RAVI MATHS TUITION CENTER, NEAR VILLIVAKKAM RLY STATION, CHENNAI – 82.
WHATSAPP - 8056206308

Complex Numbers TEST 1

12th Standard

Maths

Exam Time : 01:15:00 Hrs | Total Marks : 75

Multiple Choice Question | 55 x 1 = 55

1) $i^n+i^{n+1}+i^{n+2}+i^{n+3}$ is
(a) 0 (b) 1 (c) -1 (d) i

2) The value of $\sum_{i=1}^{13}\left(i^n+i^{n-1}\right)$ is
(a) 1+ i (b) i (c) 1 (d) 0

3) The area of the triangle formed by the complex numbers z,iz, and z+iz in the Argand's diagram is
(a) $\frac{1}{2}|z|^2$ (b) $|z|^2$ (c) $\frac{3}{2}|z|^2$ (d) $2|z|^2$

4) The conjugate of a complex number is $\frac{1}{i-2}$ /Then the complex number is
(a) $\frac{1}{i+2}$ (b) $\frac{-1}{i+2}$ (c) $\frac{-1}{i-2}$ (d) $\frac{1}{i-2}$

5) If $z=\frac{\left(\sqrt{3}+i\right)^3(3i+4)^2}{(8+6i)^2}$, then |z| is equal to
(a) 0 (b) 1 (c) 2 (d) 3

6) If z is a non zero complex number, such that $2iz^2=\bar{z}$ then |z| is
(a) $\frac{1}{2}$ (b) 1 (c) 2 (d) 3

7) If |z-2+i|≤2, then the greatest value of |z| is
(a) $\sqrt{3}-2$ (b) $\sqrt{3}+2$ (c) $\sqrt{5}-2$ (d) $\sqrt{5}+2$

8) If $\left|z-\frac{3}{z}\right|=2$ then the least value |z| is
(a) 1 (b) 2 (c) 3 (d) 5

9) If |z|=1, then the value of $\frac{1+z}{1+\bar{z}}$ is
(a) z (b) $\bar{z}$ (c) $\frac{1}{z}$ (d) 1

10) The solution of the equation |z|-z=1+2i is
(a) $\frac{3}{2}-2i$ (b) $-\frac{3}{2}+2i$ (c) $2-\frac{3}{2}i$ (d) $2+\frac{3}{2}i$

11) If $|z_1|=1,|z_2|=2|z_3|=3$ and $|9z_1z_2+4z_1z_3+z_2z_3|=12$, then the value of $|z_1+z_2+z_3|$ is
(a) 1 (b) 2 (c) 3 (d) 4

12) If z is a complex number such that $z\varepsilon C/R$ and $z+\frac{1}{z}\epsilon R$ then|z| is

(a) 0 (b) 1 (c) 2 (d) 3

13) z_1, z_2 and z_3 are complex number such that $z_1+z_2+z_3=0$ and $|z_1|=|z_2|=|z_3|=1$ then $z_1^2+z_2^2+z_3^3$ is

(a) 3 (b) 2 (c) 1 (d) 0

14) If $\frac{z-1}{z+1}$ is purely imaginary, then |z| is

(a) $\frac{1}{2}$ (b) 1 (c) 2 (d) 3

15) If z=x+iy is a complex number such that |z+2|=|z−2|, then the locus of z is

(a) real axis (b) imaginary axis (c) ellipse (d) circle

16) The principal argument of $\frac{3}{-1+i}$

(a) $\frac{-5\pi}{6}$ (b) $\frac{-2\pi}{3}$ (c) $\frac{-3\pi}{4}$ (d) $\frac{-\pi}{2}$

17) The principal argument of $(\sin 40°+i\cos 40°)^5$ is

(a) −110° (b) −70° (c) 70° (d) 110°

18) If (1+i)(1+2i)(1+3i)...(1+ni)=x+iy, then $2\cdot 5\cdot 10...\left(1+n^2\right)$ is

(a) 1 (b) i (c) x^2+y^2 (d) $1+n^2$

19) If $\omega\neq 1$ is a cubic root of unity and $(1+\omega)^7=A+B\omega$,then (A,B) equals

(a) (1,0) (b) (−1,1) (c) (0,1) (d) (1,1)

20) The principal argument of the complex number $\frac{\left(1+i\sqrt{3}\right)^2}{4i\left(1-i\sqrt{3}\right)}$ is

(a) $\frac{2\pi}{3}$ (b) $\frac{\pi}{6}$ (c) $\frac{5\pi}{6}$ (d) $\frac{\pi}{2}$

21) If α and β are the roots of $x^2+x+1=0$, then $\alpha^{2020}+\beta^{2020}$ is

(a) -2 (b) -1 (c) 1 (d) 2

22) The product of all four values of $\left(cos\frac{\pi}{3}+isin\frac{\pi}{3}\right)^{\frac{3}{4}}$ is

(a) -2 (b) -1 (c) 1 (d) 2

23) If $\omega\neq 1$ is a cubic root of unity and $\begin{vmatrix}1 & 1 & 1\\ 1 & -\omega^2 & \omega^2\\ 1 & \omega^2 & \omega^2\end{vmatrix}$ =3k, then k is equal to

(a) 1 (b) -1 (c) $\sqrt{3i}$ (d) $-\sqrt{3i}$

24) The value of $\left(\frac{1+3\sqrt{i}}{1-\sqrt{3i}}\right)^{10}$

(a) $cis\frac{2\pi}{3}$ (b) $cis\frac{4\pi}{3}$ (c) $-cis\frac{2\pi}{3}$ (d) $-cis\frac{4\pi}{3}$

25) If $\omega = cis\dfrac{2\pi}{3}$, then the number of distinct roots of

$$\begin{vmatrix} z+1 & \omega & \omega^2 \\ \omega & z+\omega^2 & 1 \\ \omega^2 & 1 & z+\omega \end{vmatrix}$$

(a) 1 (b) 2 (c) 3 (d) 4

26) The value of $(1+i)(1+i^2)(1+i^3)(1+i^4)$ is

(a) 2 (b) 0 (c) 1 (d) i

27) If $\sqrt{a+ib}$ =x+iy, then possible value of $\sqrt{a-ib}$ is

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

28) If, $i^2 = -1$, then $i^1 + i^2 + i^3 + \ldots +$ up to 1000 terms is equal to

(a) 1 (b) -1 (c) i (d) 0

29) If $z=\cos\frac{\pi}{4} + i\sin\frac{\pi}{6}$, then

(a) $|z| =1$, $\arg(z) = \frac{\pi}{4}$ (b) $|z| =1$, $\arg(z) = \frac{\pi}{6}$ (c) $|z|= \frac{\sqrt{3}}{2}$, $\arg(z)= \frac{5\pi}{24}$ (d) $|z| = \frac{\sqrt{3}}{2}$, $\arg(z) = \tan^{-1}\left(\frac{1}{\sqrt{2}}\right)$

30) If $a=\cos\theta + i\sin\theta$, then $\frac{1+a}{1-a}$ =

(a) $\cot\frac{\theta}{2}$ (b) $\cot\theta$ (c) $i\cot\frac{\theta}{2}$ (d) $i\tan\frac{\theta}{2}$

31) The principal value of the amplitude of (1+i) is

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{12}$ (c) $\frac{3\pi}{4}$ (d) π

32) The least positive integer n such that $\left(\frac{2i}{1+i}\right)^n$ is a positive integer is

(a) 16 (b) 8 (c) 4 (d) 2

33) If a = 1+i, then a^2 equals

(a) 1-i (b) 2i (c) (1+i)(1-i) (d) i-1

34) If $z = \frac{1}{(2+3i)^2}$ then $|z|$ =

(a) $\frac{1}{13}$ (b) $\frac{1}{5}$ (c) $\frac{1}{12}$ (d) none of these

35) If $z=1-\cos\theta + i\sin\theta$, then $|z|$ =

(a) $2\sin\frac{1}{3}$ (b) $2\cos\frac{\theta}{2}$ (c) $2\left|\sin\frac{\theta}{2}\right|$ (d) $2\left|\cos\frac{\theta}{2}\right|$

