

PHYSICS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

SCALARS AND VECTORS

Example

1. Find the unit vector of $4\hat{i} - 3\hat{j} + \hat{k}$

A. $\frac{3\hat{i} + 2\hat{j}}{9}$

$$\text{B. } \frac{4\hat{i} - 3\hat{j} + \hat{k}}{\sqrt{26}}$$

$$\text{C. } \frac{5\hat{i} + 6\hat{j} - \hat{k}}{\sqrt{2}}$$

$$\text{D. } \frac{2\hat{i} + 2\hat{j} - 2\hat{k}}{\sqrt{26}}$$

Answer:



Watch Video Solution

2. Find the sum of vectors A and B as shown in the figure. Also find the direction of sum vector.

Given, A = 4 unit and B = 3 unit. K



A. $\sqrt{37}$ unit, 25.3°

B. $\sqrt{2}$ unit, 36.8°

C. 5unit, 70°

D. $\sqrt{30}$ unit, 50.2°

Answer:



View Text Solution

3. Find the subtraction of vector A and B as shown in the figure, also find the direction of subtraction vector. Given, A = 4 unit and b = 3

unit.



A. $\sqrt{6}$ unit, 50.1°

B. $\sqrt{13}$ unit, 46.1°

C. $\sqrt{3}$ unit, 70°

D. 40 unit, 301°

Answer:



View Text Solution

4. Find the component of vector $A+B$ along

i. X-axis, ii. C.

Given, $A = \hat{i} - 2\hat{j} + 3\hat{k}$ and $C = \hat{i} + \hat{j}$.

A. $3, \frac{1}{\sqrt{2}}$

B. $2, \frac{3}{\sqrt{2}}$

C. $5, \frac{2}{3}$

D. $4, \frac{2}{\sqrt{2}}$

Answer:



[View Text Solution](#)

5. Find a unit vector perpendicular to

$$A = 2\hat{i} + 3\hat{j} + \hat{k} \text{ and}$$

$$B = \hat{i} - \hat{j} + \hat{k} \text{ both.}$$

A. $\frac{1}{\sqrt{2}}(21\hat{i} - 3\hat{j})$

B. $\frac{1}{\sqrt{5}}(4\hat{i} + \hat{j} + 5\hat{k})$

C. $\frac{1}{\sqrt{42}}(4\hat{i} - \hat{j} - 5\hat{k})$

D. $\frac{1}{\sqrt{42}}(4\hat{i} - \hat{j} + 5\hat{k})$

Answer:



Watch Video Solution

Exercise 1

1. Which is not a vector quantity?

A. Current

B. Displacement

C. Velocity

D. Acceleration

Answer: A



[Watch Video Solution](#)

2. Pressure is

A. scalar

B. vector

C. Sometimes vector sometimes scalar

D. Can not say

Answer: A



Watch Video Solution

3. which of the following is not the vector quantity?

A. Torque

B. Displacement

C. Dipole moment

D. Electric flux

Answer: D



Watch Video Solution

4. Unit vector does not have any

A. direction

B. magnitude

C. unit

D. All of these

Answer: C



Watch Video Solution

5. Which of the following represents a unit vector ?

A. $\frac{|A|}{A}$

B. $\frac{A}{|A|}$

C. $\frac{A}{A}$

D. $\frac{|A|}{|A|}$

Answer: B



Watch Video Solution

6. The unit vector along $\hat{i} + \hat{j}$ is

A. \hat{k}

B. $\hat{i} + \hat{j}$

C. $\frac{\hat{i} + \hat{j}}{\sqrt{2}}$

D. $\frac{\hat{i} + \hat{j}}{2}$

Answer: C



Watch Video Solution

7. Find the vector that must be added to the vector $\hat{i} - 3\hat{j} + 2\hat{k}$ and $3\hat{i} + 6\hat{j} - 7\hat{k}$ so that the resultant vector is a unit vector along the y-axis.

