YAKEEN NEET 2.0

2026

Vectors

Physics | Lecture - 4

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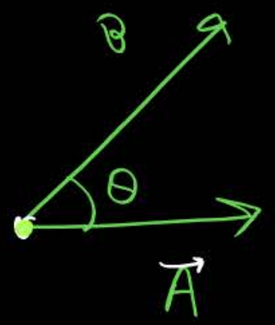
Todays Goal

- Triangle law of vector addition

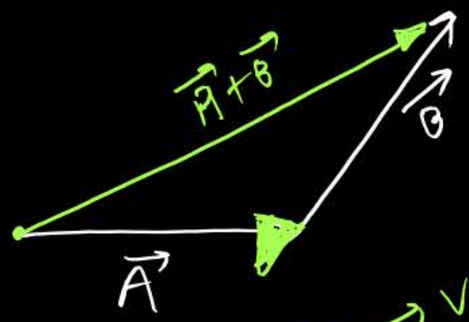
MR* BOX

↳ Angle Nikalne ke liye tail-tail or (π) head-head ko ek sath rakho.

Vector add Karne ke liye 1st ke head se 2nd ka tail start karo.



θ = Angle b/w vector

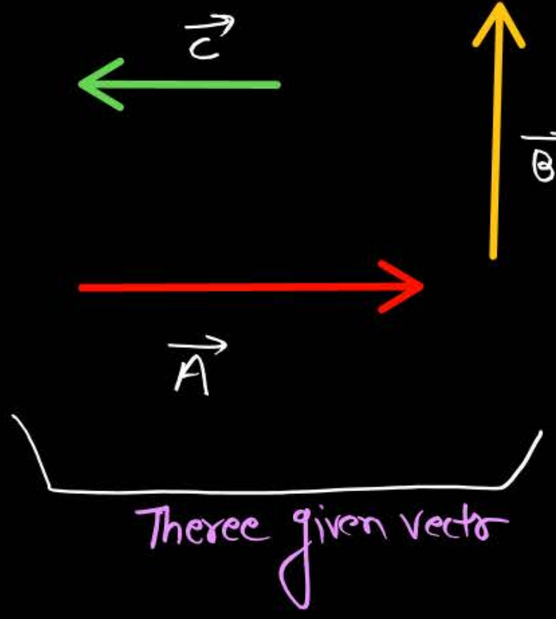


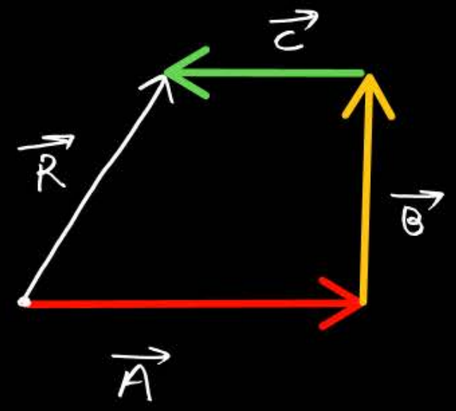
Triangle law → vector add.

$\vec{A}+\vec{B}+\vec{C} = \vec{B}+\vec{C}+\vec{A} = \vec{C}+\vec{A}+\vec{B} = \vec{C}+\vec{B}+\vec{A}$ → correct

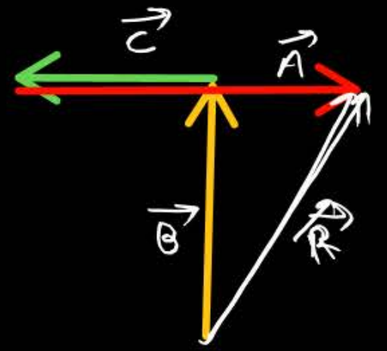
(i) (ii) (iii) (iv)

