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missiongyan

कक्षा - 11

गणित

अध्याय – 4

सम्मिश्र संख्याएँ और द्विघातीय समीकरण

भाग – 6

प्रश्नावली 4.1 (प्रश्न 10 से 14)

हर्ष गोयल

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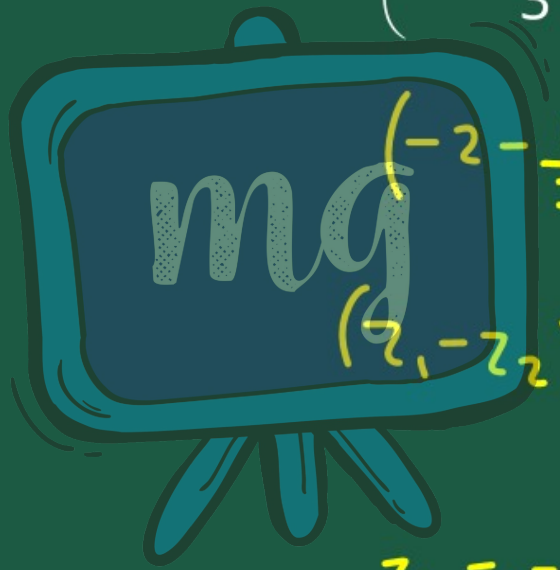


प्रश्नावली 4.1

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10. $\left(-2-\frac{1}{3}i\right)^3$



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

$(z_1-z_2)^3 = z_1^3 - z_2^3 - 3z_1^2 z_2 + 3z_1 z_2^2$

$z_1 = -2$

$z_2 = \frac{1}{3}i$

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$$\left(-2-\frac{1}{3}i\right)^3 = (-2)^3 - \left(\frac{1}{3}i\right)^3$$
$$- 3(-2)^2\left(\frac{1}{3}i\right)$$
$$+ 3(-2)\left(\frac{1}{3}i\right)^2$$
$$= -8 - \frac{1}{27}i^3 - \cancel{3}\times 4 \times \frac{1}{\cancel{3}}i$$
$$+ \cancel{3}\times(-2)\times\frac{1}{\cancel{9}}i^2$$
$$= -8 + \frac{1}{27}i - 4i + \frac{2}{3}$$

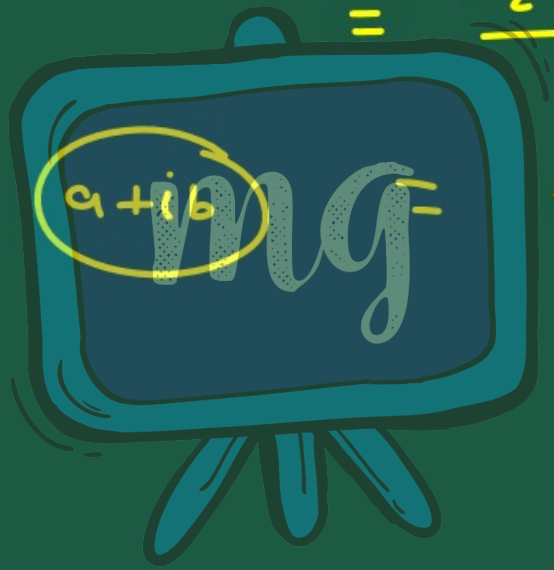
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$$= -8 + \frac{2}{3} + i\left(\frac{1}{27} - 4\right)$$

$$= \frac{-24 + 2}{3} + i\left(\frac{1 - 108}{27}\right)$$

$$a + ib = \frac{-22}{3} + i\left(\frac{-107}{27}\right)$$ Ans

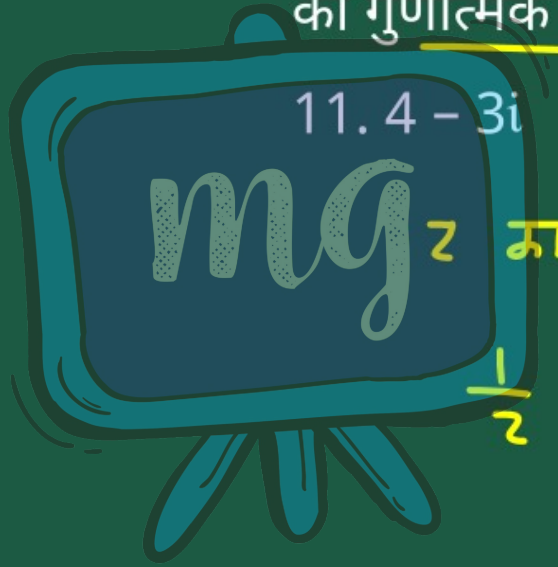


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प्रश्न 11 से 13 की सम्मिश्र संख्याओं में प्रत्येक का गुणात्मक प्रतिलोम ज्ञात कीजिए।

11. $4 - 3i$



z का गुणात्मक प्रतिलोम

$$\frac{1}{z} = \frac{\bar{z}}{|z|^2}$$

माना $z = 4 - 3i$

$\bar{z} = 4 + 3i$

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z का मापांक

$$|z| = \sqrt{(4)^2 + (-3)^2}$$

$$= \sqrt{16 + 9}$$

$$|z| = \sqrt{25}$$

$$|z|^2 = 25$$

तो z का गुणात्मक प्रतिलोम

$$\frac{1}{z} = \frac{\bar{z}}{|z|^2} = \frac{4+3i}{25}$$

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$$\frac{1}{z} = \frac{4}{25} + i\,\frac{3}{25}$$

