Under CSR Support by ipca | Foundation

missiongyan

कक्षा - 11

गणित

अध्याय - 4

सम्मिश्र संख्याएँ और द्विघातीय समीकरण

भाग - 4

उदाहरण (1 से 6)

हर्ष गोयल

Under CSR Support by ipca | Foundation

missiongyan LET'S LEARN TOGETHER

उदाहरण - 1

यदि $4x + i(3x - y) = 3 + i(-6)$, जहाँ x और y वास्तविक संख्याएँ हैं, तब x और y ज्ञात कीजिए।

$4x + i(3x - y) = 3 + i(-6)$

वास्तविक भाग व काल्पनिक भाग की तुलना करने पर

Under CSR Support by ipca | Foundation

missiongyan LET'S LEARN TOGETHER

$4x = 3$ (वास्तविक आग)

— ①

$3x - y = -6$ (काल्पनिक आग)

— ②



समी ① से

$4x = 3$

$x = \frac{3}{4}$

x का मान समी ① में रखने पर

Under CSR Support by
ipca | Foundation

missiongyan
LET'S LEARN TOGETHER

$$3 \times \frac{3}{4} - y = -6$$



$$\frac{9}{4} - y = -6$$

$$\frac{9}{4} + 6 = y$$

$$\frac{9+24}{4} = y$$

$$y = \frac{33}{4}$$

Under CSR Support by
ipca | Foundation

missiongyan
LET'S LEARN TOGETHER

उदाहरण – 2

निम्नलिखित को a + ib के रूप में व्यक्त करें :

(i) $(-5i)\left(\frac{1}{8}i\right)$

$(-5i) \times \left(\frac{1}{8}i\right)$

$= -5 \times \frac{1}{8} \times i \times i \quad (i^2 = -1)$

Under CSR Support by
ipca | Foundation

missiongyan
LET'S LEARN TOGETHER

$= -\frac{5}{8} \times -1$

$= \frac{5}{8}$ $(a + ib)$

$= \frac{5}{8} + i0$ Ans



Under CSR Support by
ipca | Foundation

missiongyan
LET'S LEARN TOGETHER

(ii) $\left(-i\right)\left(2i\right)\left(-\frac{1}{8}i\right)^3$

3

64×8

512

$= \left[(-i) \times 2i\right] \times \left(\frac{-1}{8}i\right)^3$

$= -2 \times (i^2) \times \left(\frac{-1}{8}\right)^3 (i)^3$

$= -2 \times -1 \times \frac{-1}{512} \times -i$

$= 2 \times \frac{i}{512}$

Under CSR Support by ipca | Foundation

missiongyan LET'S LEARN TOGETHER

$$= \frac{2 \times i}{5+2} \quad \text{II}$$

$$\frac{}{256}$$



$$= \frac{i}{256} \quad (a+ib)$$

$$= 0 + i\left(\frac{1}{256}\right)$$

Ans

Under CSR Support by ipca | Foundation

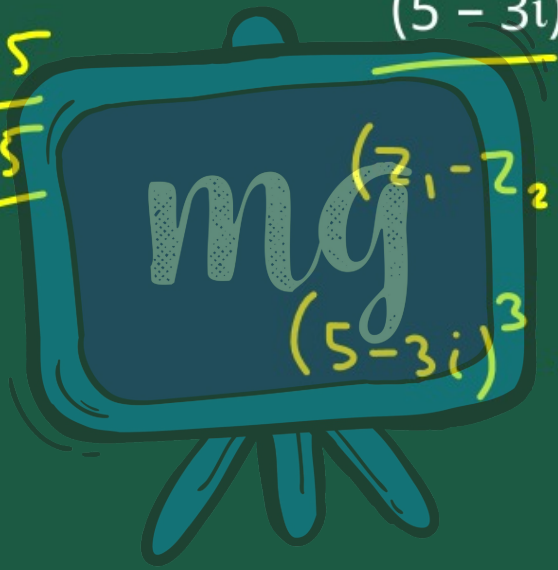
missiongyan LET'S LEARN TOGETHER

उदाहरण – 3

$(5 - 3i)^3$ को $a + bi$ के रूप में व्यक्त करें :