36) If $z=\frac{1}{1-cos\theta-isin\theta}$, the Re(z) =

(a) 0 (b) $\frac{1}{2}$ (c) $\cot\frac{\theta}{2}$ (d) $\frac{1}{2}\cot\frac{\theta}{2}$

37) If $x+iy = \frac{3+5i}{7-6i}$, they y =

(a) $\frac{9}{85}$ (b) $-\frac{9}{85}$ (c) $\frac{53}{85}$ (d) none of these

38) The amplitude of $\frac{1}{i}$ is equal to

(a) 0 (b) $\frac{\pi}{2}$ (c) $-\frac{\pi}{2}$ (d) π

39) The value of $(1+i)^4 + (1-i)^4$ is

(a) 8 (b) 4 (c) -8 (d) -4

40) The complex number z which satisfies the condition $\left|\frac{1+z}{1-z}\right|$ =1 lies on

(a) circle $x^2+y^2 =1$ (b) x-axis (c) y-axis (d) the lines x+y=1

41) If z = a + ib lies in quadrant then $\frac{\bar{z}}{z}$ also lies in the III quadrant if

(a) a > b > 0 (b) a < b < 0 (c) b < a < 0 (d) b > a > 0

42) $\frac{1+e^{-i\theta}}{1+e^{i\theta}}$ =

(a) cosθ + i sinθ (b) cosθ - i sinθ (c) sinθ - i cosθ (d) sinθ + icosθ

43) If $z^n = cos\frac{n\pi}{3} + isin\frac{n\pi}{3}$, then z_1, z_2 ..... z_6 is

(a) 1 (b) -1 (c) i (d) -i

44) If x =cosθ + i sinθ, then the value of $x^n + \frac{1}{x^n}$ is

(a) 2 cosθ (b) 2i sin nθ (c) 2i sin nθ (d) 2i cos nθ

45) If ω is the cube root of unity, then the value of $(1-\omega)(1-\omega^2)(1-\omega^4)(1-\omega^8)$ is

(a) 9 (b) -9 (c) 16 (d) 32

46) The points represented by 3 - 3i, 4 - 2i, 3 - i and 2 - 2i form _____ in the argand plane.

(a) collinear points (b) Vertices of a parallelogram (c) Vertices of a rectangle (d) Vertices of a square

47) $(1+i)^3$ = _______

(a) 3 + 3i (b) 1 + 3i (c) 3 - 3i (d) 2i - 2

48) $\frac{(cos\theta+isin\theta)^6}{(cos\theta-isin\theta)^5}$ = _________

(a) cos 11θ - isin 11θ (b) cos 11θ + isin 11θ (c) cosθ + i sinθ (d) $cos\frac{6\theta}{5} + isin\frac{6\theta}{5}$

49) If a =cosα + i sinα, b= -cosβ + i sinβ then $\left(ab - \frac{1}{ab}\right)$ is __________

(a) -2i sin(α - β) (b) 2i sin(α - β) (c) 2 cos(α - β) (d) -2 cos(α - β)

50) The conjugate of $\frac{1+2i}{1-(1-i)^2}$ is ________

(a) $\frac{1+2i}{1-(1-i)^2}$ (b) $\frac{5}{1-(1-i)^2}$ (c) $\frac{1-2i}{1+(1+i)^2}$ (d) $\frac{1+2i}{1+(1-i)^2}$

51) The modular of $\frac{(-1+i)(1-i)}{1+i\sqrt{3}}$ is _______

(a) $\sqrt{2}$ (b) 2 (c) 1 (d) $\frac{1}{2}$

52) The value of $\frac{(cos45^0+isin45^0)^2(cos30^0-isin30^0)}{cos30^0+isin30^0}$ is

(a) $\frac{1}{2}+i\frac{\sqrt{3}}{2}$ (b) $\frac{1}{2}-i\frac{\sqrt{3}}{2}$ (c) $-\frac{\sqrt{3}}{2}+\frac{1}{2}$ (d) $\frac{\sqrt{3}}{2}+\frac{1}{2}$

53) If x=cosθ + i sinθ, then $x^n + \frac{1}{x^n}$ is _______

(a) 2 cos nθ (b) 2 i sin nθ (c) 2^n cosθ (d) 2^n i sinθ

54) If z_1, z_2, z_3 are the vertices of a parallelogram, then the fourth vertex z_4 opposite to z_2 is _____

(a) $z_1 + z_2 - z_2$ (b) $z_1 + z_2 - z_3$ (c) $z_1 + z_2 - z_3$ (d) $z_1 - z_2 - z_3$

55) If $x_r = cos\left(\frac{\pi}{2^r}\right) + isin\left(\frac{\pi}{2^r}\right)$ then $x_1, x_2 \ldots x_\infty$ is

(a) -∞ (b) -2 (c) -1 (d) 0

Match the following

56) Re(z)	(1) $z=-\bar{z}$
57) Im(z)	(2) 2
58) z is real	(3) 2
59) z is imaginary	(4) $\frac{z-\bar{z}}{2}$
60) |z|	(5) $\|z_1\|\,\|z_2\|$
61) $\|z_1 + z_2\|$	(6) $2n\pi - \frac{\pi}{2}$
62) $\|z_1 - z_2\|$	(7) $\geq \|z_1\| + \|z_2\|$

63) $|z_1 z_2|$
64) arg (0)
65) arg (i)
66) arg (z^n)
67) arg (z)
68) $\left|\sqrt{3}+i\right|$
69) $\left|-\sqrt{3}+i\right|$

(8) n arg (z)
(9) arg z + 2nπ, n$\in$ Z
(10) $|\bar{z}|$
(11) $\frac{z+\bar{z}}{2}$
(12) 2nπ
(13) z=$\bar{z}$
(14) ≤ $|z_1|$ + $|z_2|$

Odd one out

70) i^{-1} =
(i) $\frac{1}{i}$
(ii) i
(iii) -i
(4) $\frac{1}{i^2}$

71) When z =x+iy, then iz is
(1) x-iy
(2) i(x+iy)
(3) -y+ix
(4) Rotation ofz by 90° in the counter clockwise direction

72) (1+3i) (1-3i)
(i) $(1)^2 - (3i)^2$
(2) 1 + 9
(3) 10
(4) -8

73) If z=x+iy, then z $\bar{z}$ =
(i) (x+iy) (x-iy)
(2) $|z|^2$
(3) $x^2 + y^2$
(4) |z|

74) The princlple argumentofa complex number.
(1) θ = α
(2) θ = -α
(3) $\frac{\pi}{2} - \alpha$
(4) θ = α - π

75) Application of De Moivre's theorem.
(1) $(\sin\theta + i\cos\theta)^n = \sin n\theta + i\cos n\theta$
(2) $(\cos\theta + i\sin\theta)^n = \cos n\theta + i\sin n\theta$
(3) $(\cos\theta + i\sin\theta)^{-n} = \cos n\theta - i\sin n\theta$
(4) $(\cos\theta - i\sin\theta)^{-n} = \cos n\theta + i\sin n\theta$

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Complex Numbers TEST 2

12th Standard

Maths

Exam Time : 01:00:00 Hrs | Total Marks : 60

30 x 2 = 60

1) Simplify the following
$i^{1947}+i^{1950}$

2) If $z_1=1-3i, z_2=4i$, and $z_3 = 5$, show that $(z_1+z_2)+z_3=z_1+(z_2+z_3)$

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

4) Find z^{-1}, if $z=(2+3i)(1-i)$.

5) If $z=x+iy$, find the following in rectangular form.
$Re\left(\frac{1}{z}\right)$

6) Which one of the points $i, -2+i$, and 3 is farthest from the origin?

7) Find the modulus of the following complex numbers
$\frac{2i}{3+4i}$

8) Find the square roots of $4+3i$

9) Show that the following equations represent a circle, and, find its centre and radius|
$|z-2-i|=3$

10) Write in polar form of the following complex numbers
$2+i2\sqrt{3}$

11) Find the value of $\sum_{k=1}^{8}\left(cos\frac{2k\pi}{9}+isin\frac{2k\pi}{9}\right)$.

12) Show that $|z+2-i|< 2$ represents interior points of a circle. Find its centre and radius.

