PHYSICS

BOOKS - CHETANA PHYSICS (MARATHI ENGLISH)

MATHEMATICAL METHODS

Exercise

1. Define scalar and vector quantities. Give 2 examples of each

Watch Video Solution

2. Define the following vectors:

Watch Video Solution

3. What are the dimensions and units of a unit vector?

Watch Video Solution

4. How can a vector be represented?

Watch Video Solution

5. Explain what is meant by 'scalar multiple of a vector'. Give 2 examples.

Watch Video Solution

6. Distinguish between the scalars & vectors.

Watch Video Solution

7. Is it correct to add two vectors representing physical quantities having different dimensions?

Watch Video Solution

8. Explain addition and substraction of vectors.

Watch Video Solution

9. State and explain the "triangle law of vector addition".

Watch Video Solution

Watch Video Solution

10. With the help of diagrams explain the properties of vector addition.

Watch Video Solution

11. State the law of parallelogram of vectors.

(i) Obtain an expression for the magnitude of the resultant.

(ii) Obtain an expression for the direction of the resultant.

Watch Video Solution

12. Explain the polygon law of vectors.

OR

What is law of polygon of vector?

Watch Video Solution

13. Two vectors of equal magnitude acting at a point, produce a resultant, also of the same magnitude. Find the angle between the vectors.

Watch Video Solution

14. Two vectors $\vec{a}$ and $\vec{b}$ intersecting at a point, make an angle of 60° between them.If the magnitude of a is 8 units, and the magnitude of the resultant is 10 units, calculate the magnitude of $\vec{b}$. Also determine the direction of the resultant.

Watch Video Solution

15. What is meant by 'resolution of a vector'? What are "rectangular components"?

Watch Video Solution

16. Explain how the rectangular components of a 2-dimensional vector, convey the complete information about the vector.(i.e its magnitude and direction.)

Watch Video Solution

17. How can the concept of components of a vector be extended to a 3-dimension vector?

Watch Video Solution

18. Show that $\vec{a} = \frac{\vec{i} - \vec{j}}{\sqrt{2}}$ is a unit vector.

Watch Video Solution

19. If $\vec{v}_1 = 3\hat{i} + 4\hat{j} + \hat{k}$ and $\vec{v}_2 = \hat{i} - \hat{j} - \hat{k}$ determine the magnitude of $\vec{v}_1 + \vec{v}_2$

Watch Video Solution

20. For $\vec{v}_1 = 2\hat{i} - 3\hat{j}$ and $\vec{v}(2) = -6\hat{i} + 5\hat{j}$ determine the magnitude and directon of $\vec{v}_1 +$

$\overrightarrow{v}_2$

Watch Video Solution

21. Find a vector which is parallel to $\overrightarrow{v} = \hat{i} - 2\hat{j}$ and has magnitude 10.

Watch Video Solution

22. Show that $\overrightarrow{a} = 2\hat{i} + 5\hat{j} - 6\hat{k}$ and $\overrightarrow{b} = \hat{i} + \frac{5}{2}\hat{j} - 3\hat{k}$ are parallel.

Watch Video Solution

23. Define scalar product of 2 vectors. State any 2 of its properties.

24. Derive the expression for the scalar product of two vectors in "component form".

25. Give 2 examples of scalar product of vectors.

Watch Video Solution

26. Define vector product (or cross product) of two vectors. Also state the characteristics ofcross product.

Watch Video Solution

27. Derive the expression for the vector product of two vectors in the "component form".

Watch Video Solution

28. Give 2 examples of vector product of two vectors.

Watch Video Solution

29. Explain the physical significance of the magnitude of the cross product.

Watch Video Solution

30. Distinguish between dot product and cross product.

Watch Video Solution

31. Determine $\vec{a} \times \vec{b}$, given $\vec{a} = 2\hat{i} + 3\hat{j}$ and $\vec{b} = 3\hat{i} + 5\hat{j}$.

Watch Video Solution

32. Show that vectors $\vec{a} = 2\hat{i} + 3\hat{j} + 6\hat{k}$, $\vec{b} = 3\hat{i} - 6\hat{j} + 2\hat{k}$ and $\vec{c} = 6\hat{i} + 2\hat{j} - 3\hat{k}$ are mutually perpenducalar.

