Complex Numbers

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Addition: $(a + bi) + (c + di) = (a+c) + (b+d)i$

Subtraction: $(a + bi) - (c + di) = (a-c) + (b-d)i$

Multiplication: $(a + bi)(c + di) = ac + bci + adi + bdi^2$

Division: $= \frac{a + bi}{c + di} = \left(\frac{ac + bd}{c^2 + d^2}\right) + \left(\frac{bc + ad}{c^2 + d^2}\right)$

Simplify.

1. $2(2 + 4i)$

2. $i(5 - 7i)$

3. $(2 + 4i) - (-3 + 8i)$

4. $(1 - 4i) + (3 - 6i)$

5. $(2 + 3i) + (1 - 2i)$

6. $(3 + 6i) - (1 - 2i)$

7. $2(2 + 4i)(-1 - i)$

8. $(2 + 4i) + (-3 + 8i)$

9. $(1 - 4i) - (3 - 6i)$

10. $(6 - 2i)^2$

11. $\frac{2 + 4i}{-1 + 3i}$

12. $\frac{1 + 2i}{5 + i}$

Complex Numbers - solutions

1. $2(2 + 4i) = 4 + 8i$

2. $i(5 - 7i) = 7 + 5i$

3. $(2 + 4i) - (-3 + 8i)$

$(2-3) + (4+8)i = 1 + 12i$

4. $(1 - 4i) + (3 - 6i)$

$(2+3) + (-4 - 6)i = 6 - 10i$

5. $(2 + 3i) + (1 - 2i)$

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

6. $(3 + 6i) - (1 - 2i)$

$(3+1) - (6 - 2)i = 4 - 4i$

7. $2(2 + 4i)(-1 - i)$

$(4 + 8i)(-1 - i) = -4 - 4i - 8i - 8i^2$

$-4 - 12i - 8(-1) = -4 - 12i + 8 = 4 - 12i$

8. $(2 + 4i) + (-3 + 8i)$

$-6 + 16i - 12i + 32i^2 = -6 + 4i + 32(-1)$

$-6 + 4i - 32 = -38 + 4i$

9. $(1 - 4i) - (3 - 6i)$

$3 - 6i - 12i + 24i^2 = 3 - 18i + 24(-1)$

$3 - 18i - 24 = -21 - 18i$

10. $(6 - 2i)^2 = (6 - 2i)(6 - 2i)$

$36 - 12i - 12i + 4i^2 = 38 - 24i + 4(-1)$

$36 - 24i - 4 = 30 - 24i$

11. $\frac{2 + 4i}{-1 + 3i} \cdot \frac{-1 - 3i}{-1 - 3i} = \frac{-2 - 4i - 3i - 12i^2}{-1 - 3i + 3i - 9i^2}$

$\frac{-2 - 7i - 12(-1)}{-1 - 9(-1)} = \frac{-2 - 7i + 12}{-1 + 9}$

$\frac{10 - 7i}{8} = \frac{10}{8} - \frac{7i}{8} = \frac{5}{4} - \frac{7i}{8}$

12. $\frac{1 + 2i}{5 + i} \cdot \frac{5 + i}{5 + i} = \frac{5 + 5i + 2i - 2i^2}{25 - 5i + 5i - i^2}$

$\frac{5 + 7i - 2(-1)}{25 - (-1)} = \frac{5 + 7i + 2}{26}$

$\frac{7 + 7i}{8} = \frac{7}{8} + \frac{7i}{8}$