One Stop for Physics Practice for NEET

Monday - Friday ; 10 PM

1 Series = Questions from Top Books

Vectors

Properties & Resolution

1

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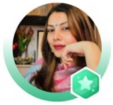
Tamanna Chaudhary
(Physics Expert)



Tamanna Chaudhary

Expert in NEET UG

One of the most followed Educators, Tamanna, won the 2020 Unacademy People's Choice Award. Her student secured 99.56 percentile in Physics.

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A force of 5 N acts on a particle along a direction making an angle of 60° with vertical. Its vertical component be

A) 10 N

B) 3 N

C) 4 N

D) 2.5 N

Position of a particle in a rectangular-co-ordinate system is (3, 2, 5). Then its position vector will be

A) $3\hat{i} + 5\hat{j} + 2\hat{k}$

B) $3\hat{i} + 2\hat{j} + 5\hat{k}$

C) $5\hat{i} + 3\hat{j} + 2\hat{k}$

D) None of these

If $\vec{A} = 2\hat{i} + 4\hat{j} - 5\hat{k}$ the direction of cosines of the vector $\vec{A}$ are

A) $\frac{2}{\sqrt{45}}, \frac{4}{\sqrt{45}}$ and $\frac{-5}{\sqrt{45}}$

B) $\frac{1}{\sqrt{45}}, \frac{2}{\sqrt{45}}$ and $\frac{3}{\sqrt{45}}$

C) $\frac{4}{\sqrt{45}}, 0$ and $\frac{4}{\sqrt{45}}$

D) $\frac{3}{\sqrt{45}}, \frac{2}{\sqrt{45}}$ and $\frac{5}{\sqrt{45}}$

TC Selected

How many minimum number of coplanar vectors having different magnitudes can be added to give zero resultant

A) 2

B) 3

C) 4

D) 5

TC Selected

Given vector $\vec{A} = 2\hat{i} + 3\hat{j}$, the angle between $\vec{A}$ and y-axis is

A) $\tan^{-1} 3/2$

B) $\tan^{-1} 2/3$

C) $\sin^{-1} 2/3$

D) $\cos^{-1} 2/3$

TC Selected

If a unit vector is represented by $0.5\hat{i} + 0.8\hat{j} + c\hat{k}$, then the value of ?c? is

A) 1

B) $\sqrt{0.11}$

C) $\sqrt{0.01}$

D) $\sqrt{0.39}$

TC Selected

Which of the following is a scalar quantity

A) Displacement

B) Electric field

C) Acceleration

D) Work

1. *A vector has component along the X-axis equal to* 25 unit *and along the Y-axis equal to* 60 unit. *Find the magnitude and direction of the vector.*

7. *Write the unit vector in the direction of* $\vec{A} = 5\,\vec{i} + \vec{j} - 2\,\vec{k}$.

1. Is a vector necessarily changed if it is rotated through an angle ?

8. Can a vector have zero component along a line and still have nonzero magnitude ?

4. The component of a vector is
   (a) always less than its magnitude
   (b) always greater than its magnitude
   (c) always equal to its magnitude
   (d) none of these.

10. Suppose $\vec{a}$ is a vector of magnitude 4·5 unit due north. What is the vector (a) $3\vec{a}$, (b) $-4\vec{a}$?

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Components of a Vector

2

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- [ ] HC Verma - Done 9n Vectors-1
- [x] SL Arora
- [x] DC Pandey
- [x] TC Selected

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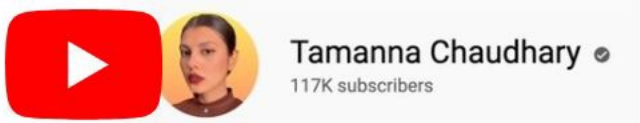

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The component of a vector $\vec{A}$ along *y*-axis will have maximum value if

(1) $\vec{A}$ makes an angle of 30° with *y*-axis

(2) $\vec{A}$ makes an angle of 60° with *y*-axis

(3) $\vec{A}$ makes an angle of 0° with *y*-axis

(4) $\vec{A}$ makes an angle of 90° with *y*-axis

The angle that the vector $\overrightarrow{OA} = 5\hat{i} + 5\hat{j}$ makes with y-axis is