Watch Video Solution

33. Determine the vector product of $\overrightarrow{v}_1$ = 2hati + 3hatj-hatk and oversetrarrvunderset(2) $= \hat{i} + 2\hat{j} - 3\hat{k}$

Watch Video Solution

34. Given $\overrightarrow{v}_1$ =5hati + 2hatj and oversetrarrvunderset(2) $= a\hat{i} - 6\hat{j}$ perpenducalar to each other, determine the value of 'a'.

Watch Video Solution

35. Find, $\vec{P} . \vec{Q}$ where $\vec{P} = 2\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{Q} = \hat{i} - \hat{j} + 2\hat{k}$

Watch Video Solution

36. Show that the vectors $\vec{A} = 4\hat{i} + 2\hat{j} - 4\hat{k}$ and $\vec{B} = \hat{i} + 4\hat{j} + 3\widehat{K}$ are perpenducular to each other.

Watch Video Solution

37. Find a if $\vec{A} = 3\hat{i} - 2\hat{j} + 4\hat{k}$ and $\vec{B} = a\hat{i} + 2\hat{j} - \hat{k}$ are perpendicular to one another.

Watch Video Solution

38. Find unit vectors perpendicular to the plane of the vectors. $\vec{A} = \hat{i} - 2\hat{j} + \hat{k}$ and $\vec{B} = 2i - k$

Watch Video Solution

39. Find the cosine of the angle between the given vectors: $\overrightarrow{P} = 3\hat{i} + 12\hat{j} - 4\hat{k}$ and $\overrightarrow{Q} = 2\hat{i} + 2\hat{j} + \hat{k}$

Watch Video Solution

40. Find the angle between the vectors $\overrightarrow{A} = 2\hat{i} + 3\hat{j} + 2\hat{k}$ and $\overrightarrow{B} = \hat{i} - \hat{j} + 3\hat{k}$

Watch Video Solution

41. If $\overrightarrow{P} = \hat{i} - 2\hat{j} + 3\hat{k}$ and $\overrightarrow{Q} = 3\hat{i} + \hat{j} + 2\hat{k}$. Find the angle between $\overrightarrow{P}$ and $\overrightarrow{Q}$

Watch Video Solution

42. A particle has a displacement represented by $\overrightarrow{r} = \left(\hat{i} + 2\hat{j} + \hat{k}\right)$m when under the action of two forces $\overrightarrow{F}_1$ = (2hati - 3hatj + 2hatk)Nq and oversetrarrFunderset(2) $= \left(\hat{i} + \hat{j} + 3\hat{k}\right)$N. Find the work done.

Watch Video Solution

43. Find $\vec{A} \times \vec{B}$, where $\vec{A} = 2\hat{i} - 5\hat{j} + 3\hat{k}$ and $\vec{B} = 3\hat{i} + 4\hat{j} - 9\hat{k}$

Watch Video Solution

44. If $\vec{A} = 2\hat{i} + \hat{j} - \hat{k}$ and $\vec{B} = \hat{i} + \hat{j} - \hat{k}$, determine the unit vector parallel to $\vec{A} \times \vec{B}$.

Watch Video Solution

45. A force $\vec{F} = \left(4\hat{i} + 2\hat{j} - \hat{k}\right)$ N acts on a body at a distance of $\vec{r} = \left(-\hat{i} - 3\hat{j} + \hat{k}\right)$ m

from the origin of an inertial reference frame. Find the torque acting on the body.