13) Represent the complex number $-1-i$

14) Simplify the following
$i^{1948}-i^{-1869}$

15) Simplify the following
$i^{59}+\frac{1}{i^{59}}$

16) Simplify the following
$\sum_{n=1}^{10} i^{n+50}$.

17) Evaluate the following if $z=5-2i$ and $w= -1+3i$
$2z+3w$

18) If $z_1=1-3i, z_2=4i$, and $z_3 = 5$,show that $(z_1+z_2)z_3=z_1(z_2z_3)$

19) Write the following in the rectangular form:
$\overline{3i}+\frac{1}{2-i}$.

20) If z=x+iy , find the following in rectangular form.
Im(3z+4z−4i)
21) Find the modulus of the following complex numbers
$(1\text{-}i)^{10}$
22) Find the square roots of −6+8i
23) Obtain the Cartesian form of the locus of z=x+iy in
$\overline{z} = 2^{-1}$
24) Show that the following equations represent a circle, and, find its centre and radius
|3z-6+12i|=8
25) Write in polar form of the following complex numbers
-2-i2
26) Simplify the following:
$\sum_{n=1}^{102} i^n$
27) Find the following $\left|\overline{(1+i)}(2+3i)(4i-3\right|$
28) Find the modulus and principal argument of the following complex numbers.
$-\sqrt{3}+i$
29) Find the modulus and principal argument of the following complex numbers.
$\sqrt{3}$-i
30) If z_1 and z_2 are 1-i, -2+4i then find Im$\left(\frac{z_1 z_2}{\bar{z}_1}\right)$.

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Complex Numbers TEST 3

12th Standard

Maths

Exam Time : 01:00:00 Hrs — Total Marks : 60

30 x 2 = 60

1) Evaluate the following if z=5−2i and w= −1+3i
z+w

2) Write $\frac{3+4i}{5-12i}$ in the x+iy form, hence find its real and imaginary parts.

3) If z_1=3-2i and z_2=6+4i, find $\frac{z_1}{z_2}$

4) Write the following in the rectangular form:
$\overline{(5+9i)+(2-4i)}$

5) Find the following $\left|\frac{2+i}{-1+2i}\right|$

6) Find the square root of 6−8i .

7) If the area of the triangle formed by the vertices z,iz and z+iz is 50 square units, find the value of |z|

8) Obtain the Cartesian form of the locus of z=x+iy in
$[Re\,(iz)]^2=3$

9) Obtain the Cartesian equation for the locus of z=x+iy in
|z-4|=16

10) If $\omega \neq 1$ is a cube root of unity, then the show that
$\frac{a+b\omega+c\omega^2}{b+c\omega+a\omega^2}+\frac{a+b\omega+c\omega^2}{c+a\omega+b\omega^2}=1$

11) Show that |3z−5+i|= 4 represents a circle, and, find its centre and radius.

12) Find the modulus and principal argument of the following complex numbers.
$\sqrt{3}+i$.

13) Find the principal argument Arg z , when z = $\frac{-2}{1+i\sqrt{3}}$

14) Simplify the following
$\sum_{n=1}^{12} i^n$

15) Simplify the following
$i\, i^2 i^3 \ldots i^{2000}$

16) Evaluate the following if z=5−2i and w= −1+3i
z−iw

17) Evaluate the following if z=5−2i and w= −1+3i
z w

18) Write the following in the rectangular form:

$$\frac{10-5i}{6+2i}$$

19) If z=x+iy , find the following in rectangular form.

Re(i z)

20) Find the modulus of the following complex number $\frac{2-i}{1+i}+\frac{1-2i}{1-i}$

21) Find the modulus of the following complex numbers

2i(3−4i)(4−3i).

22) Find the square roots of

−5−12i .

23) Show that the following equations represent a circle, and, find its centre and radius

$|2z+2-4i|=2$

24) Write in polar form of the following complex numbers

$3-i\sqrt{3}$

25) Simplify the following:

$i^{-1924}+i^{2018}$

26) Simplify the following:

$i\, i^2 i^3 \ldots i^{40}$

27) Find the following $\left|\frac{i(2+i)^3}{(1+i)^2}\right|$

28) Find the modulus and principal argument of the following complex numbers:

$-\sqrt{3}-i$

29) Represent the complex numbe $1+i\sqrt{3}$ in polar form.

30) If 1, ω, ω^2 are the cube roots of unity show that $(1+\omega^2)^3 - (1+\omega)^3 = 0$

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Complex Numbers TEST 4

12th Standard

Maths

Exam Time : 01:00:00 Hrs — Total Marks : 60

20 x 3 = 60

1) Simplify the following i^7
2) Given the complex number z=2+3i, represent the complex numbers in Argand diagram z, iz , and z+iz
3) If $z_1=3, z_2=-7i$, and $z_3=5+4i$, show that $z_1(z_2+z_3)=z_1z_2+z_1z_3$
4) If $\frac{z+3}{z-5i}=\frac{1+4i}{2}$, find the complex number z
5) The complex numbers u,v, and w are related by $\frac{1}{u}=\frac{1}{v}+\frac{1}{w}$ If v=3−4i and w=4+3i, find u in rectangular form.
6) Find the least value of the positive integer n for which $\left(\sqrt{3}+i\right)^n$ real
7) If $z_1=3+4i, z_2=5-12i$, and $z_3=6+8$, find $|z_1|,|z_2|,|z_3|,|z_1+z_2|,|z_2-z_3|$,and$|z_1+z_3|$
8) If |z|=2 show that $3 \leq |z+3+4i| \leq 7$
9) Show that the equation $z^2=\bar{z}$ has four solutions.
10) Which one of the points10 − 8i , 11+ 6i is closest to1+ i .
11) If |z| =1, show that $2 \leq \left|z^2-3\right| \leq 4$
12) Show that the equation $z^3+2\bar{z}=0$ has five solutions
13) Find the rectangular form of the complex numbers $\left(cos\frac{\pi}{6}+isin\frac{\pi}{6}\right)\left(cos\frac{\pi}{12}+isin\frac{\pi}{12}\right)$
14) If $\frac{1+z}{1-z}=cos2\theta+isin2\theta$, show that z=itan$\theta$
15) Find the value of $\left(\frac{1+sin\frac{\pi}{10}+icos\frac{\pi}{10}}{1+sin\frac{\pi}{10}-icos\frac{\pi}{10}}\right)^{10}$
16) If $\omega \neq 1$ is a cube root of unity, show that $\left(1-\omega+\omega^2\right)^6+\left(1+\omega-\omega^2\right)^6=128$
17) Obtain the Cartesian form of the locus of z in |z|=|z-i|
18) Find the quotient $\frac{2\left(cos\frac{9\pi}{4}+isin\frac{9\pi}{4}\right)}{4\left(cos\left(\frac{-3\pi}{2}+\right)isin\left(\frac{-3\pi}{2}\right)\right)}$ in rectangular form
19) Find the cube roots of unity.

20) If $z = (cos\theta + isin\theta)$, show that $z^n + \dfrac{1}{z^n} = 2cosn\theta$ and $z^n - \dfrac{1}{z^n} = 2isinn\theta$

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Complex Numbers TEST 5

12th Standard

Maths

Exam Time : 01:00:00 Hrs | Total Marks : 60

20 x 3 = 60

1) Find the value of the real numbers x and y, if the complex number (2+i)x+(1−i)y+2i −3 and x+(−1+2i)y+1+iare equal

2) Find the values of the real numbers x and y, if the complex numbers (3−i)x−(2−i)y+2i +5 and 2x+(−1+2i)y+3+ 2i are equal.

3) If z_1=2+5i, z_2=-3-4i, and z_3=1+i, find the additive and multiplicate inverse of z_1,z_2 and z_3

4) If z_i =2− i and z_2=-4+3i , find the inverse of z_1z_2 and $\frac{z_1}{z_2}$

5) Prove the following properties z is real if and only if z = $\bar{z}$

6) Show that $\left(2+i\sqrt{3}\right)^{10}-\left(2-i\sqrt{3}\right)^{10}$ is purely imaginary

7) If z_1,z_2 and z_3 ,are complex numbers such that $|z_1|=|z_2|=|z_3|=|z_1+z_2+z_3|=1$ find the value of $\left|\frac{1}{z_1}+\frac{1}{z_2}+\frac{1}{z_3}\right|$

8) Show that the points 1,$\frac{-1}{2}+i\frac{\sqrt{3}}{2}$, and $\frac{-1}{2}-i\frac{\sqrt{3}}{2}$ are the vertices of an equilateral triangle.

