PrepWiser.

PHYSICS · JEE MAIN

Vectors

Chapter-wise previous year questions, with answer key

31	2019–2025	4
PYQS	PAPERS	TOPICS

Vector Addition and Subtraction · Dot Product · Resolution of Vectors · Cross Product

1. Attempt each question on paper first. They're grouped by topic, newest papers first.
2. Check yourself against the answer key at the end.
3. Got one wrong? Tap “Step-by-step solution” under it for the full working.

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Vector Addition and Subtraction · 12 PYQs

Q1 JEE Main 2024 · 5 Apr · Shift 1

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

(A) $\tan^{-1}(\mathrm{P}/\mathrm{Q})$

(B) 0°

(C) $\tan^{-1}\frac{(2\vec{Q}-2\vec{P})}{2\vec{Q}+2\vec{P}}$

(D) $\tan^{-1}(2Q/\mathrm{P})$

Step-by-step solution ▸ prepwiser.in/questions/BijcI1gtA3

Q2 JEE Main 2024 · 4 Apr · Shift 1

Two forces $\overline{\mathrm{F}}_1$ and $\overline{\mathrm{F}}_2$ 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 _____.

Numerical answer: enter the value.

Step-by-step solution ▸ prepwiser.in/questions/-9guevPQg0

Q3 JEE Main 2024 · 31 Jan · Shift 2

If two vectors $\vec{A}$ and $\vec{B}$ having equal magnitude R are inclined at angle θ, then

(A) $|\vec{A}+\vec{B}|=2R\cos\left(\frac{\theta}{2}\right)$

(B) $|\vec{A}-\vec{B}|=2R\cos\left(\frac{\theta}{2}\right)$

(C) $|\vec{A}-\vec{B}|=\sqrt{2}R\sin\left(\frac{\theta}{2}\right)$

(D) $|\vec{A}+\vec{B}|=2R\sin\left(\frac{\theta}{2}\right)$

Step-by-step solution ▸ prepwiser.in/questions/1amf7Re25B

Q4 JEE Main 2024 · 30 Jan · Shift 2

A vector has magnitude same as that of $\vec{A}=3\hat{i}+4\hat{j}$ 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 $x=$ _____.

Numerical answer: enter the value.

Step-by-step solution ▸ prepwiser.in/questions/yJezynBdev

Q5 JEE Main 2023 · 11 Apr · Shift 2

When vector $\vec{A}=2\hat{i}+3\hat{j}+2\hat{k}$ is subtracted from vector $\overrightarrow{\mathrm{B}}$, it gives a vector equal to $2\hat{j}$. Then the magnitude of vector $\overrightarrow{\mathrm{B}}$ will be :

(A) 3

(B) $\sqrt{33}$

(C) $\sqrt{6}$

(D) $\sqrt{5}$

Step-by-step solution ▸ prepwiser.in/questions/35RVx0DfxU

Q6 JEE Main 2023 · 8 Apr · Shift 1

Two forces having magnitude A and $\frac{A}{2}$ are perpendicular to each other. The magnitude of their resultant is:

(A) $\frac{5A}{2}$

(B) $\frac{\sqrt{5}A}{4}$

(C) $\frac{\sqrt{5}A}{2}$

(D) $\frac{\sqrt{5}A^2}{2}$

Step-by-step solution ▸ prepwiser.in/questions/rUNN9idtzw

Q7 JEE Main 2022 · 29 Jun · Shift 1

Two vectors $\vec{A}$ and $\vec{B}$ have equal magnitudes. If magnitude 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 :

(A) $\sin^{-1}\left(\frac{3}{5}\right)$

(B) $\sin^{-1}\left(\frac{1}{3}\right)$

(C) $\cos^{-1}\left(\frac{3}{5}\right)$

(D) $\cos^{-1}\left(\frac{1}{3}\right)$

Step-by-step solution ▸ prepwiser.in/questions/W4aJotZPv_

Q8 JEE Main 2022 · 25 Jun · Shift 1

Which of the following relations is true for two unit vector $\hat{A}$ and $\hat{B}$ making an angle θ to each other?

