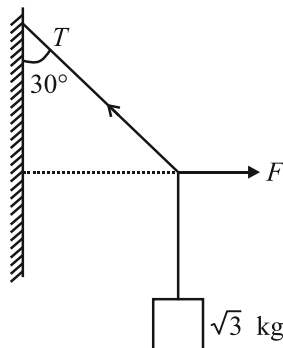


Yakeen NEET 2.0 2026

Vectors

Assignment-03
By: M.R. Sir

- Two forces having magnitude A and $\frac{A}{2}$ are perpendicular to each other. The magnitude of their resultant is: [JEE Mains 2023]
 - $\frac{\sqrt{5}A}{4}$
 - $\frac{\sqrt{5}A}{2}$
 - $\frac{5A}{2}$
 - $\frac{\sqrt{5}A^2}{2}$
- At any instant the velocity of a particle of mass 500g is $(2t\hat{i} + 3t^2\hat{j}) \text{ m s}^{-1}$. If the force acting on the particle at $t = 1\text{s}$ is $(\hat{i} + x\hat{j}) \text{ N}$. Then the value of x will be: [JEE Mains 2023]
 - 3
 - 4
 - 2
 - 6
- When vector $\vec{A} = 2\hat{i} + 3\hat{j} + 2\hat{k}$ is subtracted from vector \vec{B} , it gives a vector equal to $2\hat{j}$. Then the magnitude of vector \vec{B} will be: [JEE Mains 2023]
 - $\sqrt{5}$
 - 3
 - $\sqrt{6}$
 - $\sqrt{33}$
- A vector in x - y plane makes an angle of 30° with y -axis. The magnitude of y -component of vector is $2\sqrt{3}$. The magnitude of x -component of the vector will be: [JEE Mains 2023]
 - $\frac{1}{\sqrt{3}}$
 - 6
 - 2
 - $\sqrt{3}$
- The position vector of a particle related to time t is given by $\vec{r} = (10t\hat{i} + 15t^2\hat{j} + 7t\hat{k})\text{m}$. The direction of net force experienced by the particle is: [JEE Mains 2023]
 - Positive x -axis
 - In x - y plane
 - Positive y -axis
 - Positive z -axis
- Vectors $a\hat{i} + b\hat{j} + \hat{k}$ and $2\hat{i} - 3\hat{j} + 4\hat{k}$ are perpendicular to each other when $3a + 2b = 7$, the ratio of a to b is $\frac{x}{2}$. The value of x is _____. [JEE Mains 2023]
 - 1
 - 2
 - 3
 - 1
- If two vectors $\vec{P} = \hat{i} + 2m\hat{j} + m\hat{k}$ and $\vec{Q} = 4\hat{i} - 2\hat{j} + m\hat{k}$ are perpendicular to each other. Then, the value of m will be [JEE Mains 2023]
 - 1
 - 2
 - 3
 - 1
- If $\vec{P} = 3\hat{i} + \sqrt{3}\hat{j} + 2\hat{k}$ and $\vec{Q} = 4\hat{i} + \sqrt{3}\hat{j} + 2.5\hat{k}$ then, the unit vector in the direction of $\vec{P} \times \vec{Q}$ is $\frac{1}{x}(\sqrt{3}\hat{i} + \hat{j} - 2\sqrt{3}\hat{k})$. The value of x is _____. [JEE Mains 2023]
 - 20 N
 - 25 N
 - 10 N
 - 15 N
- A block of $\sqrt{3} \text{ kg}$ is attached to a string whose other end is attached to the wall. An unknown force F is applied so that the string makes an angle of 30° with the wall. The tension T is: (Given $g = 10 \text{ m s}^{-2}$) [JEE Mains 2023]
 

10. Expression for an electric field is given by $\vec{E} = 4000 x^2 \hat{i} \text{ V m}^{-1}$. The electric flux through the cube of side 20 cm when placed in electric field (as shown in the figure) is _____ V cm.