(1) $30°$ (2) $45°$

(3) $60°$ (4) $\tan^{-1}\left(\frac{1}{2}\right)$

If $\vec{A}=2\hat{i}+3\hat{j}$ and $\vec{B}=5\hat{i}+7\hat{j}$, then the vector having the magnitude of $\vec{A}$ and direction of $\vec{B}$ would be

(1) $\left(\frac{74}{13}\right)^{1/2}(2\hat{i}+3\hat{j})$ (2) $\sqrt{74}\,(5\hat{i}+7\hat{j})$

(3) $\left(\frac{13}{74}\right)^{1/2}(5\hat{i}+7\hat{j})$ (4) $5\sqrt{13}\,\hat{i}+7\sqrt{13}\,\hat{j}$

The unit vector of a vector $\vec{A} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ is

(1) $\frac{9}{\sqrt{29}}(\hat{i} + \hat{j} + \hat{k})$

(2) $\sqrt{29}(2\hat{i} + 3\hat{j} + 4\hat{k})$

(3) $\frac{1}{\sqrt{29}}(2\hat{i} + 3\hat{j} + 4\hat{k})$

(4) $9\sqrt{29}(\hat{i} + \hat{j} + \hat{k})$

If $\vec{A} = a\hat{i} + 0.5\hat{j} + 0.5\hat{k}$ is unit vector, then value of 'a' would be

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

(2) $\sqrt{2}$

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

(4) 2

A force $F = (6\hat{i} - 8\hat{j} + 10\hat{k})$ N produces an acceleration of $1\ m/s^2$ in a body. The mass of body would be :

(a) 200 kg (b) 20 kg

(c) $10\sqrt{2}$ kg (d) $6\sqrt{2}$ kg

What is the angle between $\hat{i}+\hat{j}+\hat{k}$ and $\hat{j}$?

(a) 0 (b) 45°

(c) 60° (d) None of these

13. What is the property of two vectors $\vec{P}$ and $\vec{Q}$ if $\vec{P}+\vec{Q}=\vec{P}-\vec{Q}$?

(a) P is null vector (b) Q is null vector

(c) P is proper vector (d) Q is proper vector

A child takes 8 steps towards east and 6 steps towards north. If each step is equal to 1 cm, then the magnitude of displacement is :

(a) 14 m (b) 0.1 m

(c) 10 m (d) none of these

The arbitrary number '–2' is multiplied with vector $\vec{A}$ then :

(a) the magnitude of vector will be doubled and direction will be same

(b) the magnitude of vector will be doubled and direction will be opposite

(c) the magnitude of vector and its direction remain constant

(d) none of the above

The position vector of a moving particle at time t is $\vec{r} = 3\hat{i} + 4t^2\hat{j} - t^3\hat{k}$. Its displacement during the time interval $t = 1$ s to $t = 3$ s is :

(a) $\hat{j} - \hat{k}$

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

(c) $9\hat{i} + 36\hat{j} - 27\hat{k}$

(d) $32\hat{j} - 26\hat{k}$

A man walks 20 m at an angle of 60° north-east. How far towards east has he travelled ?

(a) 10 m (b) 20 m

(c) $20\sqrt{3}$ m (d) $\frac{10}{\sqrt{3}}$ m

EXAMPLE 3. *A particle has a displacement of 12 m towards east and 5 m towards the north and then 6 m vertically upward. Find the magnitude of the sum of these displacements.*

EXAMPLE 19. If $\vec{A} = 3\hat{i} + 4\hat{j}$ and $\vec{B} = 7\hat{i} + 24\hat{j}$, find a vector having the same magnitude as $\vec{B}$ and parallel to $\vec{A}$.

EXAMPLE 21. *One of the rectangular components of a velocity of* $80\ kmh^{-1}$ *is* $40\ kmh^{-1}$. *Find the other component.*

4. Find the value of λ in the unit vector $0.4\,\hat{i} + 0.8\,\hat{j} + \lambda\,\hat{k}$.

A velocity of 10 ms^{-1} has its Y-component $5\sqrt{2}$ ms^{-1}. Calculate its X-component.

