Complex Numbers

Key Points:

- Complex number is the sum of the real number and imaginary number; the standard form is $a + bi$ where a is the real part and b is the imaginary part.

- The imaginary number : $i = \sqrt{-1}$

- The square root of any negative number can be written as a multiple of i.

$$\sqrt{-9} = 3i$$
$$-\sqrt{-64} = -8i$$

- Complex numbers can be added and subtracted by combining the real parts and combining the imaginary parts.

- Complex numbers can be multiplied and divided.
    - To multiply complex numbers, distribute just as with polynomials.
    - To divide complex numbers, multiply both numerator and denominator by the complex conjugate of the denominator to eliminate the complex number from the denominator.

- The powers of are cyclic, repeating every fourth one.

Complex Numbers Video

- **Expressing Roots of Negative Numbers using i**
- **Adding Subtracting Complex Numbers**
- **Multiplying Complex Numbers**
- **Dividing Complex Numbers**
- **Simplifying Powers of i**

Practice Exercises

Follow the directions for each exercise below:

1. Name the horizontal component and the vertical component: $4 - 3i$

2. Name the horizontal component and the vertical component: $-2 - i$

3. Simplify the expression: $(9 - i) - (4 - 7i)$

4. Simplify the expression: $(2 + 3i) - (-5 - 8i)$

5. Simplify the expression: $2\sqrt{-75} + 3\sqrt{25}$

6. Simplify the expression: $\sqrt{-16} + 4\sqrt{-9}$

7. Simplify the expression: $-6i(i - 5)$

8. Simplify the expression: $(3 - 5i)^2$

9. Simplify the expression: $\sqrt{-4} * \sqrt{-12}$

10. Simplify the expression: $\sqrt{-2}(\sqrt{-8} - \sqrt{5})$

11. Simplify the expression: $\dfrac{2}{5 - 3i}$

12. Simplify the expression: $\dfrac{3 + 7i}{i}$

Answers:

1.   Horizontal: 4

                Vertical: -3

2.   Horizontal: -2

                Vertical: -1

3. $5 + 6i$

4. $7 + 11i$

5. $15 + 10\sqrt{3}i$

6. $16i$

7. $6 + 30i$

8. $-16 - 30i$

9. $-4\sqrt{3}$

10. $-4 - \sqrt{10}i$

11. $\frac{5}{17} + \frac{3}{17}i$

12. $7 - 3i$