Watch Video Solution

46. Find the area of the triangle formed by $\vec{A} = 3\hat{i} - 4\hat{j} + 2\hat{k}$m and $\vec{B} = \hat{i} + \hat{j} - 2\hat{k}$ as adjacent sides.

Watch Video Solution

47. Find the area of the parallelogram with adjacent sides formed by $\vec{P}$ and $\vec{Q}$

Watch Video Solution

48. If $\left|\overline{A}+\overline{B}\right|=\left|\overline{A}-\overline{B}\right|$ then what can be the angle between $\overline{A}$ and $\overline{B}$?

Watch Video Solution

49. Using the rule for different for quotient of two functions,prove that $\frac{d}{dx}\left(\frac{\sin x}{\cos x}\right)=\sec^2 x.$

Watch Video Solution

50. Chose the correct option

The angle made by $2\hat{i} + 3\hat{j}$ with Z axis is

A. 30°

B. $\tan^{-1}\left(\frac{2}{3}\right)$

C. $\tan^{-1}\left(\frac{3}{2}\right)$

D. 90°

Answer:

Watch Video Solution

51. Chose the correct option

The magnitude of (hati + hatj +hatk)` is

A. 1

B. 3

C. $\sqrt{3}$

D. $\frac{1}{3}$

Answer:

Watch Video Solution

52. Chose the correct option

vector $2\hat{i}+3\hat{j}-7\hat{k}$ and $\hat{i}+m\hat{j}-2\hat{k}$ are perpendicular vectors. The value of m is

A. $-\frac{1}{3}$

B. -3

C. $\frac{16}{3}$

D. $-\frac{16}{3}$

Answer:

Watch Video Solution

53. Chose the correct option

If $\left(\vec{a}+\vec{b}\right)$ is maximum, the angle between $\vec{a}$ and $\vec{b}$ must be

A. 45°

B. 0°

C. 90°

D. 180°

Answer:

Watch Video Solution

54. Chose the correct option

If the vector $\overrightarrow{a}\hat{i} + 0.8\hat{j} + 0.06\hat{k}$ is said to be unit vector, the value of a is.

A. 1

B. -1.4

C. 0

D. $\frac{1}{2}$

Answer:

Watch Video Solution

55. Chose the correct option

When 2 vectors $\vec{a}$ and $\vec{b}$ are added, the magnitude of the resultant is always

A. greater than (a+b)

B. less than (a+b)

C. never greater than (a+b)

D. equal to (a+b)

Answer:

Watch Video Solution

56. Chose the correct option

If a vector has magnitude5, its components have magnitude

A. 2 and 3

B. 2.5 and 3.5

C. 1 and 4

D. 3 and 4

Answer:

Watch Video Solution

57. Chose the correct option

Two forces of magnitude 7N and 5N act on a particle. The minimum magnitude of the resultant is

A. 1 N

B. 2 N

C. 6 N

D. 5 N

Answer:

Watch Video Solution

58. Chose the correct option

A force $\overrightarrow{F} = \left(2\hat{i} - 10\hat{j} + 12\hat{k}\right)$ N acts as a particle which moves along the positive Z axis. If it covers a distance of 10 m, the work done is

A. 40 J

B. 100 J

C. 120 J

D. $-100J$

Answer:

Watch Video Solution

59. Chose the correct option

The force acting on a body of mass m, produces acceleration a,given by the equation F= ma. If $\overrightarrow{F} = \left(8\hat{i} + 6\hat{j} - 10\hat{k}\right)$N and acceleration is 1 m/s^2, the mass of the body is

A. 4 kg

B. 20 kg

C. 200 kg

D. $10\sqrt{2}$ kg

Answer:

Watch Video Solution

60. Chose the correct option

The value of $\left(\overrightarrow{A}+\overrightarrow{B}\right)\times\left(\overrightarrow{A}-\overrightarrow{B}\right)$ is

A. 0

B. A^2-B^2

C. $\overrightarrow{B}\times\overrightarrow{A}$

D. $2\left(\overrightarrow{B}\times\overrightarrow{A}\right)$

Answer:

