YAKEEN NEET 2.0

2026

Vectors

Physics | Lecture - ५

By- Manish Raj (MR Sir)

Topics to be covered

- H/W
- question on vector addition
- Vector Subtraction

Kya apne H/W solution dekh liya??

(a) Yes (55.1)

(b) ~~No~~ (44.9)

Ye Backlog Hua

-

→ Backlog kavi bhi Complt नहीं होगा।

$$\vec{A} = 2\hat{i} - 4\hat{j} + 6\hat{k}$$

find (i) $2\vec{A} = 2(2\hat{i} - 4\hat{j} + 6\hat{k})$

$= 4\hat{i} - 8\hat{j} + 12\hat{k}$

(ii) $\frac{\vec{A}}{2} = \frac{2\hat{i} - 4\hat{j} + 6\hat{k}}{2}$

$$\frac{\vec{A}}{2} = \hat{i} - 2\hat{j} + 3\hat{k}$$

(iii) $-3\vec{A} = -3(2\hat{i} - 4\hat{j} + 6\hat{k})$

$= -6\hat{i} + 12\hat{j} - 18\hat{k}$

(iv) $|\vec{A}| = \sqrt{(2)^2 - 4^2 + 6^2}$ ✗

$|\vec{A}| = \sqrt{2^2 + (-4)^2 + 6^2} = \sqrt{4+16+36} = \sqrt{56}$

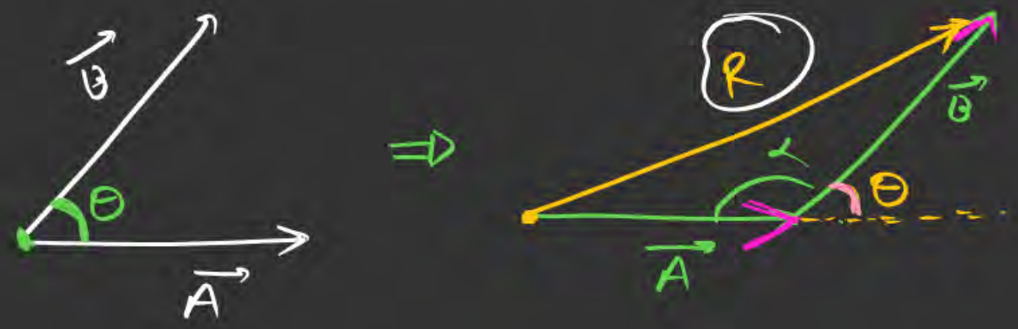
(iv) $\hat{A} = \frac{\vec{A}}{|\vec{A}|} = \frac{2\hat{i} - 4\hat{j} + 6\hat{k}}{\sqrt{56}}$

