Sample Task **Questions**

Questions with Answer Keys **MathonGo**

Q1

The point 'z' in Argand's plane moves such that $\text{Re}\left(\frac{iz+1}{iz-1}\right) = 2$, then locus of z is-

(1) straight line

(2) circle

(3) ellipse

(4) hyperbola

Q2

If $z \neq i$ be any complex number such that $\frac{z-i}{z+i}$ is a purely imaginary number, then, $z + \frac{1}{z}$ is

(1) any non-zero real number other than 1 .

(2) a purely imaginary number.

(3) 0

(4) any non-zero real number

Q3

Let $u = \frac{2z+i}{z-ki}$, $z = x + iy$ and $k > 0$. If the curve represented by $\text{Re}(u) + \text{Im}(u) = 1$ intersects the y-axis at points P and Q where PQ = 5 then the value of k is

(1) $\frac{3}{2}$

(2) $\frac{1}{2}$

(3) 4

(4) 2

Q4

The solution of the equation $|z| - z = 1 + 2i$ is

(1) $\frac{3}{2} + 2i$

(2) $\frac{3}{2} - 2i$

(3) $3 - 2i$

(4) None of these

Q5

For the complex number Z, the sum of all the solutions of $Z^2 + |Z| = \left(\bar{Z}\right)^2$ is equal to

Q6

Let z be a complex number satisfying the equation $\sqrt{2}|z - 1| + i + z = 0$. Find the number of such complex numbers.

Q7

The locus of point z, where $z = x + iy$, satisfying the equation $\left|\frac{z-5i}{z+5i}\right| = 1$, is

(1) The x - axis

(2) The straight line $y = 5$

(3) A circle passing through the origin

(4) None of these

Q8

If $Z = \cos\phi + i\sin\phi \left(\forall \phi \in \left(\frac{\pi}{3}, \pi \right) \right)$, then the value of $\arg\left(Z^2 - Z\right)$ is equal to (where, arg(Z) represents the argument of the complex number Z lying in the interval $(-\pi, \pi]$ and $i^2 = -1$)

(1) $\frac{3\phi+\pi}{2}$

(2) $\frac{3\phi}{2}$

(3) $\frac{3}{2}(\phi - \pi)$

(4) $\frac{3\phi-\pi}{2}$

Q9

If z and w are two non-zero complex numbers such that $|zw| = 1$ and $\arg(z) - \arg(w) = \frac{\pi}{2}$, then the value of $5i\bar{z}w$ is equal to

(1) – 5

(2) 5i

(3) 5

(4) – 5i

Q10

If z is a non-real complex number, then the minimum value of $\frac{Im\ z^5}{(Im\ z)^5}$ is ($Im\ z$ = Imaginary part of z)

(1) -2

(2) -4

(3) -5

(4) -1

Q11

If z and w are complex numbers satisfying $z + iw = 0$ and $\text{amp}(zw) = \pi$, then $\text{amp}(w)$ is equal to (where, $\text{amp}(w) \in (-\pi, \pi]$)

(1) $\frac{\pi}{4}$

(2) $\frac{-\pi}{4}$

(3) $\frac{\pi}{2}$

(4) $\frac{3\pi}{4}$

Q12

Let α and β be the roots of $x^2 + x + 1 = 0$, then the equation whose roots are α^{2020} and β^{2020} is

(1) $x^2 + x + 1 = 0$

(2) $x^2 - x - 1 = 0$

(3) $x^2 + x - 1 = 0$

(4) $x^2 - x + 1 = 0$

Q13

If $z = \frac{1}{2}\left(\sqrt{3} - i\right)$ and the least positive integral value of n such that $\left(z^{101} + i^{109}\right)^{106} = z^n$ is k, then the value of $\frac{2}{5}k$ is equal to

Q14

The value of $\sum_{n=0}^{100} i^{n!}$ equals (where $i = \sqrt{-1}$)

(1) -1

(2) i

(3) $2i + 95$

(4) $97 + i$

Sample Task **Questions**

Questions with Answer Keys **MathonGo**

Q15

If ω is the non-real cube root of unity, then the number of ordered pairs of integers (a, b), such that $|a\omega + b| = 1$, is equal to

Q16

The number of solutions of the equation $z^3 + \frac{3(\bar{z})^2}{|z|} = 0$ (where, z is a complex number) are

(1) 2

(2) 3

(3) 6

(4) 5

Q17

$z \in C$ satisfies the condition $|z| \geq 3$. Then the least value of $\left|z + \frac{1}{z}\right|$ is

(1) $\frac{3}{8}$

(2) $\frac{8}{5}$

(3) $\frac{8}{3}$

(4) $\frac{5}{8}$

Q18

If m and M denotes the minimum and maximum value of $|2z + 1|$, where $|z - 2i| \leq 1$ and $i^2 = -1$, then the value of $(M - m)^2$ is equal to