(A) $|\hat{A}+\hat{B}| = |\hat{A}-\hat{B}|\tan\frac{\theta}{2}$

(B) $|\hat{A}-\hat{B}| = |\hat{A}+\hat{B}|\tan\frac{\theta}{2}$

(C) $|\hat{A}+\hat{B}| = |\hat{A}-\hat{B}|cos\frac{\theta}{2}$

(D) $|\hat{A}-\hat{B}| = |\hat{A}+\hat{B}|\cos\frac{\theta}{2}$

Step-by-step solution ▸ prepwiser.in/questions/Zr4-fUD3iY

Q9 JEE Main 2021 · 31 Aug · Shift 2

Statement I :

Two forces $\left(\vec{P}+\vec{Q}\right)$ and $\left(\vec{P}-\vec{Q}\right)$ where $\vec{P} \perp \vec{Q}$, when act at an angle θ_1 to each other, the magnitude of their resultant is $\sqrt{3(P^2+Q^2)}$, when they act at an angle θ_2, the magnitude of their resultant becomes $\sqrt{2(P^2+Q^2)}$. This is possible only when $\theta_1 < \theta_2$.

Statement II :

In the situation given above.

$\theta_1 = 60^\circ$ and $\theta_2 = 90^\circ$

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

(A) Statement I is false but Statement II is true

(B) Both Statement I and Statement II are true

(C) Statement I is true but Statement II is false

(D) Both Statement I and Statement II are false.

Step-by-step solution ▸ prepwiser.in/questions/R6BuGcOa7E

Q10 JEE Main 2021 · 25 Jul · Shift 2

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 :

(A) $\cos^{-1}\left(\frac{-n^2-1}{n^2-1}\right)$

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

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

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

Step-by-step solution ▸ prepwiser.in/questions/0w6h8Ez_39

Q11 JEE Main 2021 · 20 Jul · Shift 2

Two vectors $\vec{P}$ and $\vec{Q}$ have equal magnitudes. If the magnitude of $\vec{P}+\vec{Q}$ is n times the magnitude of $\vec{P}-\vec{Q}$, then angle between $\vec{P}$ and $\vec{Q}$ is :

(A) $\sin^{-1}\left(\frac{n-1}{n+1}\right)$

(B) $\cos^{-1}\left(\frac{n-1}{n+1}\right)$

(C) $\sin^{-1}\left(\frac{n^2-1}{n^2+1}\right)$

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

Step-by-step solution ▸ prepwiser.in/questions/qgPTuFhiHj

Q12 JEE Main 2019

A particle moves in the x-y plane with velocity $\vec{v} = (3\hat{i} + 4\hat{j})$ m/s. What is the magnitude of its velocity?

(A) 3 m/s

(B) 4 m/s

(C) 5 m/s

(D) 7 m/s

Step-by-step solution ▸ prepwiser.in/questions/QWZpB_jhDQ

Dot Product · 1 PYQs

Q13 JEE Main 2025 · 22 Jan · Shift 2

A force $\overrightarrow{\mathrm{F}} = 2\hat{i} + \mathrm{b}\hat{j} + \hat{k}$ is applied on a particle and it undergoes a displacement $\hat{i} - 2\hat{j} - \hat{k}$ What will be the value of b, if work done on the particle is zero.

(A) $\frac{1}{3}$

(B) $\frac{1}{2}$

(C) 0

(D) 2

Step-by-step solution ▸ prepwiser.in/questions/FesJS0P9Sv

Resolution of Vectors · 5 PYQs

Q14 JEE Main 2023 · 25 Jan · Shift 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 $\frac{1}{x}\left(\sqrt{3}\hat{i} + \hat{j} - 2\sqrt{3}\hat{k}\right)$. The value of x is _____.

Numerical answer: enter the value.

Step-by-step solution ▸ prepwiser.in/questions/2NZdexBgHP

Q15 JEE Main 2022 · 28 Jul · Shift 1

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 _____.

Numerical answer: enter the value.