(v) Angle B/w $\vec{A}$ & x-axis

$\cos\alpha = \frac{A_x}{|\vec{A}|} = \frac{2}{\sqrt{56}}$

$\alpha = \cos^{-1}\left(\frac{2}{\sqrt{56}}\right)$

Vector addition



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

$\theta = 90$

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

$\theta = 180$

$R = A - B$

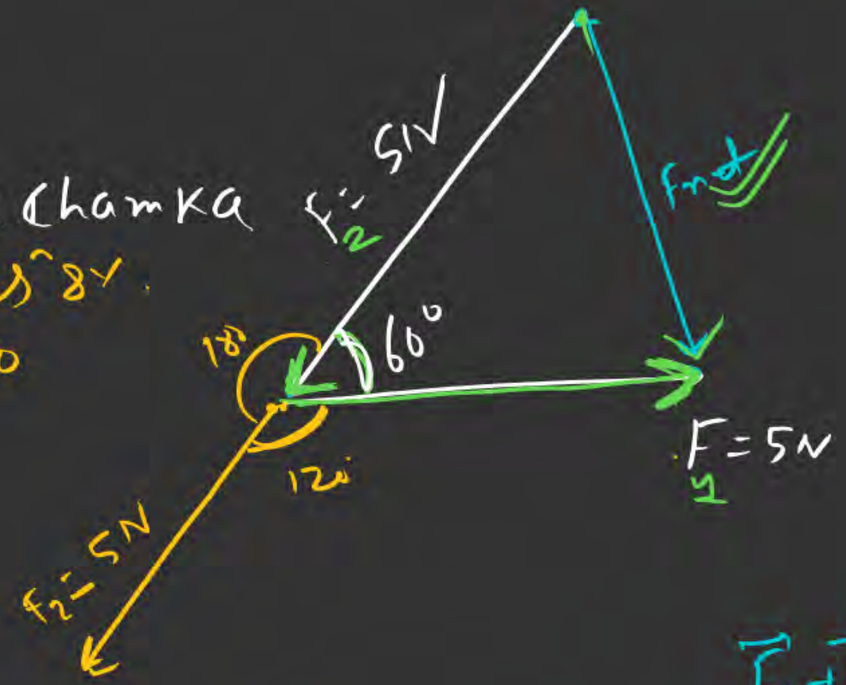
$R_{max} = A + B$

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

→ ab chamka

(a) yes 8V.

(b) 1N 0



$\vec{F_1} + \vec{F_2} = 7$

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

$= 2 \times 5 \times \frac{1}{2}$

$= 5\ N$

$F_{net} = 2F\cos(\theta/2)$

$= 2 \times 5 \cos\left(\frac{60}{2}\right)$

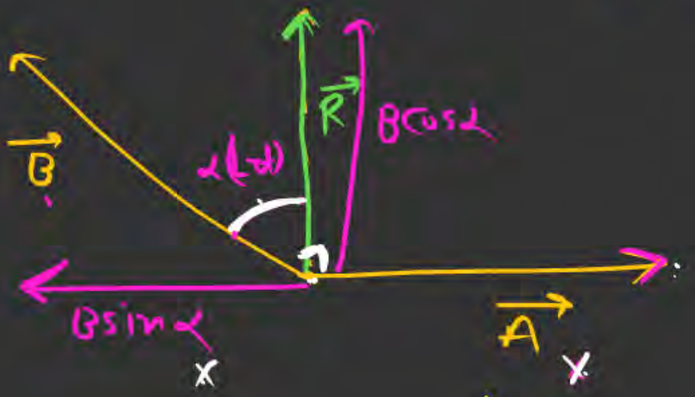
$= 2 \times 5 \cos 30°$

$= 2 \times 5 \times \frac{\sqrt{3}}{2} = 5\sqrt{3}$

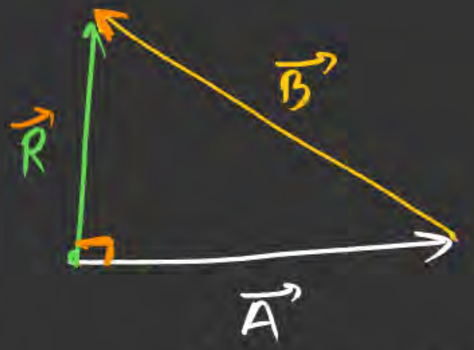
MR* Box

If Resultant of Two vector is perpendicular to one of the vector

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



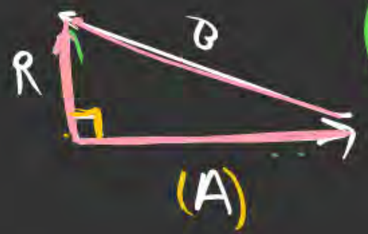
Triangle law of vector addition



Pythagorum th^{m}

$$\begin{cases} A = B\sin\alpha & -(i) \\ R = B\cos\alpha & -(ii) \end{cases}$$

Find आप।



$$A^2 + R^2 = B^2$$

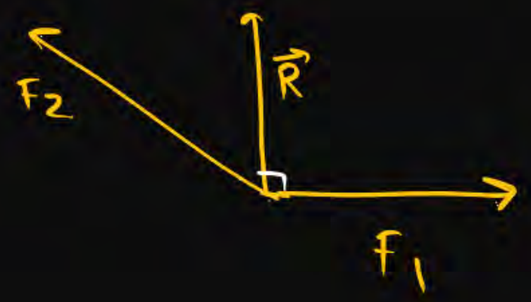
Question

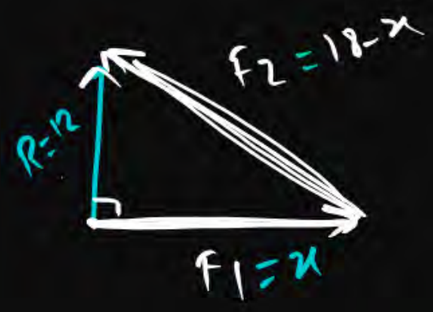
The sum of the magnitudes of two forces acting at point is 18 and the magnitude of their resultant is 12. If the resultant is at 90° with the force of smaller magnitude, what are the magnitudes of forces?

