$$(3+4i)+(9-i)$$

$$27-3i+36i-4i^2$$

$$27-3i+36i+4$$

$$\boxed{31+33i}$$

Anthony multiplied the complex numbers instead of adding them. The correct answer is $12 + 3i$.