अत: $4-3i$ का गुणात्मक

प्रतिलोम $\frac{4}{25} + i\,\frac{3}{25}$ है।



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12. $\sqrt{5} + 3i$



z का गुणात्मक प्रतिलोम $= \frac{\bar{z}}{|z|^2}$

माना $z = \sqrt{5} + 3i$

$\bar{z} = \sqrt{5} - 3i$

तो $|z| = \sqrt{(\sqrt{5})^2 + (-3)^2}$

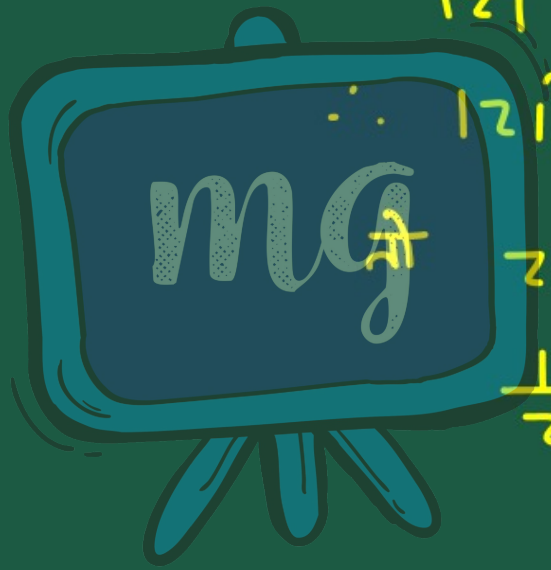
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$$|z| = \sqrt{5+9}$$

$$|z| = \sqrt{14}$$

$$\therefore |z|^2 = 14$$



तो z का गुणात्मक प्रतिलोम

$$\frac{1}{z} = \frac{\bar{z}}{|z|^2} = \frac{\sqrt{5}-3i}{14}$$

$$= \frac{\sqrt{5}}{14} + i\left(\frac{-3}{14}\right)$$

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अत: $\sqrt{5} + 3i$ का गुणात्मक प्रतिलोम

$$\frac{\sqrt{5}}{14} + i\left(\frac{-3}{14}\right)$$



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13. $-i$



z का गुणात्मक प्रतिलोम $= \frac{\bar{z}}{|z|^2}$

माना $z = -i$

$\bar{z} = i$

तो $|z| = \sqrt{(0)^2 + (-1)^2}$

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$|z| = \sqrt{0+1}$

$|z| = \sqrt{1}$

$|z| = 1$

$\therefore |z|^2 = 1$

z का गुणात्मक प्रतिलोम

$$\frac{1}{z} = \frac{\bar{z}}{|z|^2} = \frac{i}{1} = i$$

$$= 0 + i(1)$$

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अतः $-i$ का गुणात्मक

प्रतिलोम $0+i(1)$ है।



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14. निम्नलिखित व्यंजक को a + ib के रूप में व्यक्त कीजिए:

$$\frac{\left(3+i\sqrt{5}\right)\left(3-i\sqrt{5}\right)}{\left(\sqrt{3}+\sqrt{2}i\right)-\left(\sqrt{3}-i\sqrt{2}\right)}$$

$(z_1-z_2)(z_1+z_2)$

$= z_1^2 - z_2^2$

$$\frac{(3+i\sqrt{5})\,(3-i\sqrt{5})}{(\sqrt{3}+\sqrt{2}i)-(\sqrt{3}-i\sqrt{2})}$$

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

$a + ib$

$$= \frac{9 + 5}{2\sqrt{2}i}$$

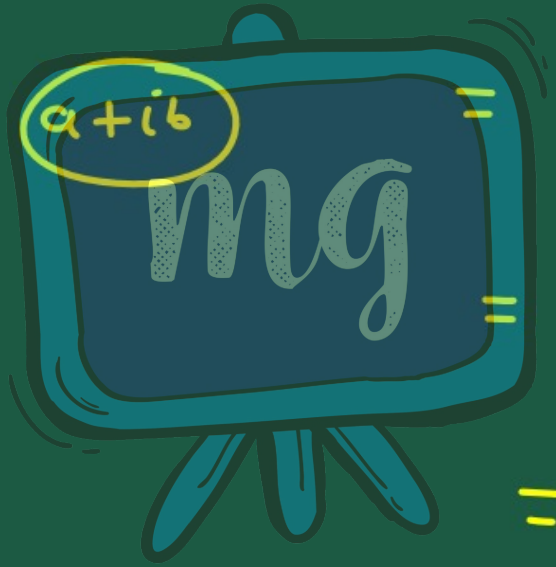
$$= \frac{14}{2\sqrt{2}i}$$

$$= \frac{7}{\sqrt{2}i}$$

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$$= \frac{7}{\sqrt{2}i} \times \frac{-\sqrt{2}i}{-\sqrt{2}i}$$



$$= \frac{-7\sqrt{2}i}{-2i^2}$$

$$= \frac{-7\sqrt{2}i}{2}$$

$$= 0 + i\left(-\frac{7\sqrt{2}}{2}\right)$$

Ans