

MATHEMATICS • CLASS 11

## CHAPTER 4

# Complex Numbers and Quadratic Equations

NCERT SOLUTIONS



## EXERCISE 4.1 – QUESTIONS 1–3

Question 1:  $(5i) \left(-\frac{3i}{5}\right)$ .

Multiply:  $(5i) \left(-\frac{3i}{5}\right) = -3i^2 = 3$ , because  $i^2 = -1$ .

Answer:  $3 + 0i$ .

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Question 2:  $i^9 + i^{19}$ .

Powers of  $i$  repeat every four:  $i^9 = i$  and  $i^{19} = -i$ .

Sum =  $i - i = 0$ .

Answer:  $0 + 0i$ .

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Question 3:  $i^{-39}$ .

Because  $-39 = 4(-10) + 1$ ,  $i^{-39} = i$ .

Answer:  $0 + i$ .

## EXERCISE 4.1 — QUESTIONS 4-5

Q4. Express in  $a + ib$  form.

$$\begin{aligned} & 3(7 + 7i) + i(7 + 7i). \\ &= 21 + 21i + 7i + 7i^2 \\ &= 21 - 7 + 28i \\ &= 14 + 28i. \end{aligned}$$

Q5. Express in  $a + ib$  form.

$$\begin{aligned} & (1 - i) - (-1 + 6i). \\ &= 1 - i + 1 - 6i \\ &= 2 - 7i. \end{aligned}$$

## EXERCISE 4.1 – QUESTIONS 6-7

$$Q6. \left( \frac{1}{5} + \frac{2i}{5} \right) - \left( 4 + \frac{5i}{2} \right).$$

Real part:

$$\frac{1}{5} - 4 = -\frac{19}{5}.$$

Imaginary coefficient:

$$\frac{2}{5} - \frac{5}{2} = \frac{4 - 25}{10} = -\frac{21}{10}.$$

Answer:  $-\frac{19}{5} - \left( \frac{21}{10} \right) i.$

$$Q7. \left[ \left( \frac{1}{3} + \frac{7i}{3} \right) + \left( 4 + \frac{i}{3} \right) \right] - \left( -\frac{4}{3} + i \right).$$

Real part:

$$\frac{1}{3} + 4 + \frac{4}{3} = \frac{17}{3}.$$

Imaginary coefficient:

$$\frac{7}{3} + \frac{1}{3} - 1 = \frac{5}{3}.$$

Answer:  $\frac{17}{3} + \frac{5}{3} i.$

## EXERCISE 4.1 – QUESTIONS 8–9

Q8. Express  $(1-i)^4$  in  $a+ib$  form.

Solution:  $(1-i)^2 = 1 - 2i + i^2 = -2i.$

$$(1-i)^4 = (-2i)^2 = 4i^2 = -4.$$

Answer:  $-4 + 0i.$

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Q9. Express  $\left(\frac{1}{3} + 3i\right)^3$  in  $a+ib$  form.

Solution:  $(a+bi)^3 = (a^3 - 3ab^2) + i(3a^2b - b^3).$

Here  $a = \frac{1}{3}$ ,  $b = 3.$

$$\text{Real part} = \frac{1}{27} - 3\left(\frac{1}{3}\right)(3^2) = \frac{1}{27} - 9 = \frac{-242}{27}.$$

$$\text{Imaginary coefficient} = 3\left(\frac{1}{3}\right)^2(3) - 3^3 = 1 - 27 = -26.$$

Answer:  $-\frac{242}{27} - 26i.$

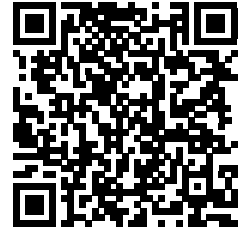


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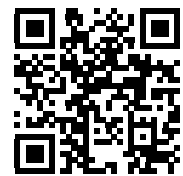


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