(1) 17

(2) 34

(3) 51

(4) 16

Q19

For a complex number Z, if all the roots of the equation $Z^3 + aZ^2 + bZ + c = 0$ are unimodular, then

(1) $|a| > 3$ and $|c| = 1$

(2) $|a| \leq 3$ and $|c| = 3$

(3) $|a| > 3$ and $|c| = \frac{1}{3}$

(4) $|a| \leq 3$ & $|c| = 1$

Q20

Let z and w be non-zero complex numbers such that $zw = \left|z^2\right|$ and $\left|z - \bar{z}\right| + \left|w + \bar{w}\right| = 4$. If w varies, then the perimeter of the locus of z is

(1) $8\sqrt{2}$ units

(2) $4\sqrt{2}$ units

(3) 8 units

(4) 4 units

Q21

The straight line $(1 + 2i)z + (2i - 1)\bar{z} = 10i$ on the complex plane, has intercept on the imaginary axis equal to

(1) 5

(2) $\frac{5}{2}$

(3) $-\frac{5}{2}$

(4) -5

Q22

If a complex number z lie on a circle of radius $\frac{1}{2}$ units, then the complex number $\omega = -1 + 4z$ will always lie on a circle of radius k units, where k is equal to

Q23

Let z be a complex number such that $\left|\frac{z-i}{z+2i}\right| = 1$ and $|z| = \frac{5}{2}$. Then the value of $|z + 3i|$ is

(1) $\sqrt{10}$

(2) $\frac{7}{2}$

(3) $\frac{15}{4}$

(4) $2\sqrt{3}$

Q24

A complex number z satisfies $arg\left(\frac{z}{z-i}\right) = \frac{\pi}{3}$ and $|z| = |z - i|$, then evaluate $[Re\,(2z - i)]$ where $[\cdot]$ represents the greatest integer function.

Q25

Let z and w be two complex numbers such that $w = z\bar{z} - 2z + 2$, $\left|\frac{z+i}{z-3i}\right| = 1$ and Re (w) has minimum value. Then, the minimum value of $n \in N$ for which w^n is real, is equal to _____.

Q26

The complex number z, satisfying the equation $z^3 = \bar{z}$ and $\arg(z + 1) = \frac{\pi}{4}$ simultaneously, is (where, $i^2 = -1$)

(1) i

(2) $1 + 2i$

(3) $2 + 3i$

(4) $3 + 4i$

Q27

The real part of the complex number z satisfying $|z - 1 - 2i| \leq 1$ and having the least positive argument, is

(1) $\frac{4}{5}$

(2) $\frac{8}{5}$

(3) $\frac{6}{5}$

(4) $\frac{7}{5}$

Q28

If a and b are two real numbers lying between 0 and 1, such that $Z_1 = a + i$, $Z_2 = 1 + bi$ and $Z_3 = 0$ form an equilateral triangle, then

(1) $a = 2 + \sqrt{3}$

(2) $b = 4 - \sqrt{3}$

(3) $a = b$

(4) $a = 2, b = \sqrt{3}$

Q29

If the locus of the complex number z given by $\arg(z + i) - a\arg(z - i) = \frac{2\pi}{3}$ is an arc of a circle, then the length of the arc is

(1) $\frac{4\pi}{3}$

(2) $\frac{4\pi}{3\sqrt{3}}$

(3) $\frac{2\sqrt{3}\pi}{3}$

(4) $\frac{2\pi}{3\sqrt{3}}$

Q30

Let the locus of any point $P(z)$ in the argand plane is $\arg\left(\frac{z-5i}{z+5i}\right) = \frac{\pi}{4}$. If O is the origin, then the value of $\frac{\max.(OP)+\min.(OP)}{2}$ is

(1) $5\sqrt{2}$

(2) $5 + \frac{5}{\sqrt{2}}$

(3) $5 + 5\sqrt{2}$

(4) $10 - \frac{5}{\sqrt{2}}$

Sample Task **Questions**

Questions with Answer Keys **MathonGo**

Answer Key

Q1 (2)	**Q2** (4)	**Q3** (4)	**Q4** (2)
Q5 (0)	**Q6** (0)	**Q7** (1)	**Q8** (3)
Q9 (3)	**Q10** (2)	**Q11** (1)	**Q12** (1)
Q13 (4)	**Q14** (3)	**Q15** (6)	**Q16** (4)
Q17 (3)	**Q18** (4)	**Q19** (4)	**Q20** (1)
Q21 (1)	**Q22** (2)	**Q23** (2)	**Q24** (1)
Q25 (4)	**Q26** (1)	**Q27** (2)	**Q28** (3)
Q29 (2)	**Q30** (2)		