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# कक्षा - 11

## गणित

अध्याय – 4

## सम्मिश्र संख्याएँ और द्विघातीय समीकरण

भाग – 5

प्रश्नावली 4.1 (प्रश्न 1 से 9)

हर्ष गोयल

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# प्रश्नावली 4.1

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प्रश्न 1 से 10 तक की सम्मिश्र संख्याओं में प्रत्येक को a + ib के रूप में व्यक्त कीजिए।



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

$5i \times \frac{-3}{5} i$

$= 5 \times \frac{-3}{5} \times i \times i$

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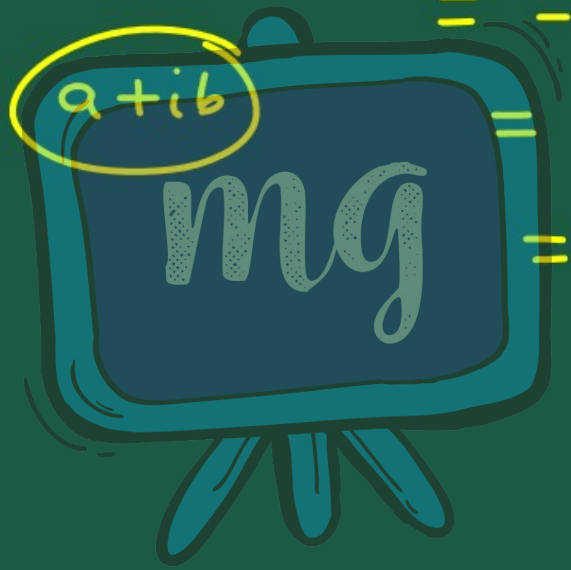
$= -3 \times i^2$

$(i^2 = -1)$

$= -3 \times -1$

$= 3$

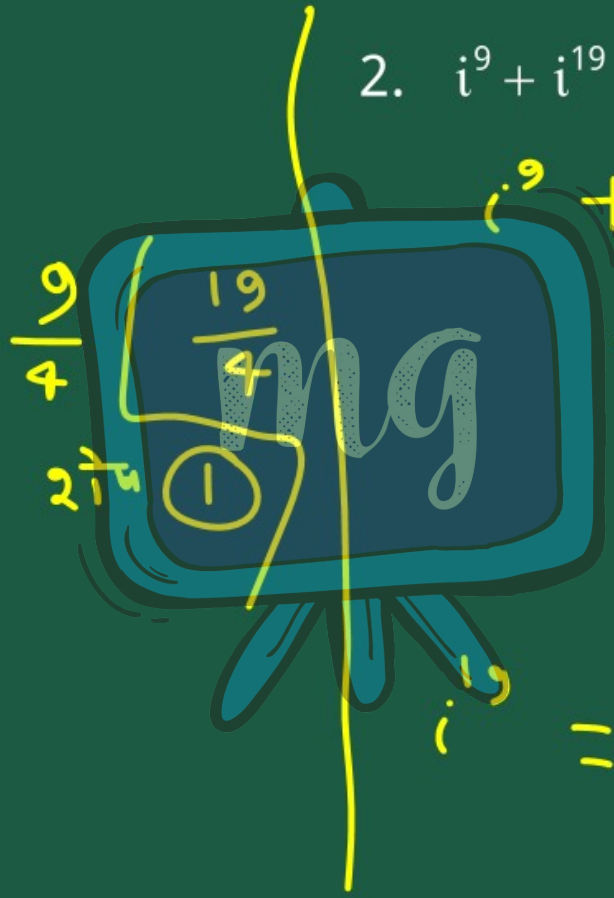
$= 3 + 0i$ Ans



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



$i^9 + i^{19}$

$\frac{9}{4}$ $\quad \frac{19}{4}$

$2\frac{1}{4}$ $\quad 1$

$\therefore \quad i^9 = (i^4)^2 \times i$

$= (1)^2 \times i$

$i^9 = i$

$i^{19} = (i^4)^4 \cdot i^3$

$= 1 \times -i = -i$

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$$\text{ans} \quad i^9 + i^{19}$$
$$= i + (-i)$$
$$= i - i$$
$$= 0$$
$$= 0 + i0$$

