MATHS

BOOKS - MAHAVEER PUBLICATION

COMPLEX NUMBERS

Question Bank

1. Find the value of i^{1203}

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2. Find the values of i^{3401}

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3. Find the values of $\left[i^{18}+\left(\frac{1}{i}\right)^{25}\right]^3$

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4. Express in a+ib form and then represent as ordered pairs

$-\frac{1}{2}$

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5. Express in a+ib form and then represent as ordered pairs

$3+\sqrt{-7}$

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6. Express in a+ib form and then represent as ordered pairs

$5-i\sqrt{-2}$

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7. The complex numbers $z_1 = 2 + 5i$, $z_2 = 3 - 4i$ and $z_3 = -4 + i$ are represented by the points A, B and C respectively on an Argand diagram. Sketch the Argand diagram

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8. Complex conjugate of 1+2i is 1-2i

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9. Find the square roots of $9 + 40i$.

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10. Prove that $\frac{a+bw+cw^2}{c+aw+bw^2} = w^2$(w (being an imaginary cube roots of unity)

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11. If w is an imaginary cube root of unity then prove that

$(1-w)\left(1-w^2\right)\left(1-w^4\right)\left(1-w^5\right) = 9$

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12. For z = 4-3i

Modulus of z

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13. Determine the amplitude of the complex numbers

-1-i

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14. Determine the amplitude of the complex numbers

$-1+\sqrt{3}i$

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15. Represent the complex number $z=1+i\sqrt{3}$ in polar form.

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16. Find the modulus and of the amplitude of the complex numbers:

$\frac{1+i}{1-i}$

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17. Find the modulus and of the complex of the complex numbers:

$$\frac{1}{1+i}$$

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18. If $\sqrt{a+ib} = x+iy$ then prove that $\sqrt{a-ib} = x-iy$

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19. If $x+iy = \frac{a+ib}{a-ib}$ prove that $x^2+y^2 = 1$

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20. Express $\frac{2+3i}{2-i}$ in the form a+ib

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21. Draw argand diagram of 6+2i.

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22. If z=a+ib and |z-2|=|2z-1|prove that $a^2 - b^2 = 1$

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23. Find the value of $\frac{2^n}{(1+i)^{2n}} + \frac{(1+i)^{2n}}{2^n}$

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24. Show that $\sqrt{i} + \sqrt{-i} = \sqrt{2}$

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25. Simplify : $\sqrt{-81}+\sqrt{-64}, i^2+\frac{1}{i^2}, i^{-106}$

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26. Find the square root of 7+24i

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27. Find the modulus of $\frac{2+3i}{1-2i}$

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28. If $x=1-i$, find the value of x^2-2x+2

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29. Solve $\left\{\cos\left(-\frac{\pi}{4}\right)+i\sin\left(-\frac{\pi}{4}\right)\right\}^{10}$

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30. Find the values of $(1+i)^{\frac{1}{3}}$

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31. Find the equation whose roots are the 7^{th} powers of the roots of the equation $x^2-2x\cos\theta+1=0$

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32. If $x=\cos\alpha+i\sin\alpha$ and $y=\cos\beta+i\sin\beta$, $z=\cos\gamma+i\sin\gamma$ and if $x+y+z=0$ then prove that $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}=0$

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33. If $\sin\alpha + \sin\beta + \sin\gamma = \cos\alpha + \cos\beta + \cos\gamma = 0$then prove that

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

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34. If $\sin\alpha + \sin\beta + \sin\gamma = \cos\alpha + \cos\beta + \cos\gamma = 0,$ then (A) cos3alpha+cos3beta+cos3gamma=cos3gamma=3cos(alpha+beta+gamma) (B)cos 3alpha+cos3beta+cos3gamma=0(C) sin3theta+sin3beta+sin3gamma=0(D) sin3alpha+sin3beta+sin3gamma= 3sin(alpha+beta+gamma)`

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35. Express the following in the form of a+ib

$$\frac{2+3i}{2-i}$$

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36. Express the following in the form of a+ib

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

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37. Express the following in the form of a+ib

$$(2+i)(2-3i)(4-3i)$$

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38. Express the following in the form of a+ib

$$\frac{2+3i}{5-4i}+\frac{2-3i}{5+4i}$$

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39. Find the conjugate of

$$\frac{i}{3+5i}$$

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40. Find the conjugate of

(2+3i)(3-4i)

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41. Find the conjugate of

$$\frac{3+i}{2+5i}$$

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42. Find the modulus of $\frac{3+4i}{12+5i}$

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43. Find the modulus and amplitude of the following complex numbers:

$\sqrt{3}+i$

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44. Find the modulus and amplitude of the following complex numbers:

-4i

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45. Find the modulus and amplitude of the following complex numbers:

$1+i\sqrt{3}$

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46. Find the modulus and amplitude of the following complex numbers:

-1-i

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47. Find the additive and multiplicative inverse of -4+5i.