9) For any two complex number z_1 and z_2 such that $|z_1|=|z_2|$=1 and z1z2 $\neq$, then show that $\frac{z_1+z_2}{1+z_1z_2}$ is real number.

10) If |z|= 3, show that $7\leq|z+6-8i|\leq13$.

11) If $\left|z-\frac{2}{z}\right|=2$ show that the greatest and least value of |z| are $\sqrt{3}+1$ and $\sqrt{3}-1$ respectively.

12) If z=x+iy is a complex number such that $\left|\frac{z-4i}{z+4i}\right|=1$ show that the locus of z is real axis.

13) If $(x_1+iy_1)(x_2+iy_2)(x_3+iy_3)...(x_n+iy_n)$ =a+ib, show that
i) $(x_1^2+y_1^2)(x_2^2+y_2^2)(x_3^2+y_3^2)...(x_n^2+y_n^2)=a^2+b^2$
ii) $\sum_{r=1}^{n}tan^{-1}\left(\frac{y_r}{x_r}\right)=tan^{-1}\left(\frac{b}{a}\right)+2k\pi,k\epsilon Z$

14) If $cos\alpha+cos\beta+cos\gamma=sin\alpha+sin\beta+sin\gamma=0$ then show that
(i) $cos3\alpha+cos3\beta+cos3\gamma=3cos(\alpha+\beta+\gamma)$
(ii) $sin3\alpha+sin3\beta+sin3\gamma+sin3\gamma=3sin\left(\alpha+\beta+\gamma\right)$

15) If $\omega\neq1$ is a cube root of unity, show that the roots of the equation $(z-1)^3+8=0$ are $-1,1-2\omega,1-2\omega^2$.

16) If z=2−2i, find the rotation of z by θ radians in the counter clockwise direction about the origin when $\theta = \frac{\pi}{3}$.

17) Find the product $\frac{3}{2}\left(cos\frac{\pi}{3} + isin\frac{\pi}{3}\right).6\left(cos\frac{5\pi}{6} + isin\frac{5\pi}{6}\right)$in rectangular from

18) Find the fourth roots of unity.

19) Simplify $\left(\frac{1 + cos2\theta + isin2\theta}{1 + cos2\theta - isin2\theta}\right)^{30}$

20) Simplify $\left(sin\frac{\pi}{6} + icos\frac{\pi}{6}\right)^{18}$

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Complex Numbers TEST 6

12th Standard

Maths

Exam Time : 01:15:00 Hrs | Total Marks : 75

25 x 3 = 75

1) Evaluate the following if z=5−2i and w= −1+3i
$z^2+2zw+w^2$
2) Evaluate the following if z=5−2i and w= −1+3i
$(z+w)^2$
3) Given the complex number z=2+3i, represent the complex numbers in Argand diagram
z, −iz , and z−iz
4) If $z_1=3, z_2=-7i$, and $z_3=5+4i$, show that
$(z_1+z_2)z_3=z_1z_3+z_2+z_3$
5) Prove the following properties
$Ro\,(z)=\frac{z+\bar{z}}{2}$ and $\text{Im}(z)=\frac{z-\bar{z}}{2i}$
6) Find the least value of the positive integer n for which $\left(\sqrt{3}+i\right)^n$ purely imaginary
7) Show that $\left(\frac{19-7i}{9+i}\right)^{12}+\left(\frac{20-5i}{7-6i}\right)^{12}$ is real
8) Obtain the Cartesian form of the locus of z=x+iy in
Im[(1−i)z+1]= 0
9) Obtain the Cartesian form of the locus of z=x+iy in
|z+i|=|z-1|
10) Obtain the Cartesian equation for the locus of z=x+iy in
$|z-4|^2-|z-1|^2=16$
11) Write in polar form of the following complex numbers
$$\frac{i-1}{cos\frac{\pi}{3}+isin\frac{\pi}{3}}$$
12) Find the rectangular form of the complex numbers
$$\frac{cos\frac{\pi}{6}-isin\frac{\pi}{6}}{2\left(cos\frac{\pi}{3}+isin\frac{\pi}{3}\right)}$$
13) If $\omega\neq 1$ is a cube root of unity, show that
$(1+\omega)\left(1+\omega^2\right)\left(1+\omega^4\right)\left(1+\omega^8\right)\ldots\left(1+\omega^{2^{11}}\right)=11.$
14) If z=2−2i, find the rotation of z by θ radians in the counter clockwise direction about the origin when $\theta=\frac{2\pi}{3}$.

15) If z=2−2i, find the rotation of z by θ radians in the counter clockwise direction about the origin when $\theta = \dfrac{3\pi}{2}$.

16) Simplify the following:
i^{1729}

17) Obtain the Cartesian form of the locus of z in
|2z-3-i|=3

18) Given the complex number z=3+2i, represent the complex numbers z,iz, and z+ iz in one Argand diagram. Show that these complex numbers form the vertices of an isosceles right triangle.

19) Show that $\left|\frac{z-3}{z+3}\right|$ = 2 represent a circle.

20) Show that the complex numbers 3 + 2i, 5i, -3 + 2i and -i form a square.

21) If the complex number 2 + i and 1-2i are equidistant from x + iy then show that x+3y = 0.

22) Find the locus of z if Re$\left(\frac{z+1}{z-i}\right)$ =0 where z=x+iy.

23) Find the locus of Z if |3z - 5| = 3 |z + 1| where z=x+iy.

24) Find the locus of z if Re$\left(\frac{\bar{z}+1}{\bar{z}-i}\right)$ =0.

25) If $\frac{(a+i)^2}{2a-i}$ =p+iq, show that $p^2+q^2 = \frac{(a^2+i)^2}{4a^2+1}$.

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RAVI MATHS TUITION CENTER, NEAR VILLIVAKKAM RLY STATION, CHENNAI – 82.
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Complex Numbers TEST 7

12th Standard

Maths

Exam Time : 02:00:00 Hrs | Total Marks : 100

20 x 5 = 100

1) Show that $\left(2+i\sqrt{3}\right)^{10}+\left(2-i\sqrt{3}\right)^{10}$ is real ii) $\left(\frac{19+9i}{5-3i}\right)^{15}-\left(\frac{8+i}{I+2i}\right)^{15}$ is purely imaginary.

2) Let z_1,z_2, and z_3 be complex numbers such that $|z_1\|=|z_2|=|z_3|=r>0$ and $z_1+z_2+z_3 \neq 0$ prove that $\left|\frac{z_1z_2+z_2z_3+z_3z_1}{z_1+z_2+z_3}\right|$ =r

3) If z_1,z_2, and z_3 are three complex numbers such that $|z_1|=1,|z_2|=2|z_3|=3$ and $|z_1+z_2+z_3|=1$,show that $|9z_1z_2+4z_1z_2+z_2z_3|=6$

4) If z=x+iy is a complex number such that Im $\left(\frac{2z+1}{iz+1}\right)=0$ show that the locus of z is $2x^2+2y^2+x-2y=0$

5) If z=x+iy and arg $\left(\frac{z-i}{z+2}\right)=\frac{\pi}{4}$, then show that $x^2+y^2+3x-3y+2=0$

6) Show that $\left(\frac{\sqrt{3}}{2}+\frac{i}{2}\right)^5+\left(\frac{\sqrt{3}}{2}-\frac{i}{2}\right)^5=-\sqrt{3}$

7) If $2cosa=x+\frac{1}{x}$ and $2cos\beta=y+\frac{1}{y}$, show that

i) $\frac{x}{y}+\frac{y}{x}=2cos\left(\alpha-\beta\right)$.

ii) $xy-\frac{1}{xy}=2isin\left(\alpha+\beta\right)$

iii) $\frac{x^m}{y^n}-\frac{y^n}{x^m}=2isin\left(m\alpha-n\beta\right)$

iv) $x^my^n+\frac{1}{x^my^n}=2cos(m\alpha+n\beta)$

8) Solve the equation $z^3+27=0$.