$|\vec{F_1}| + |\vec{F_2}| = F_1 + F_2 = 18 \quad -①$

$|\vec{F_1} + \vec{F_2}| = |\vec{F_{net}}| = 12$

1. 12, 5
2. 14, 4
3. 5, 13
4. 10, 8





If $F_1 = x$ (let)

$F_2 = 18 - x = 18 - 5 = 13$

Pythagoras th^m

$x^2 + 12^2 = (18-x)^2$

$x^2 + 144 = 324 + x^2 - 2 \times 18x$

$36x = 324 - 144$

$\frac{36x}{18} = \frac{180}{18}$ (÷ 90)

$x = 5$

(Q) If Resultant of two vector is half of bigger vector & Perpendicular to smaller vector then find Angle b/w the vector

$R = \frac{B}{2}$ → given in ques

$\vec{A}$ & $\vec{B}$ ke Bich ka angle $= 90 + \alpha = 90 + 60 = 150°$ ✓

Question

(A) Resultant of two vector must be in the plane of two vector. → True ✓

(B) Minimum number of unequal vectors can give zero resultant is 2. False ✓

(C) Minimum number of vector can give zero resultant is 2 ✓

(D) Minimum numbr of unequal vector can give zero resultant is 3.

True

True

Ex $\vec{A} = 4$, $\vec{B} = 6$

Kitne angle pr add karu ki zero Result de ??

→ Not Possile

(a) $\vec{A} = 3$ → 3 to 9

$\vec{B} = 6$

$\vec{C} = 10$ → 4 to 16

Kya $\vec{A} + \vec{B} + \vec{C} = 0$??

→ No

Question

Which of the following combination of three force can give zero resultant?

1. [2, 4, 7] → 7 + 4 = 11, 7 − 4 = 3
2. [3, 1, 5] → 5 + 1 = 6, 5 − 1 = 4
3. [2, 8, 11] → 11 + 8 = 19, 11 − 8 = 3
4. [3, 4, 2] → 4 + 2 = 6, 4 − 2 = 2

MR BOX

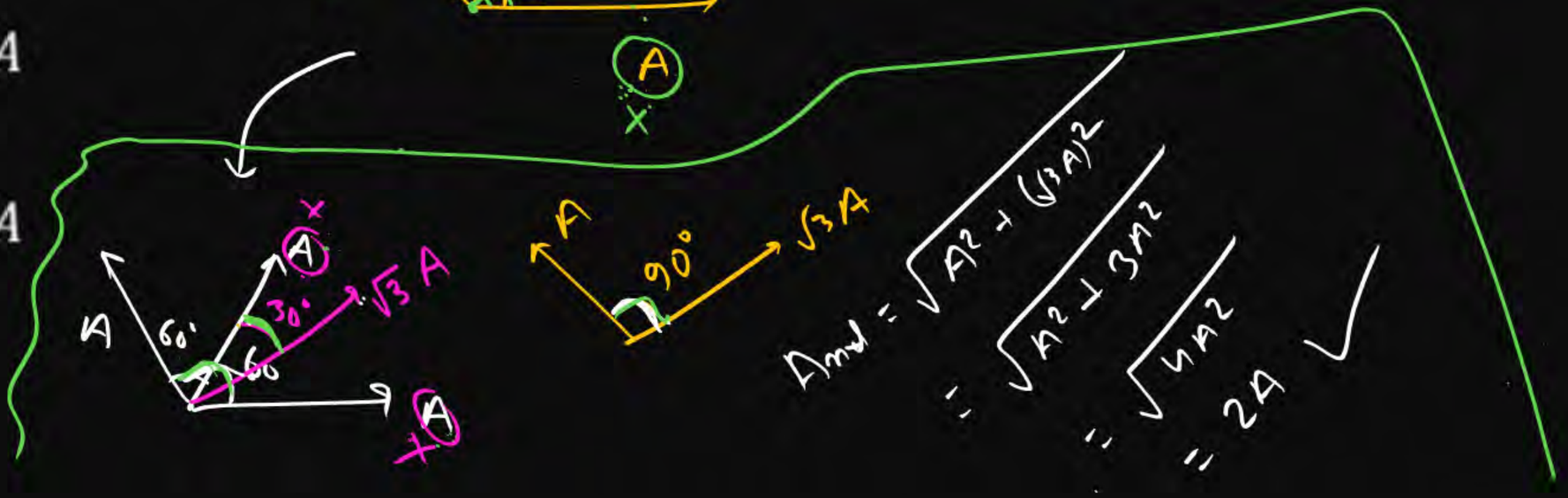
Koi bhi 2-vector ke Resultan ke Range (A−B to A+B) me 3rd vector aaya to Sum of all three vectors zero ho sakta hai