Polygon law of vector addition

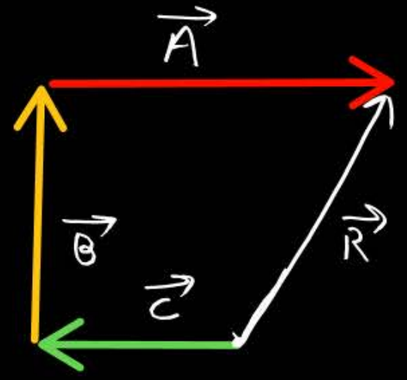




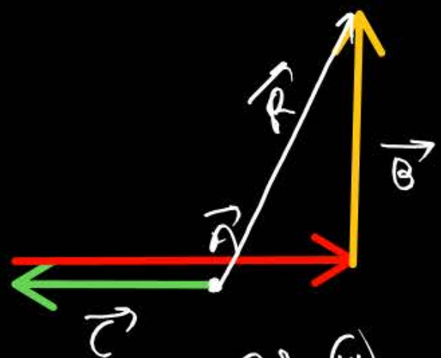
Case-1



Case-II



Case-(IV)



Case-(III)

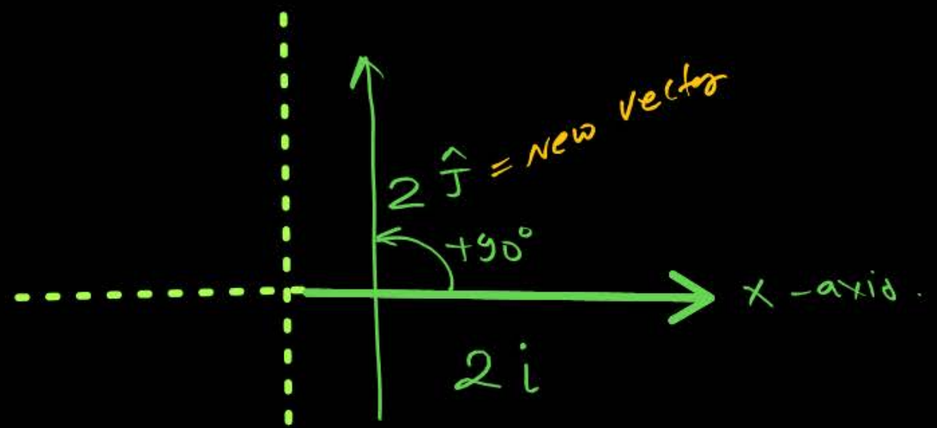
A vector $2\hat{i}$ Rotated by 90° (A-C) Anti-clock. then new vector will be ??