Step-by-step solution ▸ prepwiser.in/questions/TFpirkcLlC

Q16 JEE Main 2022 · 26 Jul · Shift 2

If $\vec{A} = (2\hat{i} + 3\hat{j} - \hat{k})\ \mathrm{m}$ and $\vec{B} = (\hat{i} + 2\hat{j} + 2\hat{k})\ \mathrm{m}$. The magnitude of component of vector $\vec{A}$ along vector $\vec{B}$ will be _____ m.

Numerical answer: enter the value.

Step-by-step solution ▸ prepwiser.in/questions/nncVQ9oX40

Q17 JEE Main 2021 · 22 Jul · Shift 2

What will be the projection of vector $\vec{A} = \hat{i} + \hat{j} + \hat{k}$ on vector $\vec{B} = \hat{i} + \hat{j}$?

(A) $\sqrt{2}(\hat{i} + \hat{j} + \hat{k})$

(B) $(\hat{i} + \hat{j})$

(C) $\sqrt{2}(\hat{i} + \hat{j})$

(D) $2(\hat{i} + \hat{j} + \hat{k})$

Step-by-step solution ▸ prepwiser.in/questions/UtWgn7ht-r

Q18 JEE Main 2021 · 16 Mar · Shift 2

A mosquito is moving with a velocity $\overrightarrow{v} = 0.5t^2\hat{i} + 3t\hat{j} + 9\hat{k}$ m/s and accelerating in uniform conditions. What will be the direction of mosquito after 2 s?

(A) $\tan^{-1}\left(\frac{\sqrt{85}}{6}\right)$ from y-axis

(B) $\tan^{-1}\left(\frac{5}{2}\right)$ from y-axis

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

(D) $\tan^{-1}\left(\frac{5}{2}\right)$ from x-axis

Step-by-step solution ▸ prepwiser.in/questions/KsFKZL7U4k

Cross Product · 13 PYQs

Q19 JEE Main 2025 · 23 Jan · Shift 1

Two particles are located at equal distance from origin. The position vectors of those are represented by $\vec{A} = 2\hat{i} + 3n\hat{j} + 2\hat{k}$ and $\bar{B} = 2\hat{i} - 2\hat{j} + 4p\hat{k}$, respectively. If both the vectors are at right angle to each other, the value of n^{-1} is _____ .

Numerical answer: enter the value.

Step-by-step solution ▸ prepwiser.in/questions/9iyAChJYTN

Q20 JEE Main 2025 · 22 Jan · Shift 2

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

(A) $\hat{j} + \hat{k}$

(B) $\hat{i} - \hat{k}$

(C) $\hat{i} - \hat{j} + \hat{k}$

(D) $\hat{i} + \hat{k}$

Step-by-step solution ▸ prepwiser.in/questions/5yTz0moiVk

Q21 JEE Main 2024 · 9 Apr · Shift 1

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 _____.

Numerical answer: enter the value.

Step-by-step solution ▸ prepwiser.in/questions/cKxWMmT4dG

Q22 JEE Main 2024 · 9 Apr · Shift 2

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 _____°.

Numerical answer: enter the value.

Step-by-step solution ▸ prepwiser.in/questions/xlNPCJFlXr

Q23 JEE Main 2024 · 6 Apr · Shift 1

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 _____.

Numerical answer: enter the value.

Step-by-step solution ▸ prepwiser.in/questions/-5PVkLM5LU

Q24 JEE Main 2023 · 24 Jan · Shift 2

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 :

(A) -1 **(B)** 3

(C) 1 **(D)** 2

Step-by-step solution ▸ prepwiser.in/questions/qqJK5y0JKO

Q25 JEE Main 2023 · 24 Jan · Shift 1

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 _____.

Numerical answer: enter the value.