[JEE Mains 2023]

11. A small particle moves to position $5\hat{i} - 2\hat{j} + \hat{k}$ from its initial position $2\hat{i} + 3\hat{j} - 4\hat{k}$ under the action of force $5\hat{i} + 2\hat{j} + 7\hat{k}$ N. The value of work done will be _____ J.

[JEE Mains 2023]

12. Position of an ant (S in metres) moving in Y-Z plane is given by $S = 2t^2\hat{j} + 5\hat{k}$ (where t is in second). The magnitude and direction of velocity of the ant at $t = 1$ s will be:

[JEE Mains 2024]

- (1) 16 m s^{-1} in y-direction
- (2) 4 m s^{-1} in x-direction
- (3) 9 m s^{-1} in z-direction
- (4) 4 m s^{-1} in y-direction

13. An electric field is given by $(6\hat{i} + 5\hat{j} + 3\hat{k}) \text{ N C}^{-1}$.

The electric flux through a surface area $30\hat{i} \text{ m}^2$ lying in YZ-plane (in SI unit) is:

[JEE Mains 2024]

- (1) 90
- (2) 150
- (3) 180
- (4) 60

14. A vector has magnitude same as that of $\vec{A} = 3\hat{j} + 4\hat{j}$ and is parallel to $\vec{B} = 4\hat{i} + 3\hat{j}$. The x and y components of this vector in first quadrant are x and 3 respectively where $x =$ _____.

[JEE Mains 2024]

15. If two vectors \vec{A} and \vec{B} having equal magnitude R are inclined at an angle θ , then [JEE Mains 2024]

- (1) $\vec{A} - \vec{B} = \sqrt{2}R \sin \frac{\theta}{2}$
- (2) $\vec{A} + \vec{B} = 2R \sin \frac{\theta}{2}$
- (3) $\vec{A} + \vec{B} = 2R \cos \frac{\theta}{2}$
- (4) $\vec{A} - \vec{B} = 2R \cos \frac{\theta}{2}$

16. Train A is moving along two parallel rail tracks towards north with 72 km h^{-1} and train B is moving towards south with speed 108 km h^{-1} . Velocity of train B with respect to A and velocity of ground with respect to B are (in m s^{-1}): [JEE Mains 2024]

- (1) -30 and 50
- (2) -50 and -30
- (3) -50 and 30
- (4) 50 and -30

17. A body of mass 4 kg experiences two force $\vec{F}_1 = 5\hat{i} + 8\hat{j} + 7\hat{k}$ and $\vec{F}_2 = 3\hat{i} - 4\hat{j} - 3\hat{k}$. The acceleration acting on the body is:

[JEE Mains 2024]

- (1) $-2\hat{i} - \hat{j} - \hat{k}$
- (2) $4\hat{i} + 2\hat{j} + 2\hat{k}$
- (3) $2\hat{i} + \hat{j} + \hat{k}$
- (4) $2\hat{i} + 3\hat{j} + 3\hat{k}$

18. Two forces \vec{F}_1 and \vec{F}_2 are acting on a body. One force has magnitude thrice that of the other force and the resultant of the two forces is equal to the force of larger magnitude. The angle between \vec{F}_1 and \vec{F}_2 is $\cos^{-1} \left(\frac{1}{n} \right)$. The value of $|n|$ is _____.

[JEE Mains 2024]

19. The angle between vector \vec{Q} and the resultant of $(2\vec{Q} + 2\vec{P})$ and $(2\vec{Q} - 2\vec{P})$ is:

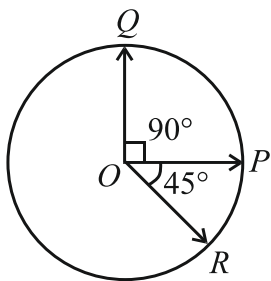
- (1) $\tan^{-1} \frac{(2\vec{Q}_1 - 2\vec{P})}{2\vec{Q} + 2\vec{P}}$
- (2) 0°
- (3) $\tan^{-1}(P/Q)$
- (4) $\tan^{-1}(2Q/P)$