(a) $2\hat{j}$

(b) $-2\hat{j}$

(c) $2\hat{i}$

(d) $-2i$

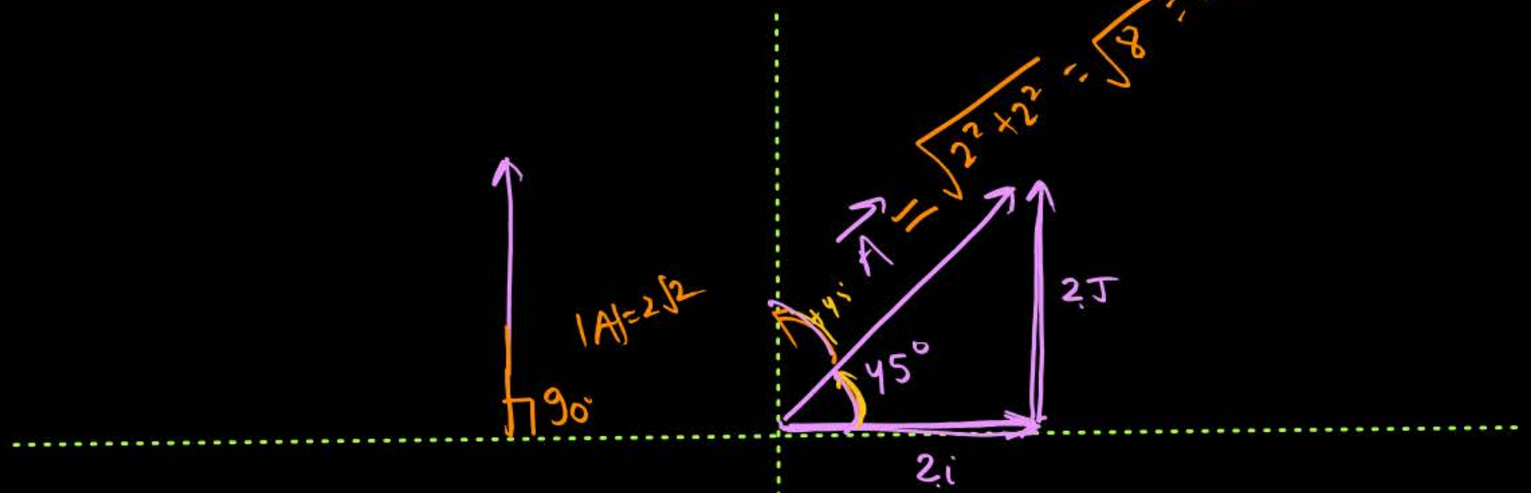


MR^4 on Rotation of vector magnitude remains same & direction → changes.

A vector $\vec{A} = 2\hat{i} + 2\hat{j}$ Now Rotated by 45° Anti-clock then new vector will be.

→ θ (Angle from x-axis) ⇒ $\tan\theta = \frac{2}{2} = 1$

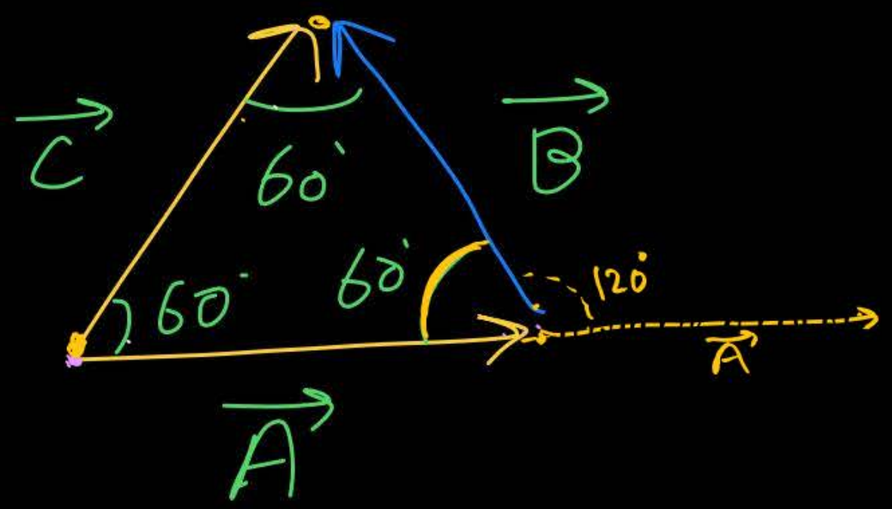
$\theta = 45°$



New vector = $2\sqrt{2}\angle 90°$

$\hat{j}$

In given diagram find Angle between vectors :→



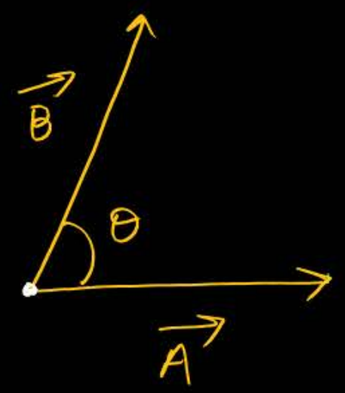
Angle B/w $\vec{A}$ & $\vec{B}$ = 120°
" " $\vec{B}$ & $\vec{C}$ = 60°
" " $\vec{A}$ & $\vec{C}$ = 60°
} Ans

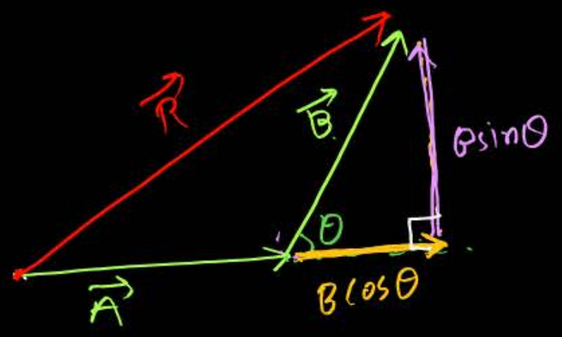
write rel" using Triangle law.