Ans

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3. $i^{-39}$




$= \frac{1}{i^{39}}$

$= \frac{1}{(i^4)^9 \times i^3}$

$= \frac{1}{(1)^9 \times -i}$

$= \frac{1}{-i}$

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$$= \frac{1}{-i} \times \frac{i}{i}$$

$$= \frac{i}{-i^2}$$

$$= \frac{i}{-(-1)} = \frac{i}{1}$$

$$= i$$

$$= 0 + i$$

Ans



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4. $3(7 + i7) + i(7 + i7)$

$3(7+i7)+i(7+i7)$

$= 21 + 21i + 7i - 7$

$= 21 - 7 + i(21 + 7)$

$= 14 + i28$

Ans

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5. $(1 - i) - (-1 + i6)$

$(1-i)-(-1+i6)$

$a+ib$

$= 1-i+1-i6$

$= 1+1-i-i6$

$= 2-i(1+6)$

$= 2-i7$

$= 2-i(7)$ Ans

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

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

$= \frac{1}{5}+i\frac{2}{5}-4-i\frac{5}{2}$

$= \frac{1}{5}-4+i\frac{2}{5}-i\frac{5}{2}$

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

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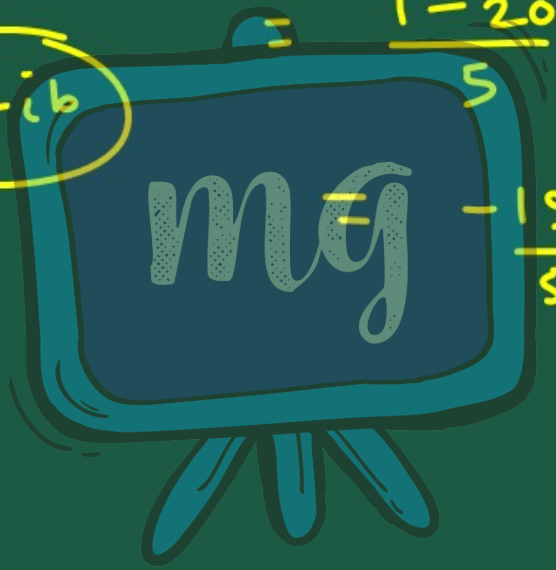
$$= \frac{1}{5} - \frac{4}{1} + i\left(\frac{2}{5} - \frac{5}{2}\right)$$

$$= \frac{1-20}{5} + i\left(\frac{4-25}{10}\right)$$

$$= -\frac{19}{5} + i\left(\frac{-21}{10}\right)$$

Ans

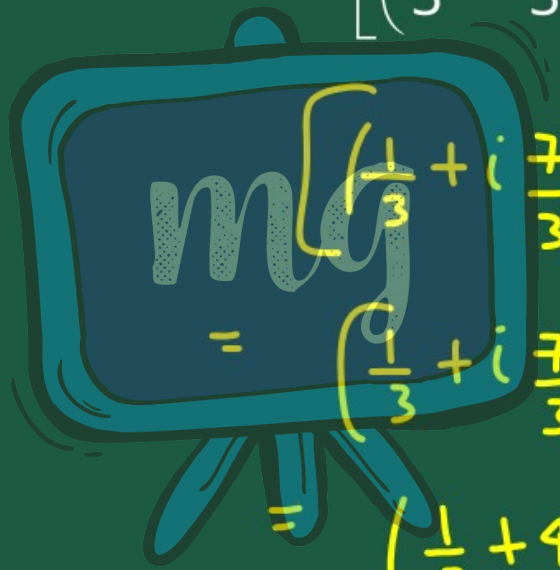
$a+ib$



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



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

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

$= \left(\frac{1}{3}+4+i\frac{7}{3}+i\frac{1}{3}\right)-\left(-\frac{4}{3}+i\right)$