20. A particle moves in x - y plane under the influence of a force \vec{F} such that its linear momentum is $\vec{p}(t) = \hat{i} \cos(kt) - \hat{j} \sin(kt)$. If k is constant, the angle between \vec{F} and \vec{p} will be [JEE Mains 2024]

- (1) $\frac{\pi}{4}$
(2) $\frac{\pi}{6}$
(3) $\frac{\pi}{2}$
(4) $\frac{\pi}{3}$

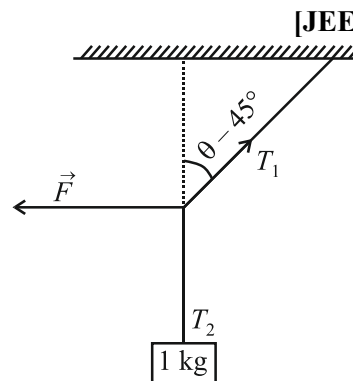
21. For three vectors $\vec{A} = (-x\hat{i} - 6\hat{j} - 2\hat{k})$, $\vec{B} = (-\hat{i} + 4\hat{j} + 3\hat{k})$ and $\vec{C} = (-8\hat{i} - \hat{j} + 3\hat{k})$, if $\vec{A} \cdot (\vec{B} \times \vec{C}) = 0$, then value of x is _____. [JEE Mains 2024]

22. Three vectors \vec{OP} , \vec{OQ} and \vec{OR} each of magnitude A are acting as shown in figure. The resultant of the three vectors is $A\sqrt{x}$. The value of x is _____. [JEE Mains 2024]



23. If \vec{a} and \vec{b} makes an angle $\cos^{-1}\left(\frac{5}{9}\right)$ with each other, then $|\vec{a} + \vec{b}| = \sqrt{2} |\vec{a} - \vec{b}|$ for $|\vec{a}| = n |\vec{b}|$. The integer value of n is _____. [JEE Mains 2024]

24. A 1 kg mass is suspended from the ceiling by a rope of length 4 m. A horizontal force ' F ' is applied at the mid point of the rope so that the rope makes an angle of 45° with respect to the vertical axis as shown in figure. The magnitude of F is: (Assume that the system is in equilibrium and $g = 10 \text{ m/s}^2$) [JEE Mains 2024]



- (1) 10 N
(2) $\frac{10}{\sqrt{2}}$ N
(3) 1 N
(4) $\frac{1}{10 \times \sqrt{2}}$ N

25. The resultant of two vectors \vec{A} and \vec{B} is perpendicular to \vec{A} and its magnitude is half that of \vec{B} . The angle between vectors \vec{A} and \vec{B} is _____. [JEE Mains 2024]

26. The position vector of a moving body at any instant of time is given as $\vec{r} = (5t^2\hat{i} - 5t\hat{j})\text{m}$. The magnitude and direction of velocity at $t = 2\text{s}$ is: [JEE Mains 2025]

- (1) $5\sqrt{15} \text{ m/s}$, making an angle of $\tan^{-1} 4$ with -ve Y
(2) $5\sqrt{15} \text{ m/s}$, making an angle of $\tan^{-1} 4$ with +ve X
(3) $5\sqrt{17} \text{ m/s}$, making an angle of $\tan^{-1} 4$ with +ve X
(4) $5\sqrt{17} \text{ m/s}$, making an angle of $\tan^{-1} 4$ with -ve Y

27. The torque due to the force $(2\hat{i} + \hat{j} + 2\hat{k})$ about the origin, acting on a particle whose position vector is $(\hat{i} + \hat{j} + \hat{k})$, would be [JEE Mains 2025]

- (1) $\hat{i} - \hat{k}$
- (2) $\hat{i} + \hat{k}$
- (3) $\hat{j} + \hat{k}$
- (4) $\hat{i} - \hat{j} + \hat{k}$

28. The coordinates of a particle with respect to origin in a given reference frame is (1, 1, 1) meters. If a force of $\vec{F} = \hat{i} - \hat{j} + \hat{k}$ acts on the particle, then the magnitude of torque (with respect to origin) in z-direction is _____. [JEE Mains 2025]