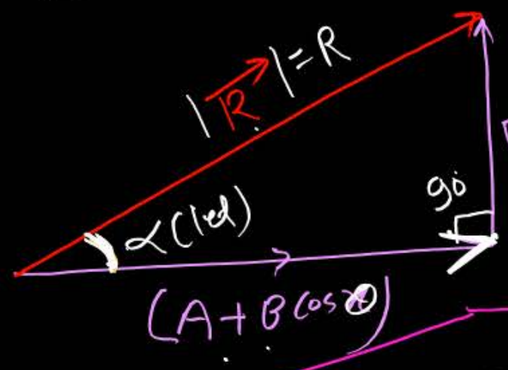
$$\vec{A} + \vec{B} = \vec{C}$$

Triangle law of vector addition

[Pythagoras law hi use hoga 😳]







MR Rafiq

θ = Angle b/w $\vec{A}$ & $\vec{B}$ ✓

$|\vec{A}| = A$ = magnitude of $\vec{A}$ ✓

$|\vec{B}| = B$ = magnitude of $\vec{B}$ ✓

$\vec{A} + \vec{B} = \vec{R}$ = Resultant of $\vec{A}+\vec{B}$

$|\vec{A}+\vec{B}| = |\vec{R}| = R$ = magnitude of Resultant of $\vec{A}$ & $\vec{B}$ ✓

Pythagoras th^{m}

$$R^2 = (A + B\cos\theta)^2 + (B\sin\theta)^2$$

$$R = \sqrt{A^2 + 2AB\cos\theta + (B^2\cos^2\theta + B^2\sin^2\theta)}$$

$$= \sqrt{A^2 + 2AB\cos\theta + B^2(\sin^2\theta + \cos^2\theta)}$$

$$R = \sqrt{A^2 + 2AB\cos\theta + B^2}$$

$$R = \sqrt{A^2 + B^2 + 2AB\cos\theta}$$

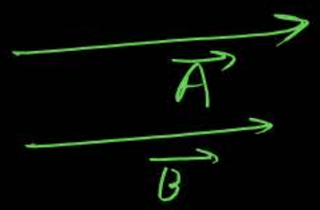
$$\tan\alpha = \frac{B\sin\theta}{A + B\cos\theta}$$

↳ Angle b/w $\vec{A}$ & $\vec{R}$

$$R = \sqrt{A^2 + B^2 + 2AB\cos\theta}$$

Case-1

If $\theta = 0°$ (Parallel vectors)



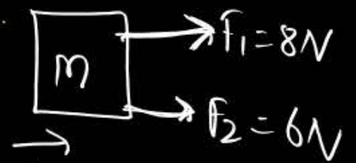
$$R = \sqrt{A^2 + B^2 + 2AB\cos 0°}$$

$$= \sqrt{A^2 + B^2 + 2AB}$$

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

$$R_{max} = A + B$$

($\theta = 0°$)



$F_{net} = 8N + 6N$

$= 14N$.