Step-by-step solution ▸ prepwiser.in/questions/WvXjN1KK15

Q26 JEE Main 2022 · 29 Jul · Shift 2

The torque of a force $5\hat{i} + 3\hat{j} - 7\hat{k}$ about the origin is τ. If the force acts on a particle whose position vector is $2i + 2j + k$, then the value of τ will be

(A) $11\hat{i} + 19\hat{j} - 4\hat{k}$ **(B)** $-11\hat{i} + 9\hat{j} - 16\hat{k}$

(C) $-17\hat{i} + 19\hat{j} - 4\hat{k}$ **(D)** $17\hat{i} + 9\hat{j} + 16\hat{k}$

Step-by-step solution ▸ prepwiser.in/questions/TGeRASkBK6

Q27 JEE Main 2022 · 25 Jun · Shift 1

If force $\overrightarrow{F} = 3\hat{i} + 4\hat{j} - 2\hat{k}$ acts on a particle position vector $2\hat{i} + \hat{j} + 2\hat{k}$ then, the torque about the origin will be :

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

(B) $-10\hat{i} + 10\hat{j} + 5\hat{k}$

(C) $10\hat{i} + 5\hat{j} - 10\hat{k}$

(D) $10\hat{i} + \hat{j} - 5\hat{k}$

Step-by-step solution ▸ prepwiser.in/questions/mh6AZYprFZ

Q28 JEE Main 2022 · 25 Jun · Shift 1

$\vec{A}$ is a vector quantity such that $|\vec{A}|$ = non-zero constant. Which of the following expression is true for $\vec{A}$?

(A) $\vec{A} \,.\, \vec{A} = 0$ **(B)** $\vec{A} \times \vec{A} < 0$

(C) $\vec{A} \times \vec{A} = 0$ **(D)** $\vec{A} \times \vec{A} > 0$

Step-by-step solution ▸ prepwiser.in/questions/hjk94h26JH

Q29 JEE Main 2021 · 22 Jul · Shift 2

Three particles P, Q and R are moving along the vectors $\vec{A} = \hat{i} + \hat{j}$, $\vec{B} = \hat{j} + \hat{k}$ and $\vec{C} = -\hat{i} + \hat{j}$ respectively. They strike on a point and start to move in different directions. Now particle P is moving normal to the plane which contains vector $\vec{A}$ and $\vec{B}$. Similarly particle Q is moving normal to the plane which contains vector $\vec{A}$ and $\vec{C}$. The angle between the direction of motion of P and Q is $\cos^{-1}\left(\frac{1}{\sqrt{x}}\right)$. Then the value of x is _____.

Numerical answer: enter the value.

Step-by-step solution ▸ prepwiser.in/questions/TC--mcO9_Q

Q30 JEE Main 2021 · 20 Jul · Shift 1

If $\vec{A}$ and $\vec{B}$ are two vectors satisfying the relation $\vec{A} \cdot \vec{B} = \left|\vec{A} \times \vec{B}\right|$. Then the value of $\left|\vec{A} - \vec{B}\right|$ will be :

(A) $\sqrt{A^2 + B^2 + \sqrt{2}AB}$

(B) $\sqrt{A^2 + B^2}$

(C) $\sqrt{A^2 + B^2 - \sqrt{2}AB}$

(D) $\sqrt{A^2 + B^2 + 2AB}$

Step-by-step solution ▸ prepwiser.in/questions/Eiwy2W1iEW

Q31 JEE Main 2021 · 25 Feb · Shift 2

If $\vec{P} \times \vec{Q} = \vec{Q} \times \vec{P}$, the angle between $\vec{P}$ and $\vec{Q}$ is $\theta(0^\circ < \theta < 360^\circ)$. The value of '$\theta$' will be _____$^\circ$.

Numerical answer: enter the value.

Step-by-step solution ▸ prepwiser.in/questions/QJcTgD_ZXW

Answer key: Vectors

Answers follow NTA's final answer keys. Typing errors are possible, so check doubtful answers against the official key. Spotted a mistake? prepwiser.in/feedback · Terms: prepwiser.in/terms

Numbers match the question numbers above. For full working, open the solution link under each question.

1 **B**	2 **6**	3 **A**	4 **4**	5 **B**	6 **C**	7 **C**	8 **B**
9 **B**	10 **B**	11 **D**	12 **C**	13 **B**	14 **4**	15 **5**	16 **2**
17 **B**	18 **A**	19 **3**	20 **B**	21 **3**	22 **150**	23 **4**	24 **D**
25 **1**	26 **C**	27 **B**	28 **C**	29 **3**	30 **C**	31 **180**	

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