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कक्षा - 11

गणित

अध्याय – 4

सम्मिश्र संख्याएँ और द्विघातीय समीकरण

भाग – 8

विविध प्रश्नावली (प्रश्न 3 से 6)

हर्ष गोयल

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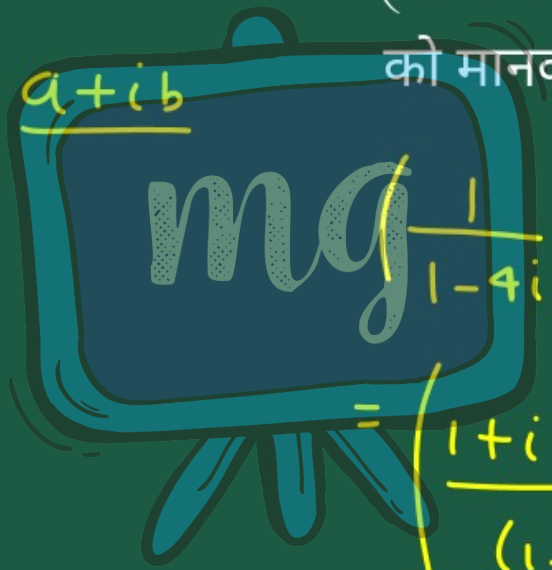
विविध प्रश्नावली

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3. $\left(\frac{1}{1-4i}-\frac{2}{1+i}\right)\left(\frac{3-4i}{5+i}\right)$ को मानक रूप में परिवर्तित कीजिए।

$a+ib$



$$= \left(\frac{1+i-2(1-4i)}{(1-4i)(1+i)}\right)\left(\frac{3-4i}{5+i}\right)$$

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$$= \left(\frac{1+i-2+8i}{1+i-4i+4}\right)\left(\frac{3-4i}{5+i}\right)$$

$$= \left(\frac{-1+9i}{5-3i}\right)\left(\frac{3-4i}{5+i}\right)$$

$$= \frac{-3+4i+27i+36}{25+5i-15i+3}$$

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$$\frac{28 \times 31}{}$$

28
84 ×
868

$$= \frac{-3 + 36 + i(4 + 27)}{25 + 3 + i(5 - 15)}$$

$a + ib$

$$= \frac{33 + 31i}{28 - 10i} \times \frac{28 + 10i}{28 + 10i}$$

(परिमेयकरण)

$$= \frac{924 + 330i + 868i - 310}{784 + 280i - 280i + 100}$$

$$\frac{28 \times 33}{}$$

84
84 ×
924

$$\frac{28 \times 28}{}$$

224
56 ×

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$$= \frac{924 - 310 + i(330 + 868)}{784 + 100}$$

$$= \frac{614 + i(1198)}{884}$$

$$= \frac{614}{884} + i\left(\frac{1198}{884}\right)$$

$$\frac{307}{442} + i\left(\frac{599}{442}\right)$$

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$$= \frac{307}{442} + i\left(\frac{599}{442}\right)$$

$a + ib$



Ans

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4. यदि $x - iy = \sqrt{\frac{a - ib}{c - id}}$, तो सिद्ध कीजिए कि $(x^2 + y^2)^2 = \frac{a^2 + b^2}{c^2 + d^2}$

$(x^2+y^2)^2$

$(x-iy)(x+iy)$

$= x^2 + y^2$

$x - iy = \sqrt{\frac{a - ib}{c - id}}$ — (1)

$x + iy = \sqrt{\frac{a + ib}{c + id}}$ — (2)

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$$(x+iy)(x-iy)$$

$$z_1^2 - z_2^2$$

$$= \left(\sqrt{\frac{a+ib}{c+id}}\right)\left(\sqrt{\frac{a-ib}{c-id}}\right)$$

$$= \sqrt{\frac{(a+ib)}{(c+id)} \times \frac{a-ib}{c-id}}$$

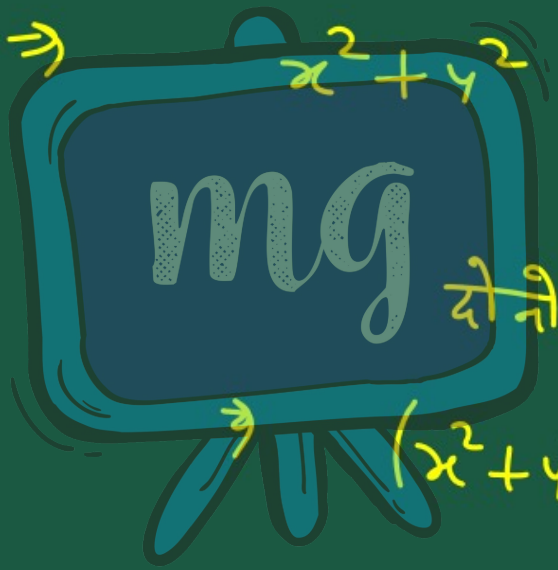
$$= \sqrt{\frac{a^2-(ib)^2}{c^2-(id)^2}}$$