9) Prove that the values of $\sqrt[4]{-1}arr \quad \pm\frac{1}{\sqrt{2}}(1\pm i)$.Let z=(-1)

10) If z=x+iy and arg$\left(\frac{z-1}{z+1}\right)=\frac{\pi}{2}$,then show that $x^2+y^2=1$.

11) Suppose z1,Z2, and z3 are the vertices of an equilateral triangle inscribed in the circle |z|= 2. If z_1 =1+i$\sqrt{3}$ then find z_2 and z_3

12) Find all cube roots of $\sqrt{3}+i$

13) Solve the equation $z^3+8i=0$,where $: z \in \mathbb{C}$

14) Simplify: $(1+i)^{18}$

15) Simplify: $\left(-\sqrt{3}+3i\right)^{31}$

16) If 1, ω, ω^2 are the cube roots of unity then show that $(1+5\omega^2+\omega^4)(1+5\omega+\omega^2)(5+\omega+\omega^5)=64$

17) Show that $\left(\frac{i+\sqrt{3}}{-i+\sqrt{3}}\right)^{2\omega}+\left(\frac{i-\sqrt{3}}{i+\sqrt{3}}\right)^{2\omega}=-1$

18) Verify that arg(1+i) + arg(1-i) = arg[(1+i) (1-i)]

19) Find all the roots $(2-2i)^{\frac{1}{3}}$ and also find the product of its roots.

20) Find the radius and centre of the circle $z\bar{z}-(2+3i)z-(2-3i)\bar{z}+9=0$ where z is a complex number.

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Complex Numbers TEST 8

12th Standard

Maths

Exam Time : 02:00:00 Hrs — Total Marks : 75

15 x 1 = 15

1) $i^n+i^{n+1}+i^{n+2}+i^{n+3}$ is
   (a) 0 (b) 1 (c) -1 (d) i

2) The area of the triangle formed by the complex numbers z,iz, and z+iz in the Argand's diagram is
   (a) $\frac{1}{2}|z|^2$ (b) $|z|^2$ (c) $\frac{3}{2}|z|^2$ (d) $2|z|^2$

3) If $z=\frac{\left(\sqrt{3}+i\right)^3(3i+4)^2}{(8+6i)^2}$, then |z| is equal to
   (a) 0 (b) 1 (c) 2 (d) 3

4) If |z-2+i|≤2, then the greatest value of |z| is
   (a) $\sqrt{3}-2$ (b) $\sqrt{3}+2$ (c) $\sqrt{5}-2$ (d) $\sqrt{5}+2$

5) If |z|=1, then the value of $\frac{1+z}{1+\overline{z}}$ is
   (a) z (b) $\bar{z}$ (c) $\frac{1}{z}$ (d) 1

6) If $|z_1|=1,|z_2|=2|z_3|=3$ and $|9z_1z_2+4z_1z_3+z_2z_3|=12$, then the value of $|z_1+z_2+z_3|$ is
   (a) 1 (b) 2 (c) 3 (d) 4

7) z_1, z_2 and z_3 are complex number such that $z_1+z_2+z_3=0$ and $|z_1|=|z_2|=|z_3|=1$ then $z_1^2+z_2^2+z_3^3$ is
   (a) 3 (b) 2 (c) 1 (d) 0

8) If z=x+iy is a complex number such that |z+2|=|z−2|, then the locus of z is
   (a) real axis (b) imaginary axis (c) ellipse (d) circle

9) The principal argument of $(\sin 40°+i\cos 40°)^5$ is
   (a) −110° (b) −70° (c) 70° (d) 110°

10) If $\omega \neq 1$ is a cubic root of unity and $(1+\omega)^7=A+B\omega$,then (A,B) equals
   (a) (1,0) (b) (−1,1) (c) (0,1) (d) (1,1)

11) If α and β are the roots of $x^2+x+1=0$, then $\alpha^{2020}+\beta^{2020}$ is
   (a) -2 (b) -1 (c) 1 (d) 2

12) If $\omega \neq 1$ is a cubic root of unity and $\begin{vmatrix} 1 & 1 & 1 \\ 1 & -\omega^2 & \omega^2 \\ 1 & \omega^2 & \omega^2 \end{vmatrix}$ =3k, then k is equal to
   (a) 1 (b) -1 (c) $\sqrt{3i}$ (d) $-\sqrt{3i}$

13) If $\omega = cis\frac{2\pi}{3}$, then the number of distinct roots of

$$\begin{vmatrix} z+1 & \omega & \omega^2 \\ \omega & z+\omega^2 & 1 \\ \omega^2 & 1 & z+\omega \end{vmatrix}$$

(a) 1 (b) 2 (c) 3 (d) 4

14) The value of $(1+i)(1+i^2)(1+i^3)(1+i^4)$ is

(a) 2 (b) 0 (c) 1 (d) i

15) If, $i^2 = -1$, then $i^1 + i^2 + i^3 + ...+$ up to 1000 terms is equal to

(a) 1 (b) -1 (c) i (d) 0

7 x 2 = 14

16) Simplify $\left(\frac{1+i}{1-i}\right)^3 - \left(\frac{1-i}{1+i}\right)^3$

17) Find the following $\left|\frac{2+i}{-1+2i}\right|$

18) Find the square root of 6−8i .

19) Show that the following equations represent a circle, and, find its centre and radius| $|z-2-i| = 3$

20) Show that |3z−5+i|= 4 represents a circle, and, find its centre and radius.

21) Find the principal argument Arg z , when z = $\frac{-2}{1+i\sqrt{3}}$

22) Find the modulus of the following complex number $\frac{2-i}{1+i} + \frac{1-2i}{1-i}$

7 x 3 = 21

23) If $z_1=3, z_2=-7i$, and $z_3=5+4i$, show that $z_1(z_2+z_3)=z_1z_2+z_1z_3$

24) The complex numbers u,v, and w are related by $\frac{1}{u} = \frac{1}{v} + \frac{1}{w}$ If v=3−4i and w=4+3i, find u in rectangular form.

25) Show that $\left(2+i\sqrt{3}\right)^{10} - \left(2-i\sqrt{3}\right)^{10}$ is purely imaginary

26) For any two complex number z_1 and z_2 such that $|z_1|=|z_2|=1$ and z1z2 $\neq$, then show that $\frac{z_1+z_2}{1+z_1z_2}$ is real number.

27) If $\left|z - \frac{2}{z}\right| = 2$ show that the greatest and least value of |z| are $\sqrt{3}+1$ and $\sqrt{3}-1$ respectively.

28) If $(x_1+iy_1)(x_2+iy_2)(x_3+iy_3)...(x_n+iy_n) = a+ib$, show that

i) $(x_1^2+y_1^2)(x_2^2+y_2^2)(x_3^2+y_3^2)...(x_n^2+y_n^2)=a^2+b^2$

ii) $\sum_{r=1}^{n} tan^{-1}\left(\frac{y_r}{x_r}\right) = tan^{-1}\left(\frac{b}{a}\right) + 2k\pi, k\epsilon Z$

29) Simplify $\left(sin\frac{\pi}{6}+icos\frac{\pi}{6}\right)^{18}$

5 x 5 = 25

30) Show that $\left(2+i\sqrt{3}\right)^{10}+\left(2-i\sqrt{3}\right)^{10}$ is real ii) $\left(\frac{19+9i}{5-3i}\right)^{15}-\left(\frac{8+i}{I+2i}\right)^{15}$ is purely imaginary.