A. $-4\hat{i} - 2\hat{j} + 5\hat{k}$

B. $-4\hat{i} + 2\hat{j} + 5\hat{k}$

C. $4\hat{i} - 2\hat{j} + 5\hat{k}$

D. $4\hat{i} - 2\hat{j} - 5\hat{k}$

Answer: A



Watch Video Solution

8. The magnitude of $\hat{i} + \hat{j}$ is

A. 2

B. 0

C. $\sqrt{2}$

D. 4

Answer: C



Watch Video Solution

9. A vector multiplied by the number 0, results into

A. 0

B. A

C. 0

D. A

Answer: C



Watch Video Solution

10. What happens, when we multiply a vector by

(-2)

A. Direction reverses and unit charges

B. Direction reverses and magnitude is
doubled

C. Direction remains unchanged and unit
changes

D. None of the above

Answer: B



Watch Video Solution



Watch Video Solution

11. $\vec{A} + \vec{B}$ can also be written as

A. $A-B$

B. $B-A$

C. $B+A$

D. $B.A$

Answer: C



Watch Video Solution

12. If $P + Q = 0$. Then which of the following is necessarily true?

A. $P = 0$

B. $P = -Q$

C. $Q = 0$

D. $P = Q$

Answer: B



Watch Video Solution

13. Two vector having magnitude 8 and 10 can maximum and minium value of magnitude of their resultant as

A. 12,6

B. 10,3

C. 18,2

D. None of these

Answer: C



Watch Video Solution

14. $\vec{P} + \vec{Q}$ is a unit vector along x-axis. If $\vec{P} = \hat{i} - \hat{j} + \hat{k}$, then what is \vec{Q} ?

A. $\hat{i} + \hat{j} - \hat{k}$

B. $\hat{j} - \hat{k}$

C. $\hat{i} + \hat{j} + \hat{k}$

D. $\hat{j} + \hat{k}$

Answer: B



Watch Video Solution

15. For the resultant of two vectors to be maximum , what must be the angle between them ?

A. 0°

B. 60°

C. 90°

D. 90°

Answer: A



Watch Video Solution

16. What are minimum number of unequal forces whose vector sum is zero ?

A. two

B. three

C. four

D. Any

Answer: B



Watch Video Solution

17. Given that $P + Q + R = 0$. Which of the following statement is true?

A. $|P| + |Q| = |R|$

B. $|P + Q| = |R|$

C. $|P| - |Q| + |R|$

D. $|P - Q| = |R|$

Answer: B



Watch Video Solution

18. $A = 2\hat{i} + \hat{j}$, $B = 3\hat{j} - \hat{k}$ and $C = 6\hat{i} - 2\hat{k}$

Value of $A - 2B + 3C$ would be

A. $20\hat{i} + 5\hat{j} + 4\hat{k}$

B. $20\hat{i} - 5\hat{j} - 4\hat{k}$

C. $4\hat{i} + 5\hat{j} + 20\hat{k}$

D. $5\hat{i} + 4\hat{j} + 10\hat{k}$

Answer: B



Watch Video Solution

19. if $P + Q + P - Q$, then

A. $P=0$

B. $Q=0$

C. $P=1$

D. $|Q| = 1$

Answer: B



Watch Video Solution

20. What vector must be added to the sum of two vectors $2\hat{i} - \hat{j} + 3\hat{k}$ and $3\hat{i} - 2\hat{j} - 2\hat{k}$. So that the resultant is a unit vector along Z-axis?

A. $5\hat{i} + \hat{k}$

B. $-5\hat{i} + 3\hat{j}$

C. $3\hat{j} + 5\hat{k}$

D. $-3\hat{j} + 2\hat{k}$

Answer: B



Watch Video Solution

21. If $|A|=2$ and $|B|=4$ and angle between them is 60° then $|A-B|$

A. $\sqrt{13}$

B. $3\sqrt{3}$

C. $\sqrt{3}$

D. $2\sqrt{3}$

Answer: D



Watch Video Solution

22. If A and B are two vectors such that $|A+B|=2|A-B|$. The angle between vectors A and B is

A. 45°

B. 60°

C. 30°

D. data insufficient

Answer: D



Watch Video Solution

23. At what angle should the two forces $2P$ and $\sqrt{2}P$ and $P\sqrt{2}P$ act so that resultant force is $P\sqrt{10}$?