Watch Video Solution

61. Chose the correct option

The angle between $\left(\hat{i}+\hat{j}\right)$ and $\left(\hat{j}+\hat{k}\right)$ is

A. 0°

B. 90°

C. 30°

D. 60°

Answer:

Watch Video Solution

62. Chose the correct option

The resultant of two vectors $\overrightarrow{p}$ and $\overrightarrow{q}$ make 45° angle with both the magnitude of the resultant is

A. p + q

B. $\frac{p+q}{\sqrt{2}}$

C. $\frac{\sqrt{p^2+q^2}}{\sqrt{2}}$

D. $\sqrt{p^2+q^2}$

Answer:

Watch Video Solution

63. Chose the correct option

The angle between $\vec{a}$ and the resultant of $\left(2\vec{a}+\vec{b}\right)$ and $\left(2\vec{a}-\vec{b}\right)$ is

A. 0°

B. 90°

C. $\tan^{-1}\left(\frac{1}{2}\right)$

D. 45°

Answer:

Watch Video Solution

64. Chose the correct option

$\overrightarrow{p}$ and $\overrightarrow{q}$ are two vectors. Then $\overrightarrow{P}.\left(\overrightarrow{p}\times\overrightarrow{q}\right)$ is

A. pq

B. p^2q

C. zero

D. 2pq

Answer:

Watch Video Solution

65. Chose the correct option

If $y = x^2 + 2x$, then $\frac{dy}{dx}$ at x= 4 is

A. 4

B. 6

C. 8

D. 10

Answer:

Watch Video Solution

66. Chose the correct option

The displacement s of a particle is expressed by the relation $s = \left(6t^2 - 3t + 6\right)$ metres and t is in seconds. The velocity of the particle at t = 2 seconds is ... m/s.

A. 9

B. 81

C. 4.5

D. 21

Answer:

Watch Video Solution

67. Chose the correct option

The value of the integral $\int_2^3 x^2 dx$ is

A. 5

B. 19

C. $\frac{19}{3}$

D. $\frac{5}{3}$

Answer:

Watch Video Solution

68. Chose the correct option

$\int_0^{\pi/2} \sin\theta d\theta$ is equal to

A. 0

B. -1

C. 1

D. $\frac{1}{2}$

Answer:

Watch Video Solution

69. Chose the correct option

$\int_0^{\pi/2} \vec{a} . \vec{b}$ d theta` is equal to

A. ab

B. $-ab$

C. 0

D. $\frac{ab}{2}$

Answer:

Watch Video Solution

70. Chose the correct option

The resultant of 2 forces 10N and 15N acting along + x and - x axes respectively is

A. 25N along + x axis

B. 25N along - x axis

C. 5N along + x axis

D. 5N along - x axis

Answer:

Watch Video Solution

71. Chose the correct option

For 2 vectors to be equal, they should have

A. Same magnitude

B. Same direction

C. Same magnitude and direction

D. Same magnitude but opposite direction

Answer:

Watch Video Solution

72. Chose the correct option

The magnitude of scalar product of two unit vectors perpendicular to each other is

A. Zero

B. 1

C. -1

D. 2

Answer:

 Watch Video Solution

73. Chose the correct option

The magnitude of vector product of two unit vectors making an angle of 60° with each other is

A. 1

B. 2

C. $\frac{3}{2}$

D. frac(sqrt3)(2)`

Answer:

Watch Video Solution

74. Chose the correct option

If $\vec{a}$, $\vec{b}$, and $\vec{C}$ are 3 vectors, then which of the following is not correct?

