MATHS

BOOKS - PATHFINDER MATHS (BENGALI ENGLISH)

COMPLEX NUMBERS

Question Bank

1. The amplitude of the complex no. $z = 1$ is

A. a) π

B. b) 0

C. c) $-\pi$

D. d) undefined

Answer: D

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2. If ω be the imaginary cube root of unity then the value of ω^{241} will be

A. 0

B. 1

C. ω

D. ω^2

Answer: C

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3. If $i = \sqrt{-1}$ then the value of $1 + i + i^2 + i^3 + i^4$ will be

A. 0

B. 1

C. (-1)

D. 2

Answer: B

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4. The modulus of complex no. (1+i)/(1-i) is

A. 0

B. 1

C. 2

D. none of these

Answer: B

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5. The square root of 2i is

A. $\pm(1+i)$

B. $\pm(1-i)$

C. $\pm i$

D. none of these

Answer: A

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6. $z+\bar{z}=0$ if and only if

A. Im(z)=0

B. Re(z)=0

C. BothRe(z)=0 and im(z)=0

D. none of these

Answer: B

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7. $z = i^5$ then the value of $\left(z + z^2 + z^3 + z^4\right)$

A. 1

B. (-i)

C. 0

D. (-1)

Answer: C

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8. Find the principal amplitude of (-1-i).

A. $\left(\frac{\pi}{4}\right)$

B. $\frac{-3\pi}{4}$

C. $\frac{5\pi}{4}$

D. none of these

Answer: B

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9. If $|x+3|=5$ then the value of x is

A. `(+-4)

B. (± 5)

C. (± 3)

D. none of these

Answer: A

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10. If z=3i then the value of $z\bar{z}$ is

A. 81

B. 27

C. 9

D. (-9)

Answer: C

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11. If $(x+iy)(1+i)=2$ then

A. $x=1$, $y=2$

B. $x=1, y=0$

C. $x=2$, $y=1$

D. $x=1$, $y=(-1)$

Answer: D

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12. In argand plane the complex no. $\left(\frac{1+2i}{1+i}\right)$ lies in

A. ist quadrant

B. 2nd quadrant

C. 3rd quadrant

D. 4th quadrant

Answer: B

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13. If the complex nos (sinx+icos2x)and (cosx-isin2x) are conjugate to each other then the value of x is

A. 0

B. $\left(\frac{\pi}{2}\right)$

C. π

D. none of these

Answer: D

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14. If $iz^3 + z^2 - z + i = 0$ then the value of $|z|$ is

A. 2

B. 1

C. $\sqrt{2}$

D. none of these

Answer: B

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15. The value of $\left(\frac{1+\sqrt{-3}}{2}\right)^6 + \left(\frac{1-\sqrt{-3}}{2}\right)^9$ is

A. 0

B. 1

C. 2

D. 3

Answer: A

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16. The number of complex no z such that $|z-1| = |z-3| = |z-i|$ is

A. a) 0

B. b) 3

C. c) 2

D. 4) none of these

Answer: C

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17. The complex no z=x+iy satisfying the condition $amp\left(\frac{z-i}{z+i}\right)=\frac{\pi}{4}$ lies on

A. a st. line

B. a circle

C. an ellipse

D. a hyperbola

Answer: B

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18. If z_1 and z_2 are two complex no. st $|z_1+z_2|=|z_1|+|z_2|$ then

A. $arg(z_1)=arg(z_2)$

B. $arg(z_1)+arg(z_2)=0$

C. $arg(z_1z_2)=0$

D. none of these

Answer: A

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19. Let z_1 and z_2 are two complex nos s.t. $|z_1| = |z_2| = 1$ then $\left|\frac{z_1 - z_2}{1 - z_1\bar{z}_2}\right|$ is equal to

A. a. 2

B. b. 1/2

C. c. 1

D. d. none of these

Answer: D

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20. The product of all the values of $\left(1+i\sqrt{3}\right)^{\frac{3}{4}}$ is equal to

A. 80

B. (-8i)

C. (-8)

D. 8

Answer: C

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21. The value of $(1-i)^{-2}-(1+i)^{-2}$ is

A. (-i)

B. 1

C. i

D. none of these

Answer: C

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22. If p,q,r three complex nos. so that p+q+r =0 and $|p| = |q| = |r| = 1$ then the value of $\left(\frac{1}{p} + \frac{1}{q} + \frac{1}{r}\right)$ is