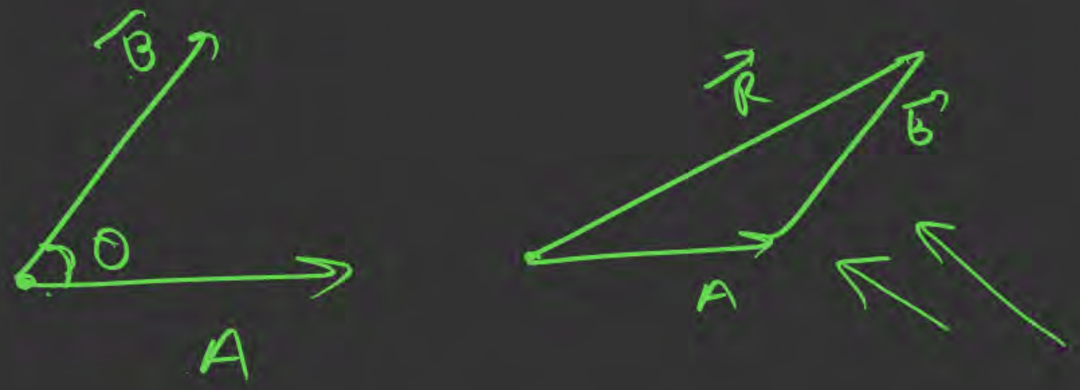
Question

Three vectors each of magnitude A are acting at a point such that angle between any two consecutive vectors in same plane is 60°. The magnitude of their resultant is :

1. $2A$
2. $\sqrt{2}A$
3. $\sqrt{3}A$
4. $\sqrt{6}A$

Two equal vector at 120° then Result will be equal to magnitude of vector





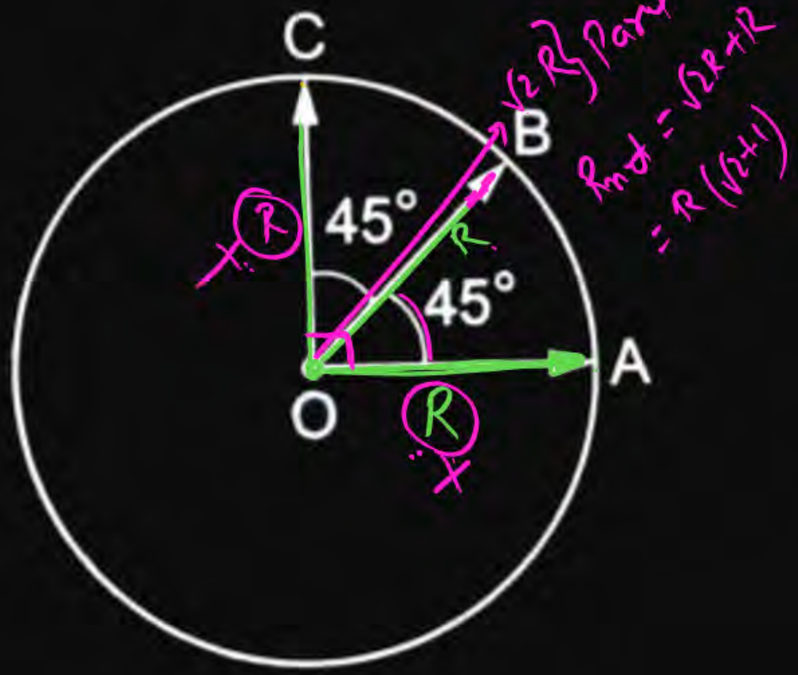
$$R = \sqrt{A^2 + B^2 + 2AB\cos\theta}$$

