

# ★ Add & Subtract Complex Number

Monday, September 15, 2025 11:59 PM

- When adding or subtracting two complex numbers, we add or subtract real parts together and add or subtract imaginary parts together.

Find the result of each of the following in the simplest form :

1  $(3 + 7i^{13}) + (5 - 9i)$

2  $(2 - \sqrt{-16}) - (5 - i)$

$13 = 4 * 3$   
 $12 = 4 * 3$

$i^{13} = i^{12} * i^1$   
 $= (i^4)^3 * i$   
 $= 1 * i$

Complex number

number

imaginary no.

number

imag.

$\sqrt{-16} = \sqrt{16} * \sqrt{-1} = \pm 4i$

$(3 + 7i) + (5 - 9i)$

$8 - 2i$

2  $(2 - \pm 4i) - (5 - i)$

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

$(2 - \pm 4i) - (5 - i)$   
 $2 + 4i - 5 + i$   
 $-3 + 5i$

# ★ Equality of two complex numbers

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Two complex numbers are equal if and only if the two real parts are equal and the two imaginary parts are equal.

**i.e.** If  $(a + bi)$  and  $(c + di)$  are two complex numbers and if  $a = c, b = d$ , then  $a + bi = c + di$

**and vice versa** If  $a + bi = c + di$ , then  $a = c, b = d$

L.H.S = R.H.S

Find the values of  $x$  and  $y$  which satisfy each of the following :

L.H.S → 1  $(2x - 3) + 5i = 7 + (3 - 2y)i$  R.H.S

3  $x - 3y + (2x + y)i = 6 + 5i$

$$\begin{aligned} \rightarrow 3 - 2y &= 5 + 2y \\ 3 - 5 &= 2y \\ \frac{-2}{2} &= \frac{2y}{2} \\ \boxed{y = -1} \end{aligned}$$

$$\begin{aligned} 2x - \frac{3}{2} &= 7 + 3 \\ \frac{2x}{2} &= \frac{10}{2} \\ \boxed{x = 5} \end{aligned}$$

2  $x + yi = \sqrt{-4} + i^{22}$   $x = -1, y = \pm 2$

$$\begin{aligned} x + yi &= \sqrt{-4} - 1 \\ \boxed{x} + yi &= \pm 2i - 1 \\ \boxed{x} + yi &= (-1) \pm 2i \end{aligned}$$

Handwritten notes and calculations:

- $i^{22} = i^4 \times i^4 \times i^4 \times i^4 = 1 \times 1 \times 1 \times 1 = 1$
- $i^{21} = i^4 \times i^4 \times i^4 \times i^3 = 1 \times 1 \times 1 \times i^3 = -i$
- $i^{20} = i^4 \times i^4 \times i^4 \times i^4 \times i^4 = 1 \times 1 \times 1 \times 1 \times 1 = 1$
- $i^{19} = i^4 \times i^4 \times i^4 \times i^4 \times i^3 = 1 \times 1 \times 1 \times 1 \times i^3 = -i$
- $i^{18} = i^4 \times i^4 \times i^4 \times i^4 \times i^4 = 1 \times 1 \times 1 \times 1 \times 1 = 1$
- $i^{17} = i^4 \times i^4 \times i^4 \times i^4 \times i^3 = 1 \times 1 \times 1 \times 1 \times i^3 = -i$
- $i^{16} = i^4 \times i^4 \times i^4 \times i^4 = 1 \times 1 \times 1 \times 1 = 1$
- $i^{15} = i^4 \times i^4 \times i^4 \times i^3 = 1 \times 1 \times 1 \times i^3 = -i$
- $i^{14} = i^4 \times i^4 \times i^4 \times i^4 = 1 \times 1 \times 1 \times 1 = 1$
- $i^{13} = i^4 \times i^4 \times i^4 \times i^3 = 1 \times 1 \times 1 \times i^3 = -i$
- $i^{12} = i^4 \times i^4 \times i^4 = 1 \times 1 \times 1 = 1$
- $i^{11} = i^4 \times i^4 \times i^3 = 1 \times 1 \times i^3 = -i$
- $i^{10} = i^4 \times i^4 \times i^2 = 1 \times 1 \times -1 = -1$
- $i^9 = i^4 \times i^4 \times i = 1 \times 1 \times i = i$
- $i^8 = i^4 \times i^4 = 1 \times 1 = 1$
- $i^7 = i^4 \times i^3 = 1 \times i^3 = -i$
- $i^6 = i^4 \times i^2 = 1 \times -1 = -1$
- $i^5 = i^4 \times i = 1 \times i = i$
- $i^4 = 1$
- $i^3 = -i$
- $i^2 = -1$
- $i = i$
- $i^0 = 1$

# Multiplying Complex Number

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Two complex numbers can be multiplied just as the algebraic expressions, considering  $i^2 = -1$

Find the result of each of the following in the simplest form :

1  $(4 + 3i)(2 - 5i)$

3  $(3 + 2i)^2$

2  $(5 - 2i)(5 + 2i)$

4  $(1 - i)^4$

①  $8 - 20i + 6i - 15i^2$   
 $= 8 - 14i - 15(-1)$   
 $= 8 - 14i + 15$   
 $= 23 - 14i$

$(3 + 2i)^2$   
 $(3 + 2i)(3 + 2i)$   
 $= 9 + 6i + 6i + 4i^2$   
 $= 9 + 12i - 4$   
 $= 5 + 12i$

$(2 + x)(3 + x)$   
 $= 6 + 2x + 3x + x^2$   
 $= 6 + 5x + x^2$



# ★ Two Conjugate numbers

Tuesday, September 16, 2025 12:02 AM

The two numbers  $a + bi$  and  $a - bi$  are called conjugate numbers.

**Note** : Take care that the complex number and its conjugate differ only in the sign of their imaginary parts.

Simplify to the simplest form :



1  $\frac{4-3i}{i} * \frac{i}{i}$

2  $\frac{10}{3+i}$

3  $\frac{3+2i}{2-5i} * \frac{2+5i}{2+5i}$

4  $\frac{(2+i)(1-i)}{(1+i)(3-2i)}$

$\frac{4-3i}{i} * \frac{i}{i} = \frac{i(4-3i)}{i^2} = \frac{4i - 3i^2}{-1} = - (4i + 3) = -3 - 4i$

3  $\frac{3+2i}{2-5i} * \frac{2+5i}{2+5i} = \frac{(3+2i)(2+5i)}{(2-5i)(2+5i)}$

$= \frac{6 + 19i + 10i^2}{4 - 25i^2} = \frac{6 - 10 + 19i}{4 + 25} = \frac{-4 + 19i}{29}$