31) Let z_1,z_2, and z_3 be complex numbers such that $|z_1||=|z_2|=|z_3|=r>0$ and $z_1+z_2+z_3 \neq$ 0 prove that $\left|\frac{z_1z_2+z_2z_3+z_3z_1}{z_1+z_2+z_3}\right|$ =r

32) If z_1,$z_{2,}$ and z_3 are three complex numbers such that $|z_1|=1$,$|z_2|=2|z_3|=3$ and $|z_1+z_2+z_3|=1$,show that $|9z_1z_2+4z_1z_2+z_2z_3|=6$

33) If z=x+iy is a complex number such that Im $\left(\frac{2z+1}{iz+1}\right)=0$ show that the locus of z is $2x^2+2y^2+x-2y=0$

34) If z=x+iy and arg $\left(\frac{z-i}{z+2}\right)=\frac{\pi}{4}$, then show that $x^2+y^2+3x-3y+2=0$

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Complex Numbers TEST 9

12th Standard

Maths

Exam Time : 02:00:00 Hrs | Total Marks : 75

15 x 1 = 15

1) The value of $\sum_{i=1}^{13}\left(i^{n}+i^{n-1}\right)$ is

(a) 1+ i (b) i (c) 1 (d) 0

2) The conjugate of a complex number is $\frac{1}{i-2}$ /Then the complex number is

(a) $\frac{1}{i+2}$ (b) $\frac{-1}{i+2}$ (c) $\frac{-1}{i-2}$ (d) $\frac{1}{i-2}$

3) If z is a non zero complex number, such that $2iz^2=\bar{z}$ then |z| is

(a) $\frac{1}{2}$ (b) 1 (c) 2 (d) 3

4) If $\left|z-\frac{3}{z}\right|=2$ then the least value |z| is

(a) 1 (b) 2 (c) 3 (d) 5

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

(a) $\frac{3}{2}-2i$ (b) $-\frac{3}{2}+2i$ (c) $2-\frac{3}{2}i$ (d) $2+\frac{3}{2}i$

6) If z is a complex number such that $z\varepsilon C/R$ and $z+\frac{1}{z}\epsilon R$ then|z| is

(a) 0 (b) 1 (c) 2 (d) 3

7) If $\frac{z-1}{z+1}$ is purely imaginary, then |z| is

(a) $\frac{1}{2}$ (b) 1 (c) 2 (d) 3

8) The principal argument of $\frac{3}{-1+i}$

(a) $\frac{-5\pi}{6}$ (b) $\frac{-2\pi}{3}$ (c) $\frac{-3\pi}{4}$ (d) $\frac{-\pi}{2}$

9) If (1+i)(1+2i)(1+3i)...(1+ni)=x+iy, then $2\cdot 5\cdot 10...\left(1+n^2\right)$ is

(a) 1 (b) i (c) x^2+y^2 (d) $1+n^2$

10) The principal argument of the complex number $\frac{\left(1+i\sqrt{3}\right)^2}{4i\left(1-i\sqrt{3}\right)}$ is

(a) $\frac{2\pi}{3}$ (b) $\frac{\pi}{6}$ (c) $\frac{5\pi}{6}$ (d) $\frac{\pi}{2}$

11) The product of all four values of $\left(cos\frac{\pi}{3}+isin\frac{\pi}{3}\right)^{\frac{3}{4}}$ is

(a) -2 (b) -1 (c) 1 (d) 2

12) The value of $\left(\frac{1+3\sqrt{i}}{1-\sqrt{3i}}\right)^{10}$

(a) $cis\frac{2\pi}{3}$ (b) $cis\frac{4\pi}{3}$ (c) $-cis\frac{2\pi}{3}$ (d) $-cis\frac{4\pi}{3}$

13) If $\sqrt{a+ib}$ =x+iy, then possible value of $\sqrt{a-ib}$ is

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

14) If z=cos$\frac{\pi}{4}$ +i sin$\frac{\pi}{6}$, then

(a) |z| =1, arg(z) =$\frac{\pi}{4}$ (b) |z| =1, arg(z) =$\frac{\pi}{6}$ (c) |z|=$\frac{\sqrt{3}}{2}$, arg(z)=$\frac{5\pi}{24}$ (d) |z| = $\frac{\sqrt{3}}{2}$, arg (z) =tan-1 $\left(\frac{1}{\sqrt{2}}\right)$

15) The principal value of the amplitude of (1+i) is

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{12}$ (c) $\frac{3\pi}{4}$ (d) π

7 x 2 = 14

16) If z_1=1-3i,z_2=4i, and z_3 = 5 , show that (z_1+z_2)+z_3=z_1+(z_2+z_3)

17) If z_1=3-2i and z_2=6+4i, find $\frac{z_1}{z_2}$

18) Which one of the points i,−2+i , and 3 is farthest from the origin?

19) Find the square roots of 4+3i

20) Obtain the Cartesian equation for the locus of z=x+iy in
|z-4|=16

21) If $\omega \neq 1$ is a cube root of unity, then the show that

$$\frac{a+b\omega+c\omega^2}{b+c\omega+a\omega^2}+\frac{a+b\omega+c\omega^2}{c+a\omega+b\omega^2}=1$$

22) Simplify the following
$i\,i^2 i^3 \ldots i^{2000}$

7 x 3 = 21

23) Find the values of the real numbers x and y, if the complex numbers (3−i)x−(2−i)y+2i +5 and 2x+(−1+2i)y+3+ 2i are equal.

24) If $\frac{z+3}{z-5i}=\frac{1+4i}{2}$, find the complex number z

25) If z_1=3+4i,z_2=5-12i, and z_3 =6+8 , find |z_1|,|z_2|,|z_3|,|z_1+z_2|,|z_2-z_3|,and|z_1+z_3|

26) If z_1,z_2 and z_3 ,are complex numbers such that |z_1|=|z_2|=|z_3|=|z_1+z_2+z_3|=1 find the value of $\left|\frac{1}{z_1}+\frac{1}{z_2}+\frac{1}{z_3}\right|$

27) If |z|=2 show that $3\leq|z+3+4i|\leq 7$

28) Which one of the points10 − 8i , 11+ 6i is closest to1+ i .

29) If $cos\alpha+cos\beta+cos\gamma=sin\alpha+sin\beta+sin\gamma=0$ then show that

(i) $cos3\alpha+cos3\beta+cos3\gamma=3cos(\alpha+\beta+\gamma)$

(ii) $sin3\alpha + sin3\beta + sin3\gamma + sin3\gamma = 3sin\left(\alpha + \beta + \gamma\right)$

5 x 5 = 25

30) Show that $\left(\frac{\sqrt{3}}{2} + \frac{i}{2}\right)^5 + \left(\frac{\sqrt{3}}{2} - \frac{i}{2}\right)^5 = -\sqrt{3}$

31) If $2cosa = x + \frac{1}{x}$ and $2cos\beta = y + \frac{1}{y}$, show that

i) $\frac{x}{y} + \frac{y}{x} = 2cos\left(\alpha - \beta\right)$.

ii) $xy - \frac{1}{xy} = 2isin\left(\alpha + \beta\right)$

iii) $\frac{x^m}{y^n} - \frac{y^n}{x^m} = 2isin\left(m\alpha - n\beta\right)$

iv) $x^m y^n + \frac{1}{x^m y^n} = 2cos(m\alpha + n\beta)$

32) Solve the equation $z^3+27=0$.

33) Prove that the values of $\sqrt[4]{-1}arr$ $\pm \frac{1}{\sqrt{2}}(1 \pm i)$ .Let z=(-1)

34) If z=x+iy and arg$\left(\frac{z-1}{z+1}\right) = \frac{\pi}{2}$,then show that $x^2+y^2=1$.