A. 45°

B. 60°


C. 90°

D. 120°

Answer: A



Watch Video Solution

24. Three forces acting on a body are shown in the figure. To have the resultant force only along the y- direction, the magnitude of the minimum additional force needed is 

A. $\frac{\sqrt{3}}{4} \hat{i} N$

B. $\sqrt{3} \hat{i} N$

C. $0.5 \hat{i} N$

D. $1.5 \hat{i} N$

Answer: C



View Text Solution

25. Three vector A, B and C satisfy the relation $A \cdot B = 0$ and $A \cdot C = 0$. Then the vector A is perpendicular to

A. B

B. C

C. B, C

D. B, C

Answer: D



Watch Video Solution

26. what is the dot product of two vectors of magnitudes 3 and 5,if angle between them is 60° ?

A. 5.2

B. 7.5

C. 8.4

D. 8.6

Answer: B



Watch Video Solution

27. When $A \cdot B = -|A||B|$, then

- A. A and B are perpendicular to each other
- B. A and B act in the same direction
- C. A and B act in the opposite direction
- D. A and B can act in any direction

Answer: C



Watch Video Solution

28. The condition $(a \cdot b)^2 = a^2 b^2$ is satisfied when

A. a is parallel to b

B. $a \neq b$

C. $a \cdot b = 1$

D. $a \perp b$

Answer: A



Watch Video Solution

29. The modulus of the vector product of two vectors is $\frac{1}{\sqrt{30}}$ times their scalar product. The angle between vectors is

A. $\frac{\pi}{6}$

B. $\frac{\pi}{2}$

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

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

Answer: A



View Text Solution

30. In a clockwise system,

A. $\hat{j} \times \hat{k} = \hat{i}$

B. $\hat{k} \cdot \hat{i} = 1$

C. $\hat{i} \cdot \hat{i} = 0$

D. $\hat{j} \times \hat{j} = 1$

Answer: A



Watch Video Solution

31. If $|A \times B| = \sqrt{3}A \cdot B$, then the value of $|A+B|$ is

A. $\left(A^2 + B^2 + \frac{AB}{\sqrt{3}}\right)^{1/2}$

B. $A + B$

C. $(A^2 + B^2 + \sqrt{3}AB)^{1/2}$

D. $(A^2 + B^2 + AB)^{1/2}$

Answer: D



Watch Video Solution

32. If $|A| = 2$, $|B| = 5$ and $|A \times B| = 8$. Angle between A and B is acute, then $(A \cdot B)$ is

A. 6

B. 3

C. 4

D. 7

Answer: A



Watch Video Solution

33. Find the torque of a force

$F = -3\hat{i} + 2\hat{j} + \hat{k}$ acting at the point

$r = 8\hat{i} + 2\hat{j} + 3\hat{k}$, (if $\tau = r \times F$)

A. $14\hat{i} - 38\hat{j} + 16\hat{k}$

B. $4\hat{i} + 4\hat{j} + 6\hat{k}$

C. $-14\hat{i} + 38\hat{j} - 16\hat{k}$

D. $-4\hat{i} - 17\hat{j} + 22\hat{k}$

Answer: D



Watch Video Solution

34. What is the unit vector perpendicular to the following Vector $2\hat{i} + 2\hat{j} - \hat{k}$ and $6\hat{i} - 3\hat{j} + 2\hat{k}$?

