RVHS H2 Mathematics Remedial Programme

Topic: Complex Numbers

Basic Mastery Questions

1. **MI Promo 9758/2020/PU2/P1/Q8(a)**

Given that $a = 3 - \mathrm{i}$ and $b = 5 + 2\mathrm{i}$, find the following complex numbers in the form $x + \mathrm{i}y$,

(i) ab^*, [2]

(ii) $\dfrac{b}{a^*}$. [3]

Answer: (i) $13 - 11\mathrm{i}$, (ii) $\dfrac{1}{10}(17 + \mathrm{i})$

2. **ASRJC Promo 9758/2020/Q8(a)**

It is given that two complex numbers *z* and *w* satisfy the following equations

$$\mathrm{i}w + z = 5$$
$$w^2 + (4\mathrm{i} - 1)z = -11 + 18\mathrm{i}$$

Find *z* and *w*. [4]

Click here or scan this  to view video example on how to solve such question!

3. **MI Promo 9758/2020/PU2/P1/Q8(b)**

(i) Express $z = \mathrm{e}^{\mathrm{i}\frac{\pi}{6}} + \mathrm{i}$ in the form of $r\mathrm{e}^{\mathrm{i}\theta}$. [3]

(ii) Given that the complex number *zw* has modulus 12 and argument $\dfrac{2\pi}{3}$, find the exact modulus and argument of complex number *w*. [3]

Answer: (i) $\sqrt{3}\mathrm{e}^{\mathrm{i}\frac{\pi}{3}}$, (ii) $r = 4\sqrt{3},\ \theta = \dfrac{\pi}{3}$

4. **MI Promo 9758/2020/PU2/P2/Q2(i)**

Do not use a calculator in answering this question.

The roots of the equation $z^2 = -8 - 6\mathrm{i}$ are z_1 and z_2.

Find z_1 and z_2 in cartesian form, $x + \mathrm{i}y$, showing your working. [5]

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Answer: $-1 + 3\mathrm{i}$, $1 - 3\mathrm{i}$

5. VJC Prelim 9758/2021/01/Q8(a)(i)

The complex number w is given by $w = re^{\mathrm{i}\theta}$, where $r > 0$ and $0 \le \theta \le \frac{\pi}{2}$.

Given that $z = \left(1 - \mathrm{i}\sqrt{3}\right)w$, find $|z|$ in terms of r and $\arg(z)$ in terms of θ. [2]

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Answers: $-\frac{\pi}{3} + \theta$, $2r$

Standard Questions

1. **RI Promo 9758/2020/Q7(a)**

Do not use a calculator in answering this question.

One root of the equation $zz^* + 2\mathrm{i}z = a + 6\mathrm{i}$, where a is real, is $z = 3 - 7\mathrm{i}$. Find the value of a and the other root. [4]

Answer: $a = 72,\ 3 + 9\mathrm{i}$

2. **VJC Promo 9758/2020/Q10(a), (e)**

It is given that the complex number $w = -\left(\sqrt{3}\right) - \mathrm{i}$.

Find the value of $|w|$. [1]

Find the exact value of arg(w). [1]

Without using a calculator, find the three smallest positive whole number values of n such that $w^n w^*$ is a real number. [3]

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Answer: $|w| = 2$, $\arg w = -\dfrac{5\pi}{6}$, $n = 1, 7, 13$