Question

Find the resultant of there vectors $\overrightarrow{OA}$, $\overrightarrow{OB}$ and $\overrightarrow{OC}$ shown in the following figure. Radius of the circle is R.

1. $2R$
2. $R(1+\sqrt{2})$
3. $R\sqrt{2}$
4. $R(\sqrt{2}-1)$

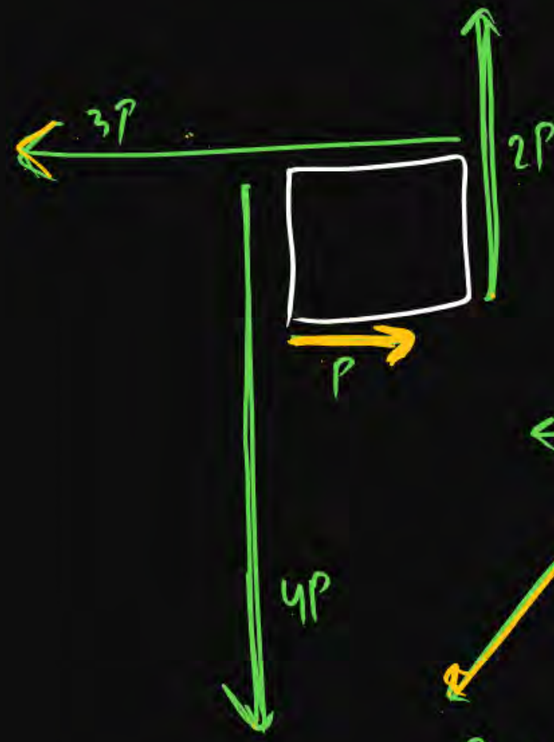
$R_{net} = 2A\cos(\theta/2)$

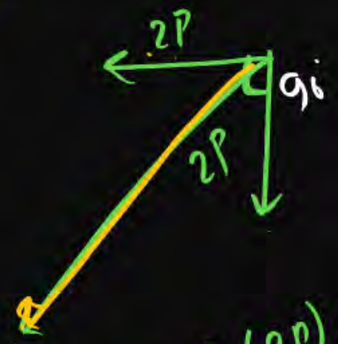


Question

Four forces of magnitude P, 2P, 3P and 4P act along the four sides of a square ABCD in cyclic order. Find the resultant force:

1. 2P
2. $3\sqrt{2}$ P
3. 0
4. $2\sqrt{2}$ P ✓ Ans





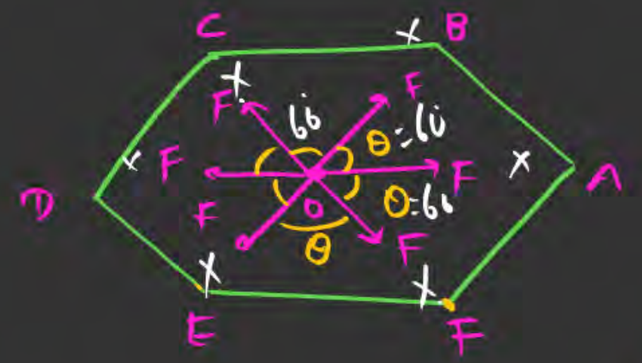
$P_{rnt} = 2(2P)\cos\left(\frac{90}{2}\right)$