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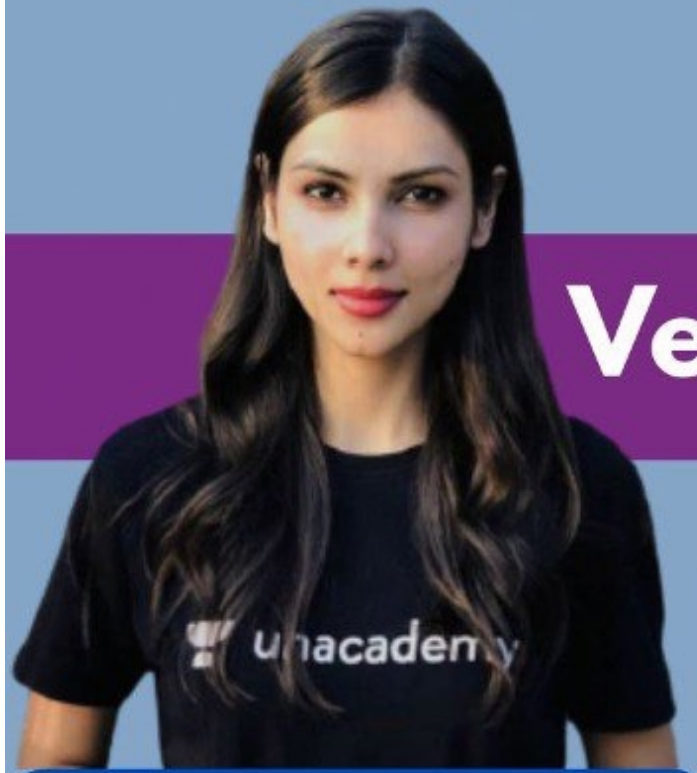

Vectorial Addition/ Subtraction 3

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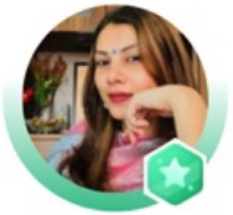

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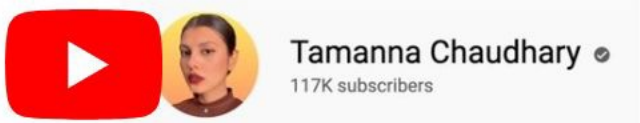

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If the sum of two unit vectors is a unit vector, then magnitude of difference is

A) $\sqrt{2}$

B) $\sqrt{3}$

C) $1/\sqrt{2}$

D) $\sqrt{5}$

Vectors: Addition/ Subtraction

TC Selected

$\vec{A} = 2\hat{i} + \hat{j}, B = 3\hat{j} - \hat{k}$ and $\vec{C} = 6\hat{i} - 2\hat{k}$. Value of $\vec{A} - 2\vec{B} + 3\vec{C}$ 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) $5\hat{i} + 4\hat{j} + 10\hat{k}$

Vectors: Addition/ Subtraction

TC Selected

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

A) $0°$

B) $60°$

C) $90°$

D) $180°$

Vectors: Addition/ Subtraction

TC Selected

Let the angle between two nonzero vectors $\vec{A}$ and $\vec{B}$ be 120° and resultant be $\vec{C}$

A) $\vec{C}$ must be equal to $|\vec{A} - \vec{B}|$

B) $\vec{C}$ must be less than $|\vec{A} - \vec{B}|$

C) $\vec{C}$ must be greater than $|\vec{A} - \vec{B}|$

D) $\vec{C}$ may be equal to $|\vec{A} - \vec{B}|$

Vectors: Addition/ Subtraction

TC Selected

What vector must be added to the two vectors $\hat{i} - 2\hat{j} + 2\hat{k}$ and $2\hat{i} + \hat{j} - \hat{k}$, so that the resultant may be a unit vector along x-axis

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

B) $-2\hat{i} + \hat{j} - \hat{k}$

C) $2\hat{i} - \hat{j} + \hat{k}$

D) $-2\hat{i} - \hat{j} - \hat{k}$

Vectors: Addition/ Subtraction

TC Selected

Assertion : Vector addition of two vectors $\vec{A}$ and $\vec{B}$ is commutative. Reason : $\vec{A} + \vec{B} = \vec{B} + \vec{A}$

A) If both assertion and reason are true and the reason is the correct explanation of the assertion.