A. 3

B. 1

C. 0

D. none of these

Answer: C

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23. The modulus of $(x - iy)^2$ is

A. $\sqrt{x^2+y^2}$

B. $\left(x^2+y^2\right)$

C. $\left(x^2+4y^2\right)$

D. $\left(4x^2+y^2\right)$

Answer: B

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24. If $2i^2+6i^3+3i^{16}-6i^{19}+4i^{25}=x+iy$, then

A. a) x=4 ,y=-1

B. b) x=1 , y=-4

C. c) x=-1, y=-4

D. d) x=1,y=4

Answer: D

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25. The value of $\left(\cos\left(\frac{\pi}{10}\right)+i\sin\left(\frac{\pi}{10}\right)\right)\left(\cos\left(\frac{2\pi}{10}\right)+i\sin\left(\frac{2\pi}{10}\right)\right)\left(\cos\left(\frac{3\pi}{10}\right)+i\sin\left($

is

A. a) (-1)

B. b) 1

C. c) 2

D. d) (-2)

Answer: A

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26. If $\frac{(a+i)^2}{2a-1}=p+iq$ then find the values of $\left(p^2+q^2\right)$

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27. If ω and ω^2 be the imaginary cube roots of unity then find the value of $\left(3+3\omega+5\omega^2\right)^6-\left(2+6\omega+2\omega^2\right)^3$

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28. Value of $i^n+i^{n+1}+i^{n+2}+i^{n+3}\left(\text{when} i=\sqrt{-1}\right)-$

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29. If (1+i)(2+i)(3+i).....(n+i)=a+ib then show that $2.5.10.\ldots\ldots\ldots\left(n^2+1\right)=a^2+b^2$

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30. Find the least possible integral value of n so that `((1+i)/(1-i))^n' is real

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31. Find the amplitude of $\left(\sqrt{3}+i\right)$

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32. Find the value of $\sqrt{\left[-3+\sqrt{\left(\left\{-3+\sqrt{-3+\ldots\text{to infinity}}\right\}\right)}\right]}$

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33. Express $\frac{1}{(1-i)^3}$ in the form A+iB

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34. Find the square root of (i)

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35. Show that $x^3-1=(x-1)(x-\omega)\left(x-\omega^2\right)$

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36. Find 4th roots of 1

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37. Express each of the following expressions as the sum of two squares:

$(1+x^2)(1+y^2)(1+z^2)$

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38. If $|z|>1$ then find the position of the complex no. of z in argand plane.

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39. If $|z+2|+|z-2| \leq 6$ then find the maximum value of $|z|$

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40. If $z^2 + |z|^2 = 0$ then find the imaginary value of z

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41. Show that in argand plane the complex number (1+4i),(2+7i)and (3+10i) are collinear.

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42. z_1 and z_2 are two different complex nos where $z_1 \neq 0$ $z_2 \neq 0$ prove that $(|z_1| + |z_2|)\left|\frac{z_1}{|z_1|} + \frac{z_2}{|z_2|}\right| \leq 2(|z_1| + |z_2|)$

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43. If x=a+b ,$y = a\omega + b\omega^2$, $z = a\omega^2 + b\omega$ then show that , $x^3 + y^3 + z^3 = 3\left(a^3 + b^3\right)$

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44. Find the modulus and amplitude of the complex nos $\frac{1+\cos\alpha+i\sin\alpha}{1+\cos\alpha-i\sin\alpha}$

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45. Express the complex nos $\frac{1+7i}{(2-i)^2}$ in polar form

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46. Factorise $a^3+b^3+c^3-3abc$

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47. Find the square roots : $x-i\sqrt{x^4+x^2+1}$

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48. If ω is the imaginary cube root of 1 then prove that $\left(a+b\omega+c\omega^2\right)^3+\left(a+b\omega^2+c\omega\right)^3=$

$(2a-b-c)(2b-a-c)(2c-a-b)$

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49. If $y=\sqrt{x^2+6x+8}$ then show that one of the value of $\sqrt{1+iy}+\sqrt{1-iy}$ is $\sqrt{2x+8}\,(i=\sqrt{-1})$