$= 2 \times 2P \cos 45$

$= \sqrt{2} \times 2P \frac{1}{\sqrt{2}} = 2\sqrt{2}P$

$6\theta = 360$

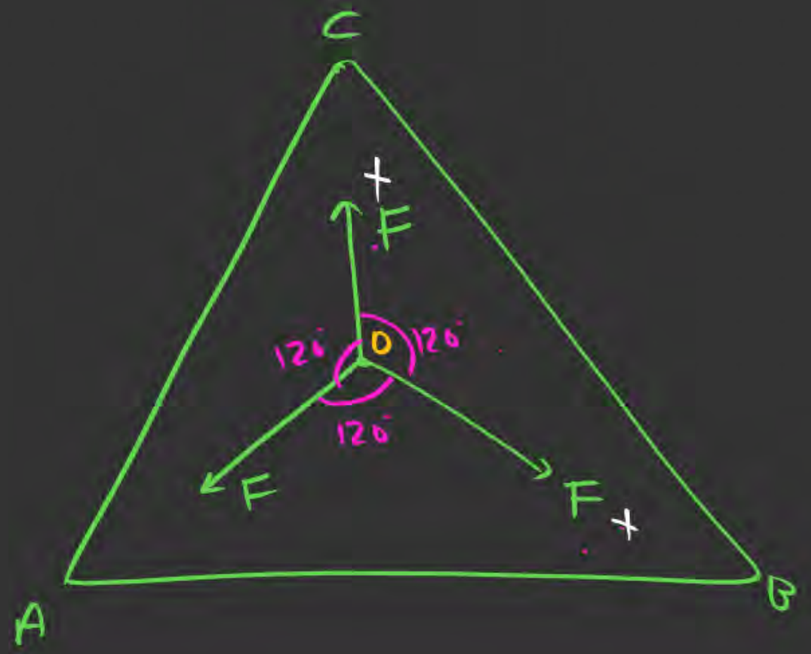
$\boxed{\theta = 60}$



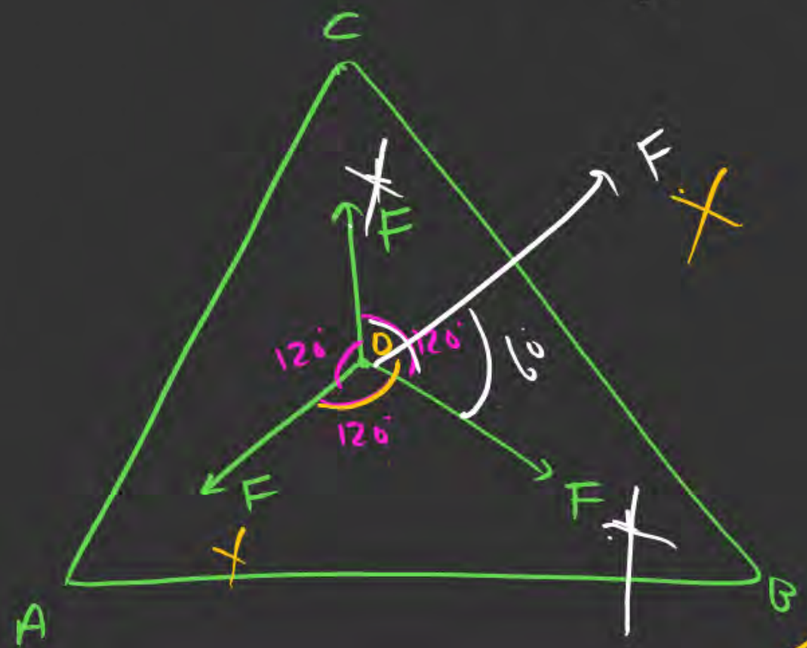
find Net force due to all six forces ??