25×5

125



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

$$= (5)^3 - (3i)^3 - 3(5)^2(3i) + 3 \times 5 \times (3i)^2$$

Under CSR Support by ipca | Foundation

missiongyan LET'S LEARN TOGETHER

$$= 125 - (3)^3 (i)^3 - 3 \times 25 \times 3i + 15 \times (3)^2 (i)^2$$

$$= 125 - 27 \times -i - 225i + 135(-1)$$

$$= 125 - 135 + 27i - 225i$$

$$= -10 - 198i$$

$$= -10 + i(-198)$$

Under CSR Support by ipca | Foundation

missiongyan LET'S LEARN TOGETHER

उदाहरण - 4

$\left(-\sqrt{3}+\sqrt{-2}\right)\left(2\sqrt{3}-i\right)$ को a + ib के रूप में व्यक्त करें :

$\sqrt{-1} = i$

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

$= \sqrt{2}i$

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

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

$= -\sqrt{3} \times 2\sqrt{3} - \sqrt{3} \times -i$

$+ \sqrt{2}i \times 2\sqrt{3} + \sqrt{2}i \times -i$

Under CSR Support by ipca | Foundation

missiongyan LET'S LEARN TOGETHER

$$= -6 + \sqrt{3}i + i\,2\sqrt{2}\sqrt{3} - \sqrt{2}\,(i^2)$$

$$= -6 + \sqrt{3}i + i\,2\sqrt{6} + \sqrt{2}$$

$$= -6 + \sqrt{2} + i\left(\sqrt{3} + 2\sqrt{6}\right)$$

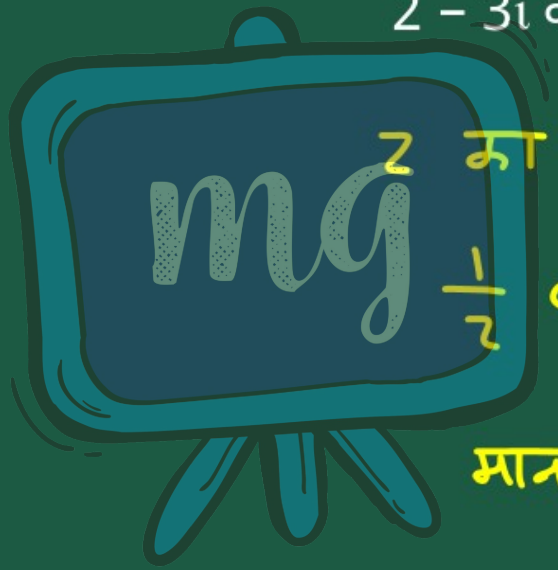
$$= \underbrace{(\sqrt{2} - 6)} + i\underbrace{(\sqrt{3} + 2\sqrt{6})}_{\text{Ans}}$$