Case-2

If $\theta = 60°$

$$R = \sqrt{A^2 + B^2 + 2AB\cos 60°}$$

$$R = \sqrt{A^2 + B^2 + 2AB \times \frac{1}{2}}$$

$$R = \sqrt{A^2 + B^2 + AB}$$

$\theta = 120°$

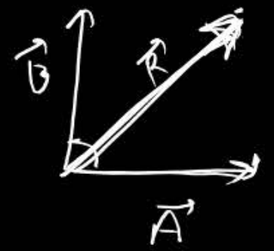
$$R = \sqrt{A^2 + B^2 - AB}$$

Case-3

If $\theta = 90°$

$$R = \sqrt{A^2 + B^2 + \underbrace{2AB\cos 90°}_{\text{zero}}}$$

$$R = \sqrt{A^2 + B^2}$$



Case-4

If $\theta = 180°$

$$R = \sqrt{A^2 + B^2 + 2AB\cos 180°}$$

$$R = \sqrt{A^2 + B^2 - 2AB}$$

$$R = \sqrt{(A-B)^2}$$

$$R_{min} = |A - B|$$

$F_{net} = |8 - 6| = 2N$

$$A-B \leq R \leq A+B$$

min. $\theta = 180$

max $\theta = 0°$

feel

Let $A = 10$

$\theta = 4$

$A+\theta = 10+4$

$(R) = 14$

$A-\theta = 10-4$

$(R) = 6$

$|\vec{A}| = 20$

$|\vec{B}| = 12$

$R_{max} = 32 \quad R_{min} = 8$

$|\vec{A}| = 3 \quad |\vec{B}| \; 2$

$R_{max} = 5 \quad R_{min} = 1$

$\{|\vec{A}| = 4, \; |\vec{B}| = 5\}$

$R_{max} = 9$

$R_{min} = 1$

Question

Two vector of magnitude 3 and 4 acting at different angle then find their Resultant :-

(i) $0°$ $\longrightarrow$ $R_{max} = A+B = 3+4 = 7$

(ii) $60°$ $\longrightarrow$ $R = \sqrt{A^2+B^2+2AB\cos 60} = \sqrt{9+16+2\times3\times4\times\frac{1}{2}}$

$= \sqrt{25+12} = \sqrt{37} \approx 6.1$

(iii) $90°$ $\longrightarrow$ $R = \sqrt{A^2+B^2} = \sqrt{3^2+4^2} = \sqrt{25} = 5$

(iv) $120°$ $\rightarrow$ $R = \sqrt{A^2+B^2+2AB\cos 120} = \sqrt{9+16+2\times3\times4\left(-\frac{1}{2}\right)} = \sqrt{25-12} = \sqrt{13}$

(v) $180°$ $\rightarrow$ $R_{min} = |A-B| = |3-4| = 1$

Then find resultant

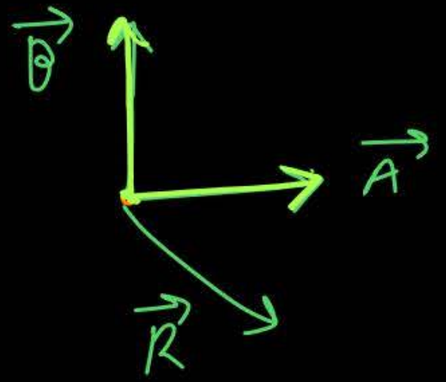
$R_{max} = 7$

$R_{min} = 1$

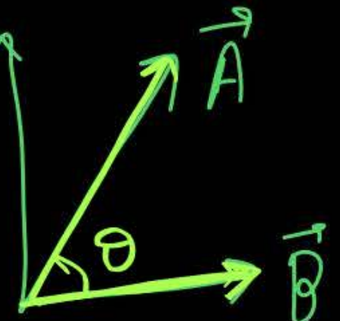
Which of the following is correct diagram for

