

Lesson 30- SWBAT complete operations with complex numbers.

Kickoff- Simplify the following

1) i^{64} 2) $(3i^6)^3$ 3) $4i^{100}(6i^4)$

1 $3^3 \cdot i^{18}$ 24
 $27(-1)$ $4(1)(6(1))$
 -27 24

$10i\sqrt{2}$

$\sqrt{8}$
 $\sqrt{4} \sqrt{2}$
 $2\sqrt{2}$

② $\sqrt{2} - \frac{5\sqrt{3}}{3}$

④ $\sqrt{2} + 1$

⑥ $\frac{27}{22} + \frac{7\sqrt{5}}{22}$

$\frac{7+\sqrt{5}}{7-\sqrt{5}} \cdot \frac{7+\sqrt{5}}{7+\sqrt{5}} = \frac{49+7\sqrt{5}+7\sqrt{5}+5}{49-5}$
 $\frac{54+14\sqrt{5}}{44}$

$\frac{27}{22} + \frac{7\sqrt{5}}{22}$

Try This: Simplify

1) i^{38} 2) $2i^2 + 6i^{42} + i^3$

-1 $2(-1) + 6(-1) - i$
 $-2 - 6 - i$
 $-8 - i$

Operations with Complex Numbers

$\sqrt{117} = \sqrt{9 \cdot 13} = 3\sqrt{13}$
 $\sqrt{117} = \sqrt{9 \cdot 13} = 3\sqrt{13}$
 $2i\sqrt{13}$

Complex Numbers: $a + bi$ * distribute a

Adding/ Subtracting Complex Numbers

1) Change $\sqrt{-1}$ to i - When Subtracting!

2) Simplify $\sqrt{\quad}$

3) Combine like terms

Ex1: $(4 + \sqrt{-1}) + (3 + \sqrt{-49})$ Ex2: $(5 - \sqrt{-128}) - (-5 - \sqrt{-98})$

$(4+i) + (3+7i)$ $i\sqrt{128}$ $i\sqrt{98}$
 $7 + 8i$ $\sqrt{64} \sqrt{2}$ $\sqrt{49} \sqrt{2}$
 $8\sqrt{2}$ $7\sqrt{2}$

$(5 - 8i\sqrt{2}) + (5 + 7i\sqrt{2})$
 $10 - i\sqrt{2}$

Multiplying Complex Numbers

1) Change $\sqrt{-1}$ to i and simplify $\sqrt{\quad}$

2) Multiply (distribute)

3) Combine like terms and i -parts!

Ex1: $6(3 - 2i)$ Ex2: $(3 + \sqrt{-49})(1 - \sqrt{-4})$

$18 - 12i$ $(3+7i)(1-2i)$
 $3 - 6i + 7i - 14i^2$
 $-14(-1)$
 $17 + i$

Dividing Complex Numbers

1) Change $\sqrt{-1}$ to i and simplify $\sqrt{\quad}$

2) Divide + Subtract exponents

3) Reduce + i -parts!

Ex1: $\frac{\sqrt{-75}}{\sqrt{-3}}$ Ex2: $\frac{(6-\sqrt{-16})}{2}$ Ex3: $\frac{9i^3 - 15i^2}{3i^2}$

$\frac{\sqrt{75}}{\sqrt{3}}$ $\frac{6-4i}{2}$ $\frac{9i^3}{3i^2} - \frac{15i^2}{3i^2}$
 $\sqrt{25} = 5$ $3 - 2i$ $3i - 5$
 $-5 + 3i$

Practice: Perform each of the indicated operations.

1) $\sqrt{-64} + \sqrt{-36}$

$14i$

2) $3\sqrt{-4} + \sqrt{-12}$

$17i$

3) $\sqrt{-100} - \sqrt{-9}$

$7i$

4) $\sqrt{-16} - 2\sqrt{-4}$

0

5) $\sqrt{-72} + \sqrt{-32} + 3\sqrt{-8}$

$16i\sqrt{2}$

6) $(3 + \sqrt{-4}) + (4 - \sqrt{-25})$

$7 - i$

7) $(2 + \sqrt{-16})(3 - \sqrt{-25})$

$26 + 2i$

8) $(3 - \sqrt{-4})^2$

$5 - 12i$

9) $(3 + \sqrt{-16})(3 - \sqrt{-16})$

25

10) $(3 + \sqrt{-18})(4 + 3\sqrt{-8})$

$48 + 36i\sqrt{2}$

11) $\frac{\sqrt{-3}}{\sqrt{-48}}$

$\frac{1}{4}$

12) $\frac{15 - \sqrt{-81}}{3}$

$5 - 3i$

13) $\frac{12i^2 - 2i\sqrt{-64}}{4i^2}$

$-4 + 3i$

14) $\frac{\sqrt{72} + \sqrt{-16}}{\sqrt{-36}}$

$\frac{2}{3} + \frac{\sqrt{2}}{i}$