A. $\vec{A} . \left(\vec{B} + \vec{C}\right) = \vec{A} . \vec{B} + \vec{A} . \vec{C}$

B. $\vec{A} . \vec{B} = \vec{B} . \vec{A}$

C. $\vec{A} \times \vec{B} = \vec{B} \times \vec{A}$

D.

$$\vec{A} \times \left(\vec{B} + \vec{C}\right) = \left(\vec{A} \times \vec{B}\right) + \left(\vec{A} \times \vec{C}\right)$$

Answer:

Watch Video Solution

75. The magnitude of the sum of 2 vectors is_____

A. Always equal to sum of magnitude of 2 vectors

B. Never equal to the sum of magnitude of 2 vectors

C. May be equal to the sum of magnitude of 2 vectors

D. Always less than sum of magnitude of 2 vectors

A. A. Always equal to sum of magnitude of 2 vectors

B. B. Never equal to the sum of magnitude of 2 vectors

C. C. May be equal to the sum of magnitude of 2 vectors

D. D. Always less than sum of magnitude of 2 vectors

Answer:

Watch Video Solution

76. State True/False:

The magnitude of the sum of 2 vectors is always equal to the sum of magnitude of 2 vector.

77. State True/False:

The magnitude of the sum of 2 vectors is never equal to the sum of magnitude of 2 vector.

78. State True/False:

The magnitude of the sum of 2 vectors is may be equal to the sum of magnitude of 2 vector.

Watch Video Solution

79. State True/False:

If $\vec{a}$ and $\vec{b}$ are 2 vectors of same magnitude than $\left(\vec{a}+\vec{b}\right)$ is

(a) at an angle 45° with both vectors.

Watch Video Solution

80. State True/False:

If $\vec{a}$ and $\vec{b}$ are 3 vectors of same magnitude than $\left(\vec{a}+\vec{b}\right)$ is

(b) at an angle of 45° with any vector

Watch Video Solution

81. State True/False:

If $\vec{a}$ and $\vec{b}$ are 4 vectors of same magnitude than $\left(\vec{a}+\vec{b}\right)$ is

c. in a plain containing the 2 vectors

Watch Video Solution

82. If $\hat{i}$ and $\hat{j}$ are unit vectors , then $\left(\hat{i}+\hat{j}\right)$

may be a unit vector

Watch Video Solution

83. If $\hat{i}$ and $\hat{j}$ are unit vectors , then $\left(\hat{i}+\hat{j}\right)$

is a unit vector

Watch Video Solution

84. If $\hat{i}$ and $\hat{j}$ are unit vectors , then $\left(\hat{i}+\hat{j}\right)$

is not a unit vector

Watch Video Solution

85. If $\hat{i}$ and $\hat{j}$ are unit vectors , then $\left(\hat{i}+\hat{j}\right)$

is a vector of magnitude2

Watch Video Solution

86. Pressure is Vector or Scalar Quantity ?

Watch Video Solution

Watch Video Solution

87. velocity is Vector or Scalar Quantity ?

Watch Video Solution

88. Time is Vector or Scalar Quantity?

Watch Video Solution

89. Distance is Scalar or vector quantity ?

Watch Video Solution

90. What is meant by 'resolution of a vector'?

Watch Video Solution

91. State the triangle law of vectors. State any 2 of its properties.

Watch Video Solution

92. Define scalar product of 2 vectors. State any 2 of its properties.

Watch Video Solution

93. Explain the physical significance of the magnitude of the cross product.

Watch Video Solution

94. Explain addition and substraction of vectors.

Watch Video Solution

95. Two forces of magnitude 10N and 15N act at a point making angle of 60° between them. Find the magnitude of the resultant and the angle made by it with the 10N force.

Watch Video Solution

96. Determine the area of the parallelogram formed by the 2 vectors . $\hat{i} + 3\hat{j} - 4\hat{k}$ and $3\hat{i} - 2\hat{j} - \hat{k}$

Watch Video Solution

97. State the law of parallelogram of vectors.Obtain an expression for the magnitude of the resultant.

Watch Video Solution

98. A dimensionally correct equation need not be actually correct, but a dimensionally incorrect equation is necessarily wrong. Justify.

Watch Video Solution