29. \vec{A} is a vector quantity such that $\vec{A} =$ non-zero constant. Which of the following expression is true for \vec{A} ? [JEE Mains 2021/22]

- (1) $\vec{A} \cdot \vec{A} = 0$
- (2) $\vec{A} \times \vec{A} < 0$
- (3) $\vec{A} \times \vec{A} = 0$
- (4) $\vec{A} \times \vec{A} > 0$

30. Two vectors \vec{A} and \vec{B} have equal magnitudes. If magnitudes of $\vec{A} + \vec{B}$ is equal to two times the magnitude of $\vec{A} - \vec{B}$, then the angle between \vec{A} and \vec{B} will be [JEE Mains 2021/22]

- (1) $\cos^{-1}\left(\frac{3}{5}\right)$
- (2) $\cos^{-1}\left(\frac{1}{3}\right)$
- (3) $\sin^{-1}\left(\frac{1}{3}\right)$
- (4) $\sin^{-1}\left(\frac{3}{5}\right)$

31. If $\vec{A} = 2\hat{i} + 3\hat{j} - \hat{k}$ m and $\vec{B} = \hat{i} + 2\hat{j} + 2\hat{k}$ m. The magnitude of component of vector \vec{A} along vector \vec{B} will be _____ m. [JEE Mains 2021/22]

32. If the projection of $2\hat{i} + 4\hat{j} - 2\hat{k}$ on $\hat{i} + 2\hat{j} + \alpha\hat{k}$ is zero. Then, the value of α will be _____. [JEE Mains 2021/22]

33. If $\vec{P} \times \vec{Q} = \vec{Q} \times \vec{P}$, the angle between \vec{P} and \vec{Q} is θ ($0^\circ < \theta < 360^\circ$). The value of θ will be _____. [JEE Mains 2021/22]

34. **Statement I:** If three forces \vec{F}_1 , \vec{F}_2 and \vec{F}_3 are represented by three sides of a triangle and $\vec{F}_1 + \vec{F}_2 = \vec{F}_3$, then these three forces are concurrent forces and satisfy the condition for equilibrium.

Statement II: A triangle made up of three forces \vec{F}_1 , \vec{F}_2 and \vec{F}_3 as its sides were taken in the same order, none satisfies the condition for translatory equilibrium.

In the light of the above statements, choose the most appropriate answer from the options given below:

- (1) Both Statement I and Statement II are true.
- (2) Statement I is true but Statement II is false.
- (3) Both Statement I and Statement II are false.
- (4) Statement I is false but Statement II is true.

35. **Statement-I:** Two forces $\vec{P} + \vec{Q}$ and $\vec{P} \cdot \vec{Q}$ where $\vec{P} \perp \vec{Q}$, when act at an angle θ_1 each other, the magnitude of their resultant is $\sqrt{3P^2 + Q^2}$, when they act at an angle θ_2 , the magnitude of their resultant becomes $\sqrt{2P^2 + Q^2}$. This only when $\theta_1 < \theta_2$.

Statement-II: In the situation given above.

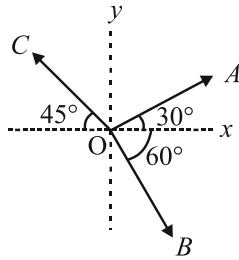
$$\theta_1 = 60^\circ \text{ and } \theta_2 = 90^\circ$$

In the light of the above statement, choose the most appropriate answer from the options given below:

[JEE Mains 2024]

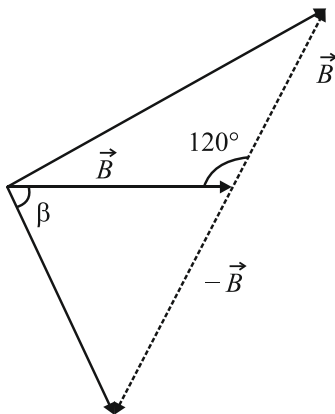
- (1) Statement I is false but Statement II is true.
- (2) Both Statement I and Statement II are true
- (3) Both Statement I and Statement II are false.
- (4) Statement I is true but Statement II is false.