$\vec{A} + \vec{B} = \vec{R}$

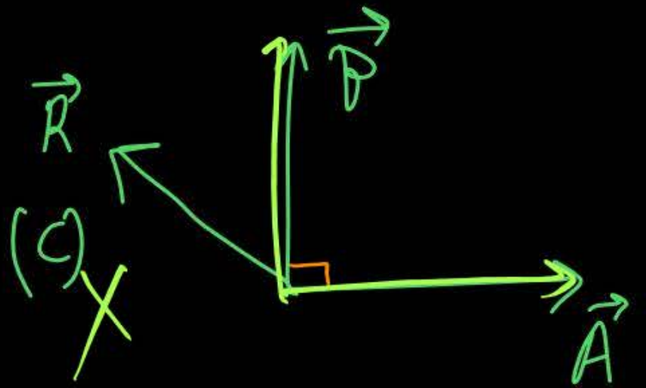
(a) ✗



(b) ✗

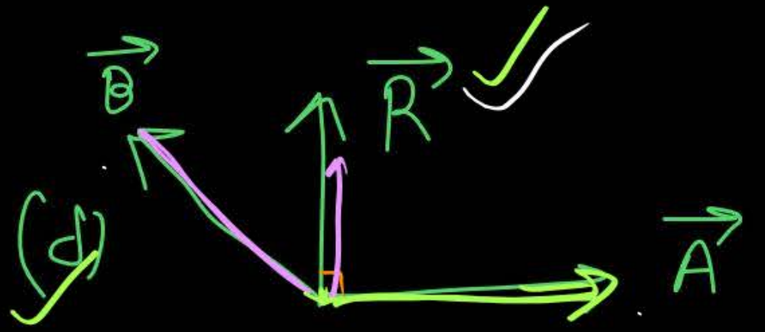


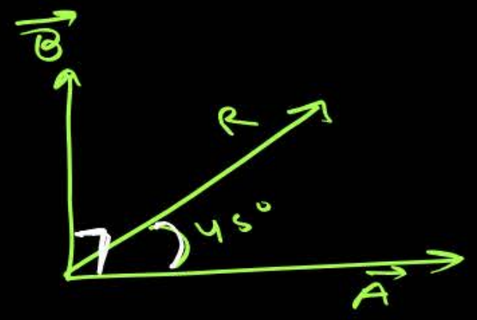
(c) ✗



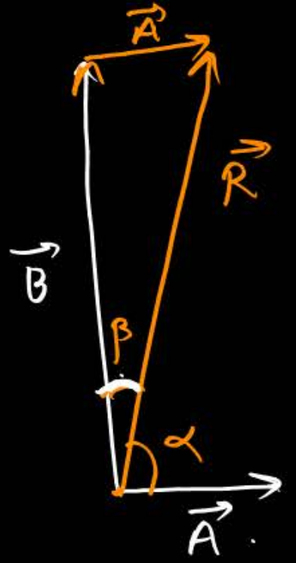
Jab bhi 2-Vector ko add karte hai resultant unke bich me aata hai; & bade magnitud wale vector ke paas.

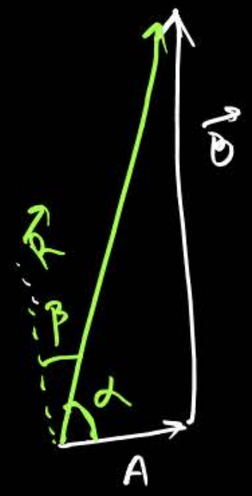
(d)





If $|\vec{A}| = |\vec{B}|$



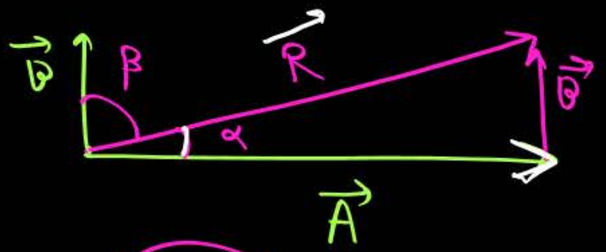


$\alpha > \beta$

$|\vec{A}| < |\vec{B}|$

α = Angle b/w $\vec{A}$ & $\vec{R}$

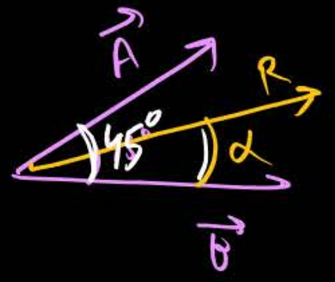
β = Angle b/w $\vec{B}$ & $\vec{R}$



$\alpha < \beta$ $\quad |\vec{A}| > |\vec{B}|$

Angle b/w $\vec{R}$ & $\vec{A}$

AIPMT



If $|\vec{A}| = |\vec{B}|$ then find α = ?