A. $\frac{\hat{i} + 10\hat{j} - 18\hat{k}}{5\sqrt{17}}$

B. $\frac{\hat{i} - 10\hat{j} + 18\hat{k}}{5\sqrt{17}}$

C. $\frac{\hat{i} - 10\hat{j} - 18\hat{k}}{5\sqrt{17}}$

D. $\frac{\hat{i} + 10\hat{j} + 18\hat{k}}{5\sqrt{17}}$

Answer: C



Watch Video Solution

35. If $A \times B = B \times A$ then the angle between A and B is

A. zero

B. (π)

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

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

Answer: B



Watch Video Solution

36. What is the value of linear velocity, if

$$\vec{\omega} = 3\hat{i} - 4\hat{j} + \hat{k} \text{ and } \vec{r} = 5\hat{i} - 6\hat{j} + 6\hat{k}$$

A. $6\hat{i} - 2\hat{j} + 3\hat{k}$

B. $6\hat{i} - 2\hat{j} + 8\hat{k}$

C. $4\hat{i} - 13\hat{j} + 6\hat{k}$

D. $-18\hat{i} - 13\hat{j} + 2\hat{k}$

Answer: D



Watch Video Solution

37. The area of the parallelogram determined by two adjacent sides as $A = 2\hat{i} + \hat{j} - 3\hat{k}$ and $B = 12\hat{j} - 2\hat{k}$ is approximately

A. 43

B. 56

C. 38

D. 74

Answer: A



Watch Video Solution

Exercise 2 Miscellaneous Problems

1. A vector is added to an equal and opposite vector of similar nature, forms a

- A. unit vector
- B. position vector
- C. null vector
- D. displacement vector

Answer: C



Watch Video Solution

2. Which of the following is a unit vector ?

A. $\hat{i} + \hat{j}$

B. $\cos \theta \hat{i} - \sin \theta \hat{j}$

C. $\sin \theta \hat{i} + 2 \cos \theta \hat{j}$

D. $\frac{1}{\sqrt{3}} (\hat{i} + \hat{j})$

Answer: B



Watch Video Solution

3. The expression $\left(\frac{1}{\sqrt{2}} \hat{i} + \frac{1}{\sqrt{2}} \hat{j} \right)$ is a

A. unit vector

B. null vector

C. vector of magnitude $\sqrt{2}$

D. scalar

Answer: A



Watch Video Solution

4. Vector $P = 6\hat{i} + 4\sqrt{2}\hat{j} + \sqrt{2}\hat{k}$ makes angle from Z-axis equal to

A. $\cos^{-1}\left(\sqrt{\frac{2}{5}}\right)$

B. $\cos^{-1}\left(\frac{2}{\sqrt{2}}\right)$

C. $\cos^{-1}\left(\frac{2\sqrt{2}}{5}\right)$

D. None of these

Answer: C



Watch Video Solution

5. Given $A = \hat{i} + \hat{j} + \hat{k}$ and $B = -\hat{i} - \hat{j} - \hat{k}$

then $(A-B)$ will make angle with A

A. 0°

B. 180°

C. 90°

D. 60°

Answer: A



Watch Video Solution

6. If three vectors along coordinate axis represent the adjacent sides of a cube of length b , then the unit vector along its diagonal passing through the origin will be

A. $\frac{\hat{i} + \hat{j} + \hat{k}}{\sqrt{2}}$

B. $\frac{\hat{i} + \hat{j} + \hat{k}}{\sqrt{36}}$

C. $\hat{i} + \hat{j} + \hat{k}$

D. $\frac{\hat{i} + \hat{j} + \hat{k}}{\sqrt{3}}$

Answer: D



View Text Solution

7. If two vectors are equal and their resultant is also equal to one of them, then the angle between the two vectors is

A. 60°

B. 120°

C. 90°

D. 0°

Answer: B



Watch Video Solution

8. If A and B are two non-zero vectors having equal magnitude, then angle between the vectors A and $A - B$ is

A. 0°

B. 90°

C. 180°

D. dependent on the orientation of A and B

Answer: D



View Text Solution

9. A man first moves 3m due east, then 6m due north and finally 7m due west, then the magnitude of the resultant displacement is (in metre)