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Complex Numbers TEST 10

12th Standard

Maths

Exam Time : 02:30:00 Hrs — Total Marks : 100

20 x 1 = 20

1) If a = 1+i, then a^2 equals
(a) 1-i (b) 2i (c) (1+i)(1-i) (d) i-1

2) If z = $\frac{1}{(2+3i)^2}$ then |z| =
(a) $\frac{1}{13}$ (b) $\frac{1}{5}$ (c) $\frac{1}{12}$ (d) none of these

3) If z=1-cosθ + i sinθ, then |z| =
(a) 2 sin$\frac{1}{3}$ (b) 2 cos$\frac{\theta}{2}$ (c) 2|sin$\frac{\theta}{2}$ | (d) 2|cos$\frac{\theta}{2}$ |

4) If z=$\frac{1}{1-cos\theta-isin\theta}$, the Re(z) =
(a) 0 (b) $\frac{1}{2}$ (c) cot$\frac{\theta}{2}$ (d) $\frac{1}{2}$ cot$\frac{\theta}{2}$

5) If x+iy =$\frac{3+5i}{7-6i}$, they y =
(a) $\frac{9}{85}$ (b) -$\frac{9}{85}$ (c) $\frac{53}{85}$ (d) none of these

6) The amplitude of $\frac{1}{i}$ is equal to
(a) 0 (b) $\frac{\pi}{2}$ (c) -$\frac{\pi}{2}$ (d) π

7) The value of $(1+i)^4$ + $(1-i)^4$ is
(a) 8 (b) 4 (c) -8 (d) -4

8) The complex number z which satisfies the condition $\left|\frac{1+z}{1-z}\right|$ =1 lies on
(a) circle x^2+y^2 =1 (b) x-axis (c) y-axis (d) the lines x+y=1

9) If z = a + ib lies in quadrant then $\frac{\bar{z}}{z}$ also lies in the III quadrant if
(a) a > b > 0 (b) a < b < 0 (c) b < a < 0 (d) b > a > 0

10) $\frac{1+e^{-i\theta}}{1+e^{i\theta}}$ =
(a) cosθ + i sinθ (b) cosθ - i sinθ (c) sinθ - i cosθ (d) sinθ + icosθ

11) If z^n =$cos\frac{n\pi}{3}+isin\frac{n\pi}{3}$, then z_1, z_2 ..... z_6 is
(a) 1 (b) -1 (c) i (d) -i

12) If x =cosθ + i sinθ, then the value of $x^n+\frac{1}{x^n}$ is
(a) 2 cosθ (b) 2i sin nθ (c) 2i sin nθ (d) 2i cos nθ

13) If ω is the cube root of unity, then the value of (1-ω) $(1-\omega^2)$ $(1-\omega^4)$ $(1-\omega^8)$ is
(a) 9 (b) -9 (c) 16 (d) 32

14) The points represented by 3 - 3i, 4 - 2i, 3 - i and 2 - 2i form _____ in the argand plane.
(a) collinear points (b) Vertices of a parallelogram (c) Vertices of a rectangle (d) Vertices of a square

15) $(1+i)^3$ = _______
(a) 3 + 3i (b) 1 + 3i (c) 3 - 3i (d) 2i - 2

16) $\frac{(cos\theta+isin\theta)^6}{(cos\theta-isin\theta)^5}$ = ________
(a) cos 11θ - isin 11θ (b) cos 11θ + isin 11θ (c) cosθ + i sinθ (d) $cos\frac{6\theta}{5}+isin\frac{6\theta}{5}$

17) If a =cosα + i sinα, b= -cosβ + i sinβ then $\left(ab - \frac{1}{ab}\right)$ is __________

(a) -2i sin(α - β) (b) 2i sin(α - β) (c) 2 cos(α - β) (d) -2 cos(α - β)

18) The conjugate of $\frac{1+2i}{1-(1-i)^2}$ is ________

(a) $\frac{1+2i}{1-(1-i)^2}$ (b) $\frac{5}{1-(1-i)^2}$ (c) $\frac{1-2i}{1+(1+i)^2}$ (d) $\frac{1+2i}{1+(1-i)^2}$

19) The modular of $\frac{(-1+i)(1-i)}{1+i\sqrt{3}}$ is _______

(a) $\sqrt{2}$ (b) 2 (c) 1 (d) $\frac{1}{2}$

20) If x=cosθ + i sinθ, then $x^n+\frac{1}{x^n}$ is _______

(a) 2 cos nθ (b) 2 i sin nθ (c) 2^n cosθ (d) 2^n i sinθ

10 x 2 = 20

21) Simplify the following

$\sum_{n=1}^{10} i^{n+50}$.

22) Write the following in the rectangular form:

$$\overline{3i} + \frac{1}{2-i}$$.

23) If z=x+iy , find the following in rectangular form.

Im(3z+4z−4i)

24) Find the square roots of

−5−12i .

25) Show that the following equations represent a circle, and, find its centre and radius

|3z-6+12i|=8

26) Simplify the following:

$\sum_{n=1}^{102} i^n$

27) Find the following $\left|\overline{(1+i)}(2+3i)(4i-3\right|$

28) Find the following $\left|\frac{i(2+i)^3}{(1+i)^2}\right|$

29) Find the modulus and principal argument of the following complex numbers:

$-\sqrt{3}-i$

30) Represent the complex numbe $1+i\sqrt{3}$ in polar form.

10 x 3 = 30

31) Find the cube roots of unity.

32) If $z = (cos\theta + isin\theta)$, show that $z^n + \frac{1}{z^n} = 2cosn\theta$ and

$$z^n - \frac{1}{z^n} = 2isinn\theta$$

33) Evaluate the following if z=5−2i and w= −1+3i

$z^2+2zw+w^2$

34) If $z_1=3$,$z_2=-7i$, and $z_3=5+4i$, show that

$(z_1+z_2)z_3=z_1z_3+z_2+z_3$

35) Show that $\left(\frac{19-7i}{9+i}\right)^{12}+\left(\frac{20-5i}{7-6i}\right)^{12}$ is real

36) Obtain the Cartesian form of the locus of z=x+iy in
Im[(1−i)z+1]= 0

37) Obtain the Cartesian equation for the locus of z=x+iy in
$|z-4|^2-|z-1|^2=16$

38) Find the rectangular form of the complex numbers

$$\frac{cos\frac{\pi}{6}-isin\frac{\pi}{6}}{2\left(cos\frac{\pi}{3}+isin\frac{\pi}{3}\right)}$$

39) If $\omega \neq 1$ is a cube root of unity, show that

$$(1+\omega)\left(1+\omega^2\right)\left(1+\omega^4\right)\left(1+\omega^8\right)\ldots\left(1+\omega^{2^{11}}\right)=11$$.

40) Obtain the Cartesian form of the locus of z in
|2z-3-i|=3

6 x 5 = 30

41) Suppose z1,Z2, and z3 are the vertices of an equilateral triangle inscribed in the circle |z|= 2. If $z_1=1+i\sqrt{3}$ then find z_2 and z_3

42) Find all cube roots of $\sqrt{3}+i$

43) Solve the equation $z^3+8i=0$,where $z \in \mathbb{C}$

44) Simplify: $(1+i)^{18}$

45) Simplify: $\left(-\sqrt{3}+3i\right)^{31}$

46) Show that $\left(\frac{i+\sqrt{3}}{-i+\sqrt{3}}\right)^{2\omega}+\left(\frac{i-\sqrt{3}}{i+\sqrt{3}}\right)^{2\omega}$ =-1

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RAVI MATHS TUITION CENTER ,GKM COLONY, CH- 82. PH: 8056206308
COMPLEX NUMBER FULL CHAPTER TEST

12th Standard
Maths

Reg.No. : [ ][ ][ ][ ][ ][ ]

Exam Time : 03:00:00 Hrs | Total Marks : 90

ANSWER ALL | 20 x 1 = 20

1) $i^n+i^{n+1}+i^{n+2}+i^{n+3}$ is

(a) 0 (b) 1 (c) -1 (d) i

2) The conjugate of a complex number is $\frac{1}{i-2}$ /Then the complex number is

(a) $\frac{1}{i+2}$ (b) $\frac{-1}{i+2}$ (c) $\frac{-1}{i-2}$ (d) $\frac{1}{i-2}$

3) If |z-2+i|≤2, then the greatest value of |z| is

(a) $\sqrt{3}-2$ (b) $\sqrt{3}+2$ (c) $\sqrt{5}-2$ (d) $\sqrt{5}+2$

4) If |z|=1, then the value of $\frac{1+z}{1+\bar{z}}$ is

(a) z (b) $\bar{z}$ (c) $\frac{1}{z}$ (d) 1

5) If $|z_1|=1,|z_2|=2|z_3|=3$ and $|9z_1z_2+4z_1z_3+z_2z_3|=12$, then the value of $|z_1+z_2+z_3|$ is

(a) 1 (b) 2 (c) 3 (d) 4

6) If z is a complex number such that $z\varepsilon C/R$ and $z+\frac{1}{z}\epsilon R$ then|z| is

(a) 0 (b) 1 (c) 2 (d) 3

7) If $\frac{z-1}{z+1}$ is purely imaginary, then |z| is

(a) $\frac{1}{2}$ (b) 1 (c) 2 (d) 3

8) The principal argument of $\frac{3}{-1+i}$

(a) $\frac{-5\pi}{6}$ (b) $\frac{-2\pi}{3}$ (c) $\frac{-3\pi}{4}$ (d) $\frac{-\pi}{2}$