36. The magnitude of vectors \vec{OA} , \vec{OB} and \vec{OC} in the given figure are equal. The direction of $\vec{OA} + \vec{OB} - \vec{OC}$ with x-axis will be:



- (1) $\tan^{-1} \left(\frac{\sqrt{3}-1+\sqrt{2}}{1+\sqrt{3}-\sqrt{2}} \right)$
- (2) $\tan^{-1} \left(\frac{1-\sqrt{3}-\sqrt{2}}{1+\sqrt{3}+\sqrt{2}} \right)$
- (3) $\tan^{-1} \left(\frac{\sqrt{3}-1+\sqrt{2}}{1-\sqrt{3}+\sqrt{2}} \right)$
- (4) $\tan^{-1} \left(\frac{1+\sqrt{3}-\sqrt{2}}{1-\sqrt{3}-\sqrt{2}} \right)$

37. The angle between vector (\vec{A}) and $(\vec{A} - \vec{B})$ is:



- (1) $\tan^{-1} \left(\frac{B \cos \theta}{A - B \sin \theta} \right)$
- (2) $\tan^{-1} \left(\frac{\sqrt{3}B}{2A - B} \right)$
- (3) $\tan^{-1} \left(\frac{-\frac{B}{2}}{A - B \frac{\sqrt{3}}{2}} \right)$
- (4) $\tan^{-1} \left(\frac{A}{0.7B} \right)$

38. Match List-I with List-II.

List-I

- (a) $\vec{C} - \vec{A} - \vec{B} = 0$
- (b) $\vec{A} - \vec{C} - \vec{B} = 0$
- (c) $\vec{B} - \vec{A} - \vec{C} = 0$
- (d) $\vec{A} + \vec{B} = -\vec{C}$

List-II

- (i)
- (ii)
- (iii)
- (iv)

Choose the correct answer from the options given below:

- (1) (a) \rightarrow (iv), (b) \rightarrow (i), (c) \rightarrow (iii), (d) \rightarrow (ii)
 - (2) (a) \rightarrow (iv), (b) \rightarrow (iii), (c) \rightarrow (i), (d) \rightarrow (ii)
 - (3) (a) \rightarrow (iii), (b) \rightarrow (ii), (c) \rightarrow (iv), (d) \rightarrow (i)
 - (4) (a) \rightarrow (i), (b) \rightarrow (iv), (c) \rightarrow (ii), (d) \rightarrow (iii)
39. Two vectors \vec{X} and \vec{Y} have equal magnitude. The magnitude of $(\vec{X} - \vec{Y})$ is n times the magnitude of $(\vec{X} + \vec{Y})$. The angle between \vec{X} and \vec{Y} is:

- (1) $\cos^{-1} \left(\frac{-n^2 - 1}{n^2 - 1} \right)$
- (2) $\cos^{-1} \left(\frac{n^2 - 1}{-n^2 - 1} \right)$
- (3) $\cos^{-1} \left(\frac{n^2 + 1}{-n^2 - 1} \right)$
- (4) $\cos^{-1} \left(\frac{n^2 + 1}{n^2 - 1} \right)$

ANSWER KEY

- | | |
|-----------|------------|
| 1. (2) | 21. [4] |
| 2. (1) | 22. [3] |
| 3. (4) | 23. [3] |
| 4. (3) | 24. (1) |
| 5. (3) | 25. [150] |
| 6. [1] | 26. (4) |
| 7. (2) | 27. (1) |
| 8. [4] | 28. [2] |
| 9. (1) | 29. (3) |
| 10. [640] | 30. (1) |
| 11. [40] | 31. [2] |
| 12. (4) | 32. [5] |
| 13. (3) | 33. [180°] |
| 14. [4] | 34. (1) |
| 15. (3) | 35. (2) |
| 16. (3) | 36. (2) |
| 17. (3) | 37. (2) |
| 18. [4] | 38. (2) |
| 19. (2) | 39. (2) |
| 20. (3) | |