A. $\sqrt{16}$

B. $\sqrt{24}$

C. $\sqrt{52}$

D. $\sqrt{94}$

Answer: D



[View Text Solution](#)

10. The resultant of two forces $3P$ and $2P$ is R . If the first force is doubled then resultant is also doubled. The angle between the two forces is

A. 60°

B. 120°

C. 90°

D. 180°

Answer: D



11. The resultant of A and B is R_1 . On reversing the vector B, the resultant R_2 what is the value of $R_1^2 + R_2^2$?

A. $A^2 + B^2$

B. $A^2 - B^2$

C. $2(A^2 + B^2)$

D. $2(A^2 - B^2)$

Answer: C



Watch Video Solution

12. If the sum of two unit vectors is a unit vector, then magnitude of difference is-

A. $\sqrt{2}$

B. $\sqrt{3}$

C. $1/\sqrt{2}$

D. $\sqrt{5}$

Answer: B



Watch Video Solution

13. In the figure shown, ABCDEF is a regular hexagon. What is the value of $AB + AC + AD + AE + AF$?



A. AO

B. $2AO$

C. $4AO$

D. $6AO$

Answer: D



14. Figure shows three vectors p, q and r , where C is the mid-point of AB . Then, which of the following relation is correct?



A. $p + q = 2r$

B. $p + q = r$

C. $p - q = 2r$

D. $p - q = r$

Answer: A



View Text Solution

15. The velocity of a particle is $v = 6\hat{i} + 2\hat{j} - 2\hat{k}$. The component of the velocity parallel to vector $a = \hat{i} + \hat{j} + \hat{k}$ in vector form is

A. $6\hat{i} + 2\hat{j} + 2\hat{k}$

B. $2\hat{i} + 2\hat{j} + 2\hat{k}$

C. $\hat{i} + \hat{j} + \hat{k}$

$$D. 6\hat{i} + 2\hat{j} - 2\hat{k}$$

Answer: B



[View Text Solution](#)

16. The resultant R of vector P and Q is perpendicular to P and $R=P$ both, then angle between $|P|$ and $|Q|$ is

A. 45°

B. 135°

C. 120°

D. All of these

Answer: B



Watch Video Solution

17. The value of

$$\hat{i} \times (\hat{i} \times a) + \hat{j} \times (\hat{j} \times a) + \hat{k} \times (\hat{k} \times a) \text{ is}$$

A. a

B. $a \times \hat{k}$

C. $-2a$

D. $-a$

Answer: C



View Text Solution

18. What is the angle between \vec{P} and the resultant of $\left(\vec{P} + \vec{Q}\right)$ and $\left(\vec{P} - \vec{Q}\right)$?

A. zero

B. $\tan^{-1}(P/Q)$

C. $\tan^{-1}(Q/P)$

$$D. \tan^{-1}(P - Q) / (P + Q)$$

Answer: A



Watch Video Solution

19. If a_1 and a_2 are two non-collinear unit vectors and if $|a_1 + a_2| = \sqrt{3}$, then value of $(a_1 - a_2) \cdot (2a_1 - a_2)$ is

A. 2

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

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

D. 1

Answer: B



Watch Video Solution

20. If θ is the angle between two vectors A and B , then match the following two columns.

Column I

Column II

(A) $A \cdot B = |A \times B|$

(P) $\theta = 90^\circ$

(B) $A \cdot B = B^2$

(Q) $\theta = 0^\circ$ or 180°

(C) $|A + B| = |A - C|$

(r) $A = B$

(D) $|A \times B| = AB$

(s) None

A. $A \rightarrow s, B \rightarrow q, C \rightarrow p, D \rightarrow p$

B. $A \rightarrow p, B \rightarrow q, C \rightarrow p, D \rightarrow p$

C. $A \rightarrow q, B \rightarrow q, C \rightarrow r, D \rightarrow s$

D. $A \rightarrow p, B \rightarrow r, C \rightarrow r, D \rightarrow s$

Answer: A



Watch Video Solution