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$$(x+iy)(x-iy) = \sqrt{\frac{a^2+b^2}{c^2+d^2}}$$

$$x^2+y^2 = \sqrt{\frac{a^2+b^2}{c^2+d^2}}$$



दोनों पक्षों का वर्ग करने पर

$$(x^2+y^2)^2 = \frac{a^2+b^2}{c^2+d^2}$$

इति

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5. यदि $z_1 = 2 - i, z_2 = 1 + i$, $\left|\frac{z_1 + z_2 + 1}{z_1 - z_2 + 1}\right|$ का मान ज्ञात कीजिए।



तो

$z_1 = 2 - i$

$z_2 = 1 + i$

$$\frac{z_1 + z_2 + 1}{z_1 - z_2 + 1} = \frac{2 - i + 1 + i + 1}{2 - i - (1 + i) + 1}$$

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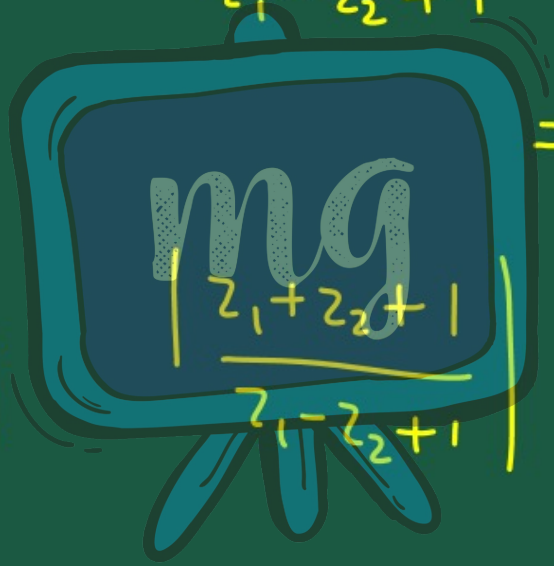
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$$\frac{z_1 + z_2 + 1}{z_1 - z_2 + 1} = \frac{4}{2 - i - i + i}$$

$$\left|\frac{z_1}{z_2}\right| = \frac{4}{2 - 2i}$$

$$= \frac{|z_1|}{|z_2|} \qquad \left|\frac{z_1 + z_2 + 1}{z_1 - z_2 + 1}\right| = \left|\frac{4}{2 - 2i}\right|$$

$$= \frac{|4|}{|2 - 2i|}$$



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$|4| = 4$

$|-4| = 4$

$= \frac{\sqrt{(4)^2 + (0)^2}}{\sqrt{(2)^2 + (-2)^2}}$

$= \frac{\sqrt{16 + 0}}{\sqrt{4 + 4}}$

$= \frac{4}{\sqrt{8}}$



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$$\left|\frac{z_1+z_2+1}{z_1-z_2+1}\right| = \frac{4}{\sqrt{8}}$$

$$= \frac{4}{\sqrt{4\times 2}}$$

$$= \frac{4}{2\sqrt{2}} = \frac{2}{\sqrt{2}}$$

$$\left|\frac{z_1+z_2+1}{z_1-z_2+1}\right| = \sqrt{2}$$

Ans

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6. यदि $a+ib=\frac{(x+i)^2}{2x^2+1}$, तो सिद्ध कीजिए कि

$$(a^2+b^2)=\frac{(x^2+1)^2}{(2x^2+1)^2}$$

a^2+b^2

$(a+ib)(a-ib)$

$a+ib = \frac{(x+i)^2}{2x^2+1}$

$a-ib = \frac{(x-i)^2}{2x^2+1}$

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$$(a+ib)(a-ib)$$

$$= \frac{(x+i)^2}{2x^2+1} \times \frac{(x-i)^2}{2x^2+1}$$

$$a^2+b^2 = \frac{[(x+i)(x-i)]^2}{(2x^2+1)^2}$$

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$$a^2+b^2 = \frac{\left[x^2-(i^2)\right]^2}{(2x^2+1)^2}$$

$$a^2+b^2 = \frac{(x^2+1)^2}{(2x^2+1)^2}$$

इति