9) The principal argument of $(\sin 40°+i\cos 40°)^5$ is

(a) −110° (b) −70° (c) 70° (d) 110°

10)

The principal argument of the complex number $\frac{\left(1+i\sqrt{3}\right)^2}{4i\left(1-i\sqrt{3}\right)}$ is

(a) $\frac{2\pi}{3}$ (b) $\frac{\pi}{6}$ (c) $\frac{5\pi}{6}$ (d) $\frac{\pi}{2}$

11) If α and β are the roots of $x^2+x+1=0$, then $\alpha^{2020}+\beta^{2020}$ is

(a) -2 (b) -1 (c) 1 (d) 2

12) The product of all four values of $\left(cos\frac{\pi}{3}+isin\frac{\pi}{3}\right)^{\frac{3}{4}}$ is

(a) -2 (b) -1 (c) 1 (d) 2

13) If $\omega \neq 1$ is a cubic root of unity and $\begin{vmatrix} 1 & 1 & 1 \\ 1 & -\omega^2 & \omega^2 \\ 1 & \omega^2 & \omega^2 \end{vmatrix}$ =3k, then k is equal to

(a) 1 (b) -1 (c) $\sqrt{3i}$ (d) $-\sqrt{3i}$

14) The value of $\left(\frac{1+3\sqrt{i}}{1-\sqrt{3i}}\right)^{10}$

(a) $cis\frac{2\pi}{3}$ (b) $cis\frac{4\pi}{3}$ (c) $-cis\frac{2\pi}{3}$ (d) $-cis\frac{4\pi}{3}$

15) If $\omega = cis\frac{2\pi}{3}$, then the number of distinct roots of $\begin{vmatrix} z+1 & \omega & \omega^2 \\ \omega & z+\omega^2 & 1 \\ \omega^2 & 1 & z+\omega \end{vmatrix}$

(a) 1 (b) 2 (c) 3 (d) 4

16) The value of $\sum_{i=1}^{13}\left(i^n+i^{n-1}\right)$ is

(a) 1+ i (b) i (c) 1 (d) 0

17) The area of the triangle formed by the complex numbers z,iz, and z+iz in the Argand's diagram is

(a) $\frac{1}{2}|z|^2$ (b) $|z|^2$ (c) $\frac{3}{2}|z|^2$ (d) $2|z|^2$

18) If $z = \frac{\left(\sqrt{3}+i\right)^3(3i+4)^2}{(8+6i)^2}$, then |z| is equal to

(a) 0 (b) 1 (c) 2 (d) 3

19) If z is a non zero complex number, such that $2iz^2=\bar{z}$ then |z| is

(a) $\frac{1}{2}$ (b) 1 (c) 2 (d) 3

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

(a) $\frac{3}{2} - 2i$ (b) $-\frac{3}{2} + 2i$ (c) $2 - \frac{3}{2}i$ (d) $2 + \frac{3}{2}i$

ANSWER ANY 7 $7 \times 2 = 14$

21) If z_1=2+5i, z_2=-3-4i, and z_3=1+i, find the additive and multiplicate inverse of z_1,z_2 and z_3

22) If z=x+iy, find the following in rectangular form.

$Re\left(\frac{1}{z}\right)$

23) The complex numbers u,v, and w are related by $\frac{1}{u} = \frac{1}{v} + \frac{1}{w}$ If v=3−4i and w=4+3i, find u in rectangular form.

24) If |z|= 3, show that $7 \le |z + 6 - 8i| \le 13$.

25) If the area of the triangle formed by the vertices z,iz and z+iz is 50 square units, find the value of |z|

26) Find the square roots of 4+3i

27) Show that the following equations represent a circle, and, find its centre and radius|

$|z - 2 - i| = 3$

28) Write in polar form of the following complex numbers

$2 + i2\sqrt{3}$

29) If $cos\alpha + cos\beta + cos\gamma = sin\alpha + sin\beta + sin\gamma = 0$ then show that

(i) $cos3\alpha + cos3\beta + cos3\gamma = 3cos(\alpha + \beta + \gamma)$

(ii) $sin3\alpha + sin3\beta + sin3\gamma + sin3\gamma = 3sin(\alpha + \beta + \gamma)$

30) If $2cosa = x + \frac{1}{x}$ and $2cos\beta = y + \frac{1}{y}$, show that

i) $\frac{x}{y} + \frac{y}{x} = 2cos(\alpha - \beta)$.

ii) $xy - \frac{1}{xy} = 2isin(\alpha + \beta)$

iii) $\frac{x^m}{y^n} - \frac{y^n}{x^m} = 2isin(m\alpha - n\beta)$

iv) $x^m y^n + \frac{1}{x^m y^n} = 2cos(m\alpha + n\beta)$

ANSWER ANY 7 $7 \times 3 = 21$

31) Simplify $\left(\frac{1+i}{1-i}\right)^3 - \left(\frac{1-i}{1+i}\right)^3$

32) If $\frac{z+3}{z-5i} = \frac{1+4i}{2}$, find the complex number z

33) Solve the equation $z^3+8i=0$,where $z \in \mathbb{C}$

34) Find the cube roots of unity.

35) Simplify $\left(\frac{1+cos2\theta+isin2\theta}{1+cos2\theta-isin2\theta}\right)^{30}$

36) If $z = (cos\theta + isin\theta)$, show that $z^n + \frac{1}{z^n} = 2cosn\theta$ and $z^n - \frac{1}{z^n} = 2isinn\theta$

37) Simplify $\left(sin\frac{\pi}{6} + icos\frac{\pi}{6}\right)^{18}$

38) Simplify the following:
$i\, i^2 i^3 \ldots i^{40}$

39) Given the complex number z=3+2i, represent the complex numbers z,iz, and z+ iz in one Argand diagram. Show that these complex numbers form the vertices of an isosceles right triangle.

40) If $\omega \neq 1$ is a cube root of unity, show that $(1+\omega)\left(1+\omega^2\right)\left(1+\omega^4\right)\left(1+\omega^8\right)\ldots\left(1+\omega^{2^{11}}\right) = 11$.

ANSWER ANY 7 7 x 5 = 35

41) If z_1,z_2 and z_3 ,are complex numbers such that $|z_1|=|z_2|=|z_3|=|z_1+z_2+z_3|=1$ find the value of $\left|\frac{1}{z_1}+\frac{1}{z_2}+\frac{1}{z_3}\right|$

42) Show that the points $1, \frac{-1}{2} + i\frac{\sqrt{3}}{2},$ and $\frac{-1}{2} - i\frac{\sqrt{3}}{2}$ are the vertices of an equilateral triangle.

43) Let z_1,z_2, and z_3 be complex numbers such that $|z_1| = |z_2| = |z_3| = r > 0$ and $z_1+z_2+z_3 \neq 0$ prove that $\left|\frac{z_1z_2+z_2z_3+z_3z_1}{z_1+z_2+z_3}\right|$ =r

44) Find the quotient $\frac{2\left(cos\frac{9\pi}{4}+isin\frac{9\pi}{4}\right)}{4\left(cos\left(\frac{-3\pi}{2}\right)+isin\left(\frac{-3\pi}{2}\right)\right)}$ in rectangular form

45)

If z=x+iy and $\arg\left(\frac{z-1}{z+1}\right)=\frac{\pi}{2}$,then show that $x^2+y^2=1$.

46) Find the following $\left|\overline{(1+i)}(2+3i)(4i-3\right|$

47) Find the following $\left|\frac{i(2+i)^3}{(1+i)^2}\right|$

48) If z=x+iy is a complex number such that $\text{Im}\left(\frac{2z+1}{iz+1}\right)=0$ show that the locus of z is $2x^2+2y^2+x-2y=0$

49) Show that $\left(2+i\sqrt{3}\right)^{10}+\left(2-i\sqrt{3}\right)^{10}$ is real ii) $\left(\frac{19+9i}{5-3i}\right)^{15}-\left(\frac{8+i}{I+2i}\right)^{15}$ is purely imaginary.

50) Solve the equation $z^3+27=0$.

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