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

$$= \left[\frac{1+12}{3} + i\left(\frac{7+1}{3}\right)\right] - \left(\frac{-4}{3} + i\right)$$

$$= \left(\frac{13}{3} + i\,\frac{8}{3}\right) - \left(\frac{-4}{3} + i\right)$$

$$= \frac{13}{3} + i\,\frac{8}{3} + \frac{4}{3} - i$$

$$= \frac{13}{3} + \frac{4}{3} + i\left(\frac{8}{3} - 1\right)$$

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$$= \frac{13}{3} + \frac{4}{3} + i\left(\frac{8}{3} - 1\right)$$

$$= \frac{13+4}{3} + i\left(\frac{8-3}{3}\right)$$

$a + ib$

$$= \frac{17}{3} + i\,\frac{5}{3}$$

Ans

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8. $(1 - i)^4$

$(1-i)^4$

$= [(1-i)^2]^2$

$(z_1 - z_2)^2 = z_1^2 - 2z_1z_2 + z_2^2$

$= [(1)^2 - 2(1)(i) + (i)^2]^2$

$= [1 - 2i - 1]^2$

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$$= (-2i)^2$$

$$= -2i \times -2i$$

$$= -2 \times -2 \times i \times i$$

$$= 4 \times i^2$$

$$= 4 \times -1$$

$$= -4$$

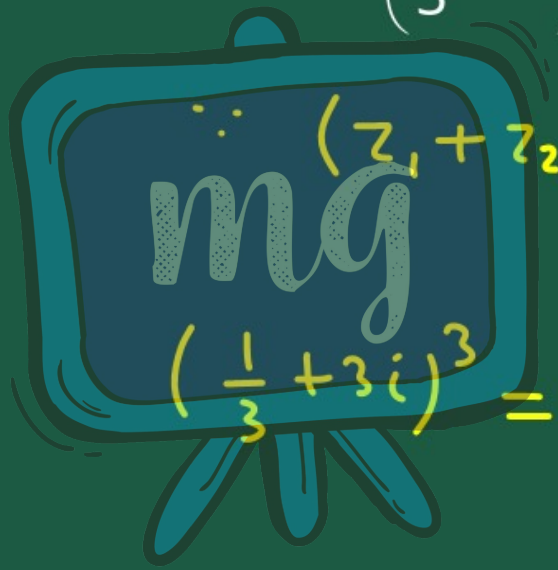
$$= -4 + 0i$$



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9. $\left(\frac{1}{3}+3i\right)^3$




$\therefore (z_1+z_2)^3 = z_1^3 + z_2^3 + 3z_1^2z_2 + 3z_1z_2^2$

$\left(\frac{1}{3}+3i\right)^3 = \left(\frac{1}{3}\right)^3 + (3i)^3 + 3\left(\frac{1}{3}\right)^2(3i) + 3\left(\frac{1}{3}\right)(3i)^2$

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$$= \frac{1}{27} + (3)^3 (i)^3 + 3 \times \frac{1}{9} \times 3i$$

$$+ 3 \times \frac{1}{3} \times 9 \times i^2$$

$$= \frac{1}{27} + 27(-i) + i - 9$$

$$= \frac{1}{27} - 9 + i - 27i$$

$$= \frac{1}{27} - 9 - 26i$$

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$a+ib$

$= \frac{1}{27} - 9 - 26i$

$= \frac{1 - 243 - 702i}{27}$

$= \frac{-242 - 702i}{27}$

$= -\frac{242}{27} + i\left(-\frac{702}{27}\right)$

$= -\frac{242}{27} + i(-26)$

27 × 9 = 243

27 × 26 = 162 + 540 = 702