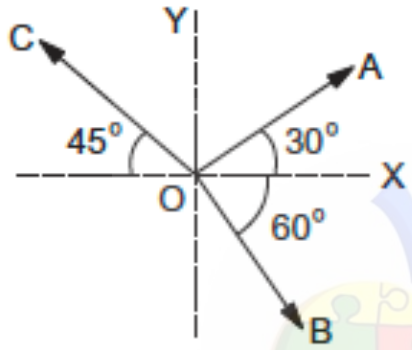
B) If both assertion and reason are true but reason is not the correct explanation of the assertion.

C) If assertion is true but reason is false.

D) If the assertion and reason both are false.

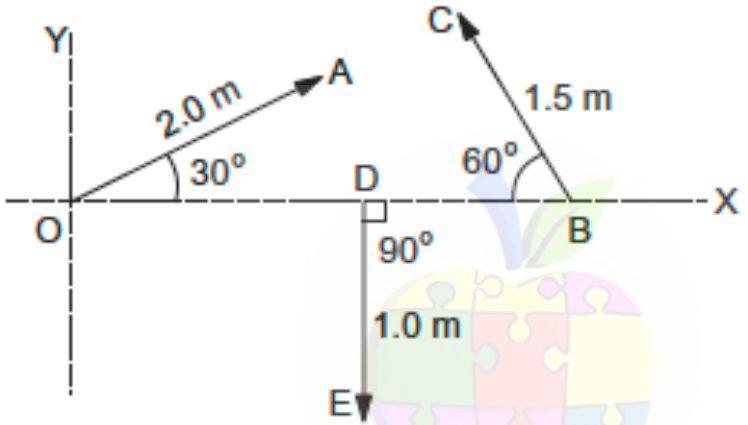
E) If assertion is false but reason is true.

The magnitudes of vectors $\vec{OA}$, $\vec{OB}$ *and* $\vec{OC}$ *in figure (2-W3) are equal. Find the direction of* $\vec{OA} + \vec{OB} - \vec{OC}$.



6. Two vectors have magnitudes 3 unit and 4 unit respectively. What should be the angle between them if the magnitude of the resultant is (a) 1 unit, (b) 5 unit and (c) 7 unit.

5. Refer to figure (2-E1). Find (a) the magnitude, (b) x and y components and (c) the angle with the X-axis of the resultant of $\vec{OA}$, $\vec{BC}$ and $\vec{DE}$.



2. Let $\vec{A}$ and $\vec{B}$ be the two vectors of magnitude 10 unit each. If they are inclined to the X-axis at angles $30°$ and $60°$ respectively, find the resultant.

7. Can you add two vectors representing physical quantities having different dimensions? Can you multiply two vectors representing physical quantities having different dimensions?

2. *Find the resultant of the three vectors shown in figure (2-W1).*

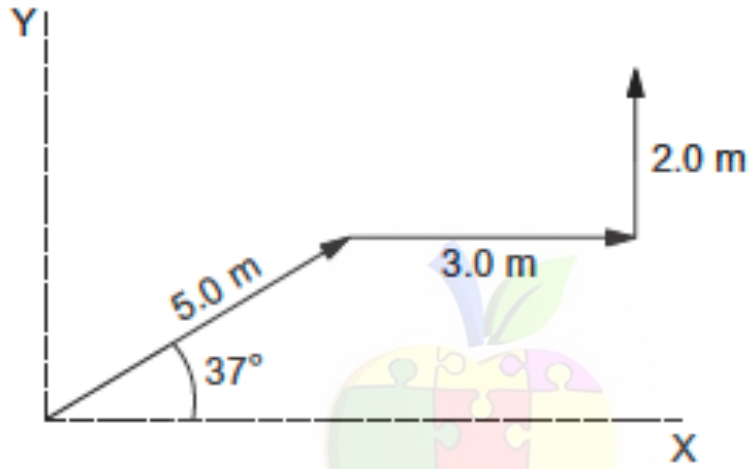


Figure 2-W1

Vectors: Addition/ Subtraction

SL Arora

When the angle between two vectors of equal magnitude is $2\pi / 3$, prove that the magnitude of the resultant is equal to either.