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50. If $x=\cos\alpha+i\sin\alpha$ and $1+\sqrt{1-y^2}=ny$ then show that $\frac{y}{2}n(1+nx)\left(1+\frac{n}{x}\right)=1+$ ycosalpha`

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51. If $a = \frac{1}{2}\left(5 - i\sqrt{3}\right)$ then find the value of $a^3 - 6a^2 + 12a - 8$

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52. Show that complex numbers $(2 + i3), (2 - i3), (3 - i2), (3 + i2)$ are concyclic in the argand plane

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53. If in argand plane the vertices A,B,C of an isoceles triangle are represented by the complex nos z_1, z_2, z_3 respectively where $\angle C = 90^\circ$ then show that $(z_1 - z_2)^2 = 2(z_1 - z_3)(z_3 - z_2)$

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54. If z_1, z_2, z_3 are three complex number then prove that $z_1 Im(\bar{z}_2 . z_3) + z_2 Im(\bar{z}_3 . z_1) + z_3 Im(\bar{z}_1 . z_2) = 0$

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55. Prove that $(1-\omega^2)(1-\omega^2+\omega^4)(1-\omega^4+\omega^8)\ldots\ldots\ldots$ to 2n terms $=2^{2n}$

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56. If $x-iy=\sqrt{\frac{a+ib}{c-id}}$, prove that $\left(x^2+y^2\right)^2=\frac{a^2+b^2}{c^2+d^2}$

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57. If z be complex no. and $\frac{z-1}{z+1}$ be purely imaginary show that z lies on the circle whose centre is at origin and the radius is 1

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58. z_1 and z_2 be two complex no. then prove that $|z_1+z_2|^2+|z_1-z_2|^2=2\left[|z_1|^2+|z_2|^2\right]$

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59. If $z=\frac{3}{2+\cos\theta+i\sin\theta}$ then show that z lies on a circle in the complex plane

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60. If $a=\cos\alpha+i\sin\alpha, b=\cos\beta+i\sin\beta, c=\cos\gamma+i\sin\gamma$ and $\frac{b}{c}+\frac{c}{a}+\frac{a}{b}=1$, then $\cos(\beta-\gamma)+\cos(\gamma-\alpha)+\cos(\alpha-\beta)$=

A. a) $\frac{3}{2}$

B. b) $-\frac{3}{2}$

C. c) 0

D. d) 1

Answer:

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61. If ω is the imaginary cube root of unity and a+b+c=0 then show that $\left(a+b\omega+c\omega^2\right)^3+\left(a+b\omega^2+c\omega\right)^3=27abc$

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62. If z_1, z_2, z_3 represent three vertices of an equilateral triangle in argand plane then show that $\frac{1}{z_1-z_2}+\frac{1}{z_2-z_3}+\frac{1}{z_3-z_1}=0$

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63. Prove that the complex numbers z_1, z_2 and the origin from an isoceles triangle with vertical angle $\frac{2\pi}{3}$ if $z_1^2+z_1z_2+z_2^2=0$

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64. If $(1+x)^n = a_0 + a_1 x + a_2 x^2 + \ldots\ldots + a_n x^n$ then show that $(a_0 - a_2 + a_4 - \ldots\ldots)^2 + (a_1 - a_3 + a_5 - \ldots\ldots)^2 = a_0 + a_1 + a_2 + \ldots$

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65. If $z_1, z_2, z_3 \ldots\ldots\ldots\ldots z_n$ are n complex numbers s.t, $|z_1| = |z_2| = \ldots\ldots\ldots\ldots |z_n| = 1$ then show that $|z_1 + z_2 + \ldots\ldots\ldots + z_n| = \left|\left(\frac{1}{z_1}\right) + \left(\frac{1}{z_2}\right) + \ldots\ldots + \left(\frac{1}{z_n}\right)\right|$

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66. z_1 and z_2 be two complex no. then prove that $|z_1 + z_2|^2 + |z_1 - z_2|^2 = 2\left[|z_1|^2 + |z_2|^2\right]$

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67. If $\cos\theta = \frac{1}{2}\left(a + \frac{1}{a}\right)$ $\cos(\phi) = \frac{1}{2}\left(b + \frac{1}{b}\right)$ show that one of the values of $2\cos(\theta - \phi)$ is $\left(\frac{a}{b} + \frac{b}{a}\right)$

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