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48. If $z_1 = 7 + 3i$ and $z_2 = -7 + 3i$ then find the following:

$z_1 z_2$

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49. If $z_1 = 7 + 3i$ and $z_2 = -7 + 3i$ then find the following:

$\bar{z}_1 \bar{z}_2$

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50. If $z_1 = 7 + 3i$ and $z_2 = -7 + 3i$ then find the following:

$z_1 \bar{z}_2$

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51. If $z_1 = 7 + 3i$ and $z_2 = -7 + 3i$ then find the following:

$\frac{z_1}{z_2}$

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52. If $z_1 = 7 + 3i$ and $z_2 = -7 + 3i$ then find the following:

$\frac{\bar{z}_1}{\bar{z}_2}$

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53. If x and y are real numbers of such that $\frac{(1+i)x-2i}{3+i}+\frac{(2-3i)y+i}{3-i}=i$, then determine the values of x and y.

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54. Find the square root of $7-30\sqrt{-2}$

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55. Find the square root of $-3+4\sqrt{-7}$

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56. Prove that, $\left(1-w+w^2\right)^4+\left(1+w-w^2\right)^4=-16$

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57. Prove that $(1+w)\left(1+w^2\right)\left(1+w^4\right)\left(1+w^8\right)=1$ where w is the imagination cube root of unity.

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58. If w be an imaginary cube root of unity, prove that

$\left(1-w+w^2\right)^2+\left(1+w-w^2\right)^2=-4$

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59. Prove that

$\left(1-w+w^2\right)^5+\left(1+w-w^2\right)^5=32$

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60. If w is the imaginary cube root of unity evaluate

$$\begin{vmatrix} 1 & w & w^2 \\ w & w^2 & 1 \\ w^2 & 1 & w \end{vmatrix}$$

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61. If, x = 3 +i then find the value of the expression $x^4 - 4x^3 + 4x^2 - 16x + 60.$

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62. If $x = \frac{1}{\sqrt{2}}(1+i)$ then show that $x^6 + x^4 + x^2 + 1 = 0$

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63. If $z = \cos 30^\circ + i\sin 30^\circ$, find z^7

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64. Show that, $\frac{(\cos 2\theta + i\sin 2\theta)^3(\cos 3\theta - i\sin 3\theta)^4}{(\cos 3\theta + i\sin 3\theta)^2(\cos 4\theta + i\sin 4\theta)^{-3}} = 1$

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65. Find the values of $(1+i)^{\frac{1}{7}}$

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66. Find the values of $(-i)^{\frac{1}{6}}$

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67. Find the values of $(-i)^{\frac{2}{5}}$

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68. If n be a positive integer, then prove that $(1+i)^n + (1-i)^n = 2^{\frac{n}{2}+1} \cdot \cos\left(\frac{n\pi}{4}\right)$

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69. If $a = \cos\theta + i\sin\theta, b = \cos\phi + i\sin\phi$,find the values of $\cos(\theta+\phi)$ and $\cos(\theta-\phi)$ in terms of a and b.

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70. Show that complex numbers $z_1 = -1+5i$ and $z_2 = -3+2i$ on the argand plane.

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71. Find the complex conjugate of 3+i

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72. Find the complex conjugate of 2+5i

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73. Find the complex conjugate of -3i-5

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74. Find the multiplicative inverse of 3-5i

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75. Express the following in the form of a+ib:

$(5i)\left(\frac{1}{8}i\right)$

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76. Express the following in the form of a+ib:

$(2i)\left(\frac{1}{8}i\right)$

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77. Express the following in the form of a+ib:

$(5-3i)^3$

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78. Express the following in the form of a+ib:

$(-\sqrt{3}+\sqrt{-2})(2\sqrt{3}-i)$

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79. Express the following in the form of a+ib:

i^{-35}

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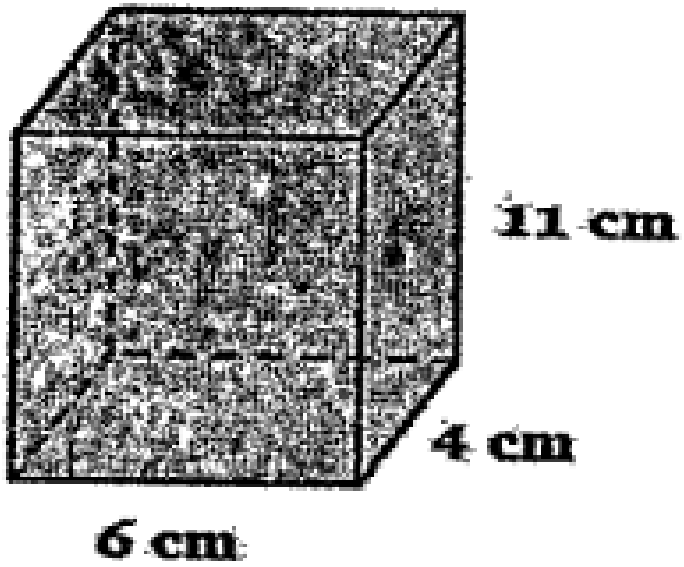
80. Find the volume of the prism shown