Vectors: Addition/ Subtraction

SL Arora

At what angle do the two forces $(P + Q)$ and $(P - Q)$ act so that the resultant is $\sqrt{3P^2 + Q^2}$. **(Ans. 60°)**

Vectors: Addition/ Subtraction

SL Arora

Find the angle between two vectors $\vec{P}$ and $\vec{Q}$ if resultant of the vectors is given by $R^2 = P^2 + Q^2$.

Vectors: Addition/ Subtraction

SL Arora

Given three coplanar vectors $\vec{a} = 4\hat{i} - \hat{j}$, $\vec{b} = -3\hat{i} + 2\hat{j}$ and $\vec{c} = -3\hat{j}$. Find the magnitude of the sum of the three vectors. [Ans. $\sqrt{5}$]

Problem 14. If $\vec{a}+\vec{b}=\vec{c}$ and $|\vec{a}|+|\vec{b}|=|\vec{c}|$, what can we say about the direction of these vectors ?

Problem 8. Under what condition does the equality :

$|\vec{A}+\vec{B}| = |\vec{A}-\vec{B}|$ **hold good ?**

Vectors: Addition/ Subtraction

DC Pandey

The maximum resultant of two vectors is 26 unit and minimum resultant is 16 unit, then the magnitude of each vector is :

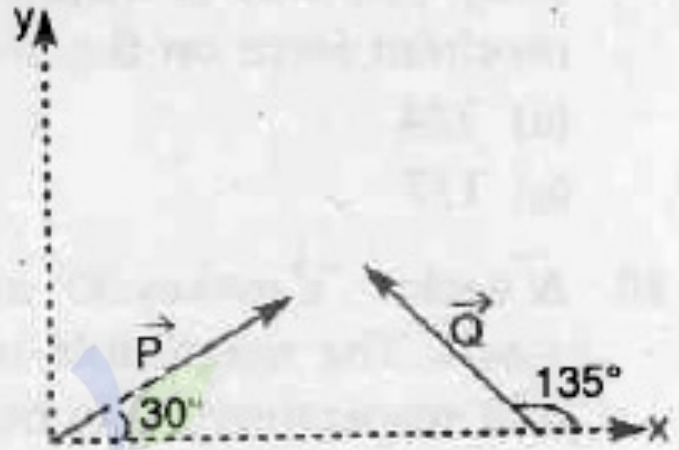
(a) 21, 5 (b) 13, 13

(c) 20, 6 (d) none of these

Vectors: Addition/ Subtraction

DC Pandey

Two vectors $\vec{P}$ and $\vec{Q}$ have equal magnitude of 10 unit. They are oriented as shown in figure. The resultant of these vector is :



(a) 10 unit

(b) $10\sqrt{2}$ unit

(c) 12 unit

(d) none of the above

DC Pandey

A cyclist is moving on a circular path with constant speed. What is the change in its velocity after it has described an angle of 30° ?

(a) $v\sqrt{2}$ (b) $v(0.3\sqrt{3})$

(c) $v\sqrt{3}$ (d) None of these

If two forces of equal magnitude 4 units acting at a point and the angle between them is 120° then the magnitude and direction of the sum of the two vectors are :

(a) $4, \theta = \tan^{-1}(1.73)$ (b) $4, \theta = \tan^{-1}(0.73)$

(c) $2, \theta = \tan^{-1}(1.73)$ (d) $6, \theta = \tan^{-1}(0.73)$

The angle between $\vec{A}$ and the resultant of $(\vec{A}+\vec{B})$ and $(\vec{A}-\vec{B})$ will be :

(a) $0°$

(b) $\tan^{-1}\left(\frac{A}{B}\right)$

(c) $\tan^{-1}\left(\frac{B}{A}\right)$

(d) $\tan^{-1}\left(\frac{A-B}{A+B}\right)$

Vectors: Addition/ Subtraction

DC Pandey

Obtain the magnitude and direction cosines of vector $(\vec{A}-\vec{B})$, if $\vec{A}=2\hat{i}+3\hat{j}+\hat{k}$, $\vec{B}=2\hat{i}+2\hat{j}+3\hat{k}$:

(a) $0, \frac{1}{\sqrt{5}}, \frac{-2}{\sqrt{5}}$

(b) $0, \frac{2}{\sqrt{5}}, \frac{1}{\sqrt{5}}$

(c) $0, 0, \frac{1}{\sqrt{5}}$

(d) none of these