Under CSR Support by ipca | Foundation

missiongyan LET'S LEARN TOGETHER

उदाहरण – 5

2 – 3i का गुणात्मक प्रतिलोम ज्ञात कीजिए।



z का गुणात्मक प्रतिलोम

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

माना $z = 2 - 3i$

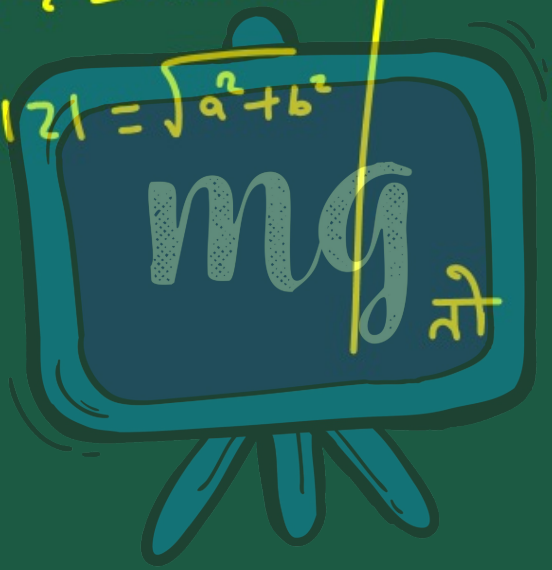
$\bar{z} = 2 + 3i$

Under CSR Support by ipca | Foundation

missiongyan LET'S LEARN TOGETHER

यदि $z = a + ib$

तो $|z| = \sqrt{a^2 + b^2}$



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

$= \sqrt{4 + 9}$

$|z| = \sqrt{13}$

$|z|^2 = 13$

$\frac{1}{z} = \frac{\bar{z}}{|z|^2} = \frac{2 + 3i}{13}$

$\frac{1}{z} = \frac{2}{13} + i\frac{3}{13}$

Under CSR Support by
ipca | Foundation

missiongyan
LET'S LEARN TOGETHER

अतः $2-3i$ का गुणात्मक प्रतिलोम

$\frac{2}{13}+i\frac{3}{13}$ है।



Under CSR Support by ipca | Foundation

missiongyan LET'S LEARN TOGETHER

उदाहरण – 6

निम्नलिखित को a + ib के रूप में व्यक्त करें।

(i) $\dfrac{5+\sqrt{2}i}{1-\sqrt{2}i}$

$\dfrac{1}{2i+1} \times \dfrac{-2i+1}{-2i+1}$

$\dfrac{5+\sqrt{2}i}{1-\sqrt{2}i} \times \dfrac{1+\sqrt{2}i}{1+\sqrt{2}i}$

Under CSR Support by ipca | Foundation

missiongyan LET'S LEARN TOGETHER

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

$$= \frac{3 + 6\sqrt{2}i}{3}$$

$$= 1 + 2\sqrt{2}i \qquad (a+ib)$$

$$= 1 + i(2\sqrt{2})$$

Ans

Under CSR Support by
ipca | Foundation

missiongyan
LET'S LEARN TOGETHER

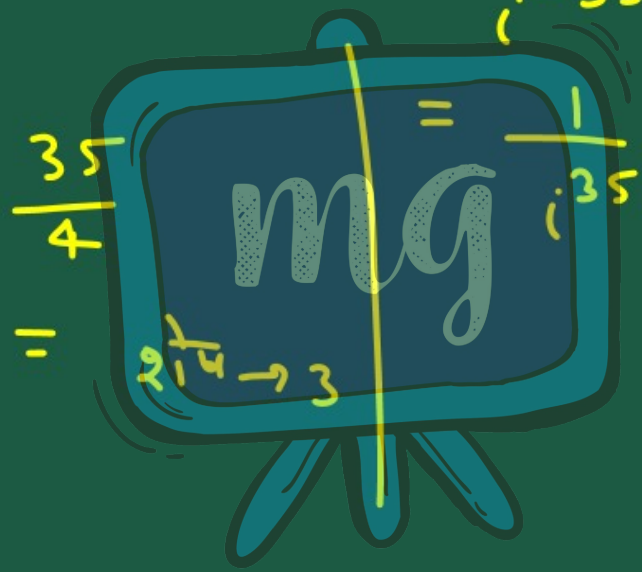
(ii) i^{-35}

$= \frac{1}{i^{35}}$

$= \frac{1}{(i^4)^8 \cdot (i)^3}$

$= \frac{1}{(1)^8 \cdot i}$

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



Under CSR Support by
ipca | Foundation

missiongyan
LET'S LEARN TOGETHER

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



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

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

$$= i$$

$$= 0 + i$$

Ans