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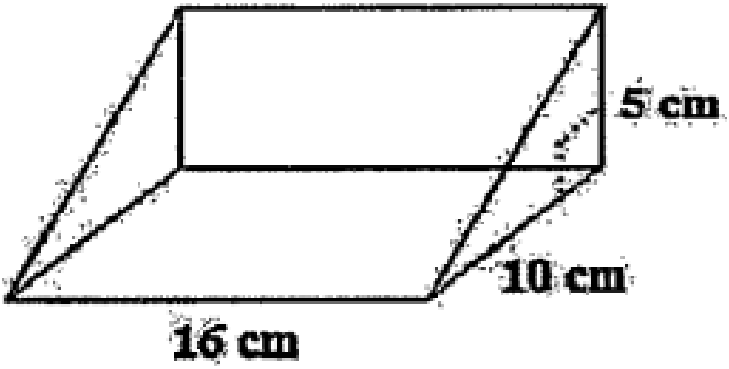
81. Find the volume of the triangular prism shown in the diagram.



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82. The base of a triangular prism is ΔABC, where AB=3 cm, BC=4 cm and $\angle B = 90$. If the height of the prism is 10 cm. Find Lateral surface area

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83. The base of a triangular prism is ΔABC, where AB=3 cm, BC=4 cm and $\angle B = 90$. If the height of the prism is 10 cm. Find Total surface area

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84. Find the whole surface area of a right prism whose height is 75 cm and whose base is a regular octagon of side 12 cm.

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85. The following figure is a right pyramid with an isosceles triangle base. Find the volume of the pyramid if the height is 18 cm

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86. Calculate the lateral surface area and the total surface area of the following pyramid.

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87. Find the volume of a sector of a sphere, the radius 10 cm and height of the cap is 9 cm ?

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88. Find the area of a sector of a sphere, the radius 5 cm, radius of the base of the cap is 4 cm and height of the cap is 7 cm ?

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89. The radius of base of a right circular cone is 2 metres and its height is 6 meters. Find its curved surface and volume.

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90. The section of a right circular cone by a plane through its vertex perpendicular to the base is an equilateral triangle each side of which is 12 m. Find the volume of the cone.

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91. A circular tent is cylindrical to a height of 4 m and conical above it. If its diameter is 105 m and its slant height is 80 m, calculate the total area of canvas required. What will be the cost of canvas at Rs 50 per meter if it is of width 1.5 m ?

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92. The volume of a conical frustum and that of a cylinder are same. The height of the cylinder is 1/3 m and radius is 62 m. The height of the frustum is 31 m and the radius of one end is 10 m. Find the radius of the other end.

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93. What is the surface area of a prism where the base area is $25m^2$, the base perimeter is 24 m, and the length is 12 m

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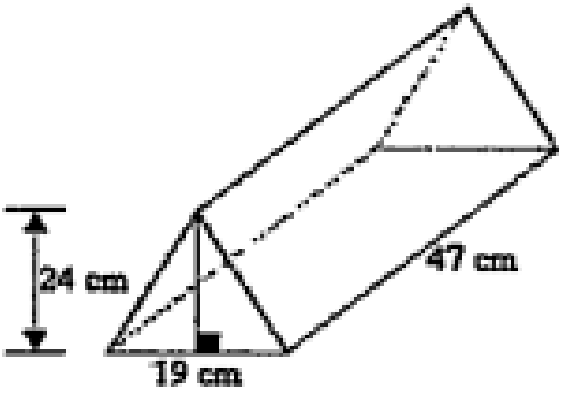
94. Find the volume of the following triangular prism



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95. A rectangular pyramid has a base area of $56cm^2$ and a volume of $224cm^2$. What is the height of the pyramid ?

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96. Find the volume of the zone and the total surface area of a sphere of radius 8 cm, and the radius of the smaller end is 6 cm. The

thickness of the zone is 12 cm.

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97. Calculate the lateral area, surface area and volume of the truncated square pyramid whose larger base edge is 24 cm, smaller base edge is 14 cm and whose lateral edge is 13 cm.

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98. Find the surface area of a frustum of a right circular cone with a slant height of 30 m, lower base radius 20 m and top radius of 15 m ?

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