$\alpha = 22.5°$ Ans

(Q) gf Two vector of same magnitude $|\vec{A}| = |\vec{B}|$ acting at an angle θ the find their Resultant.

diff^n magn

$$R = \sqrt{A^2 + B^2 + 2AB\cos\theta}$$

$$R = \sqrt{A^2 + A^2 + 2A \cdot A\cos\theta}$$

$$R = \sqrt{2A^2 + 2A^2\cos\theta}$$

$$R = \sqrt{2A^2(1+\cos\theta)}$$

→ using half Angle formula.

$$1 + \cos\theta = 2\cos^2\theta/2$$

↳ Half Angle

$$R = \sqrt{2A^2 \times (2\cos^2\theta/2)}$$

$$R = \sqrt{4A^2\cos^2\theta/2}$$

$$R = 2A\cos(\theta/2)$$

gf two of same magnitude at angle θ

MR Rafiq

gf $\theta = 0°$

$R_{max} = 2A$

$\theta = 60°$

$R = 2A\cos(60/2)$

$= 2A\frac{\sqrt{3}}{2}$

$R = \sqrt{3}A$

$\theta = 90°$

$R = 2A\cos(90/2)$

$R = 2A\frac{1}{\sqrt{2}}$

$R = \sqrt{2}A$

$\theta = 120°$

$R = 2A\cos(120/2)$

$R = 2A \times \frac{1}{2}$

$R = A$

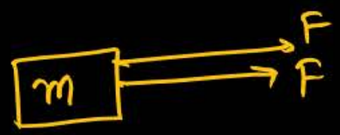
$\theta = 180°$

$R = 2A\cos(180/2)$

$R = 0$

Min.

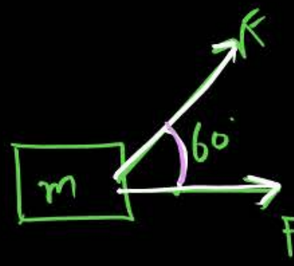
#



$\theta = 0^\circ$

$F_{net} = 2F$

#

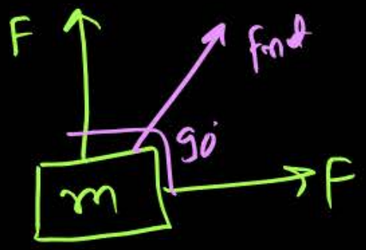


$F_{net} = 2F\cos\left(\frac{60^\circ}{2}\right)$

$= 2F\,\frac{\sqrt{3}}{2}$

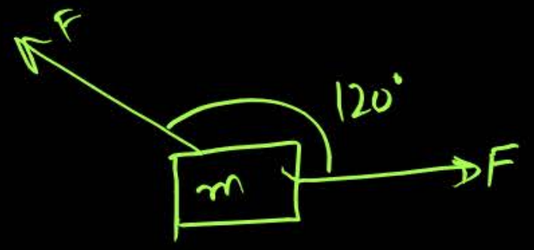
$= \sqrt{3}F$

#



$F_{net} = \sqrt{2}F$

#



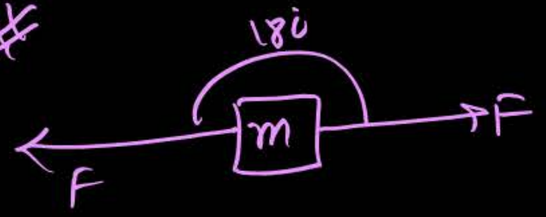
$F_{net} = 2F\cos\left(\frac{\theta}{2}\right)$

$= 2F\cos\left(\frac{120}{2}\right)$

$= 2F\cos 60$

$= 2F\,\frac{1}{2} = F$

#



$F_{net} = 0$

$\cos(22.5^\circ) = ??$

$1 + \cos\theta = 2\cos^2\theta/2$

$\frac{1+\cos\theta}{2} = \cos^2\theta/2$

$\cos(\theta/2) = \sqrt{\frac{1+\cos\theta}{2}}$

$\theta = 45^\circ$

$\cos(22.5) = \sqrt{\frac{1+\cos 45}{2}} = \sqrt{\frac{1+1/\sqrt{2}}{2}}$ R

Which of the following pair can't give resultant of magnitude 4.

(a) 2, 4 (b) 4, 4 (c) 4, 9 (d) 1, 5

Ans

Mo

Question H/w

Two forces of magnitude 8 N and 15 N respectively act at a point. If the resultant forces is 17 N, the angle between the forces has to be

1. 60°
2. 45°
3. 90°
4. 30°

Question

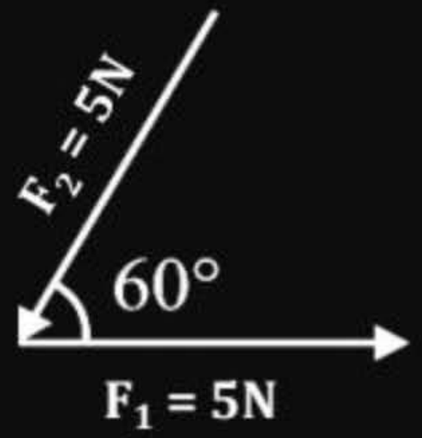
H/W

Two force $\vec{F}_1 = 5\text{N}$ due east and $F_2 = 10\ \text{N}$ due north then resultant of these two force is

1. $5\sqrt{5}\ \text{N}$
2. $15\ \text{N}$
3. $5\ \text{N}$
4. $\sqrt{5}\ \text{N}$

Question

Find net force $(\vec{F}_1 + \vec{F}_2) = ?$



Question

H|W

Two forces of 10 N and 6 N act upon a body. The direction of the forces are unknown. The resultant forces on the body may be

1. 15 N
2. 3 N
3. 17 N
4. 2 N

Question

H/W

If $\vec{R} = \vec{A} + \vec{B}$ and $R = A + B$ then angle between $\vec{A}$ and $\vec{B}$ must be

1. $90°$
2. $60°$
3. $0°$
4. $180°$

Question

H/W

If $\vec{R} = \vec{A} + \vec{B}$ and $R^2 = A^2 + B^2$ then angle between $\vec{A}$ and $\vec{B}$ may be

1. $90°$
2. $60°$
3. $120°$
4. $80°$

Question

11/10

Two vector of magnitude 2 then resultant of these two vector may be ?

1. 2
2. 8
3. 5
4. 6

H/W

Two force 5N and 2N acting on object then net force on object must Not be :→

(a) 2N (b) 1N (c) 6N (d) both (a) & (b)

HW

Vector $\vec{A}$ is 2m long at 60° above the +X axis and $\vec{B}$ is 2m long at 60° below the +x-axis then resultant will be:-

H/W

If vector Sum of Two unit vector is a unit vector then :-

H/w

The ratio of maximum and minimum magnitute of Resultant of two vectors $\vec{a}$ and $\vec{b}$ is 3:1 then $|\vec{a}|$ in term of $|\vec{b}|$

HW

Find Angle b/w two force $2P$ & $\sqrt{2}P$ act so that resultant force is $P\sqrt{10}$.

H/W

Two vector of magnitude 2 and 4 and resultant is $2\sqrt{3}$ find Angle B/W vectors.

H/W

The sum of the magnitude of two force is 18 and magnitude of their resultant is 12. If Resultant is is at 90° with the force of smaller magnitude, then what is magnitude of force

H/W

Which of the combination of three force can give zero resultant.

(a) 2, 4, 7

(b) (3, 1, 5)

(c) (2, 8, 11)

(d) (3, 4, 2)

THANK YOU