$F_{net} = 0$

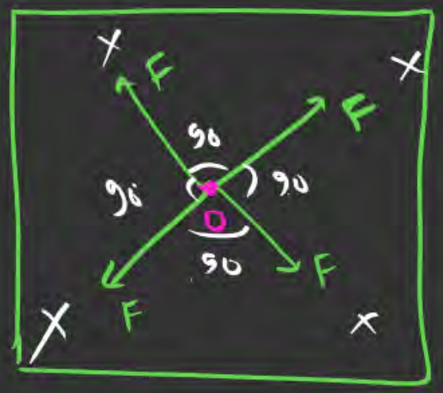
zero



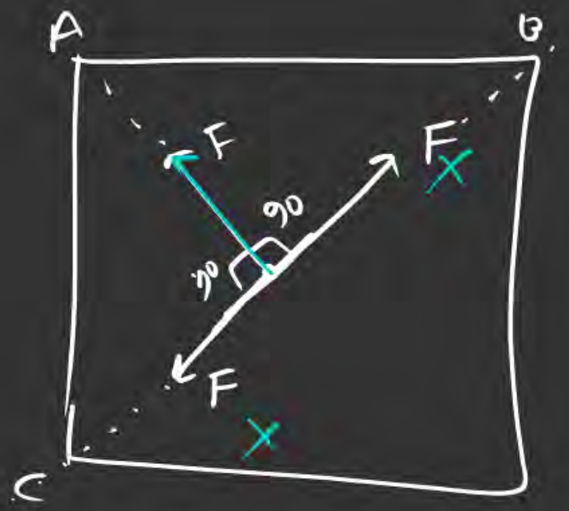
Sum of these three force of equal magnitude ?



$F_{net} = 0$



$$\vec{F}_{\text{all 4 force}} = \text{zero}$$



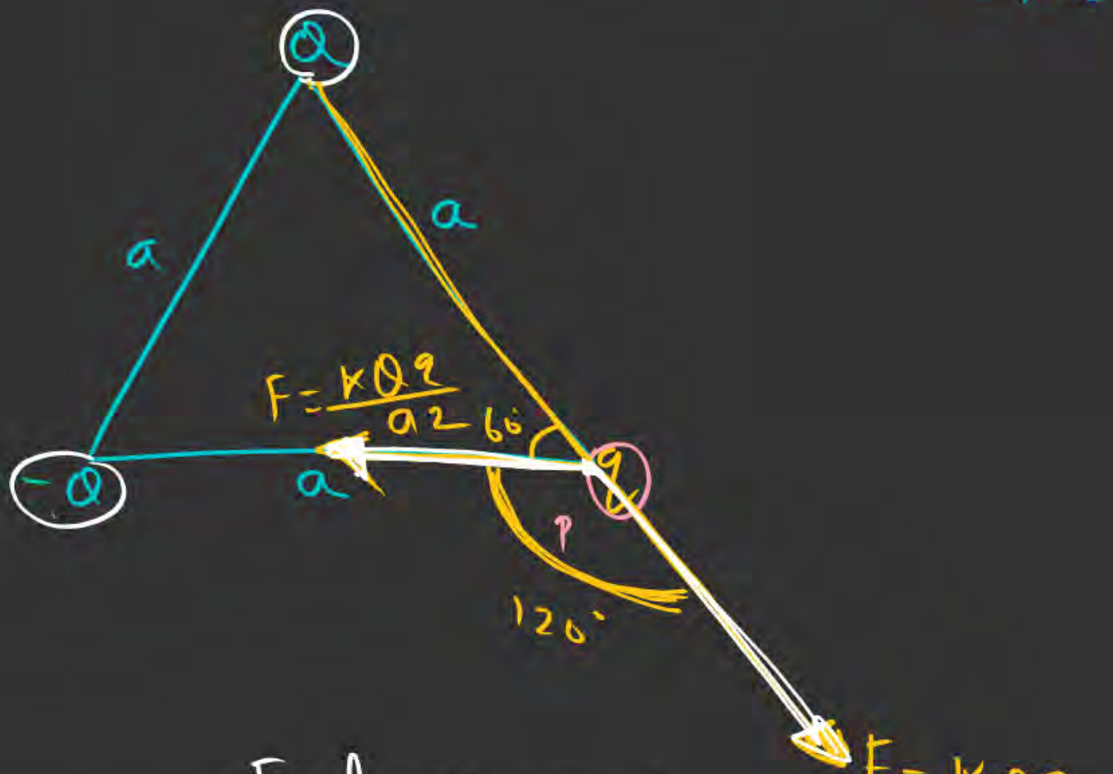
$F_{net} = F$

and three forces

Find Force on +q charge at P due to other two charge.

we this

$$F = \frac{Kq_1q_2}{r^2}$$



$$F_{net} = 2F\cos\theta/2$$

$$= 2\,\frac{KQq}{a^2}\cos\left(\frac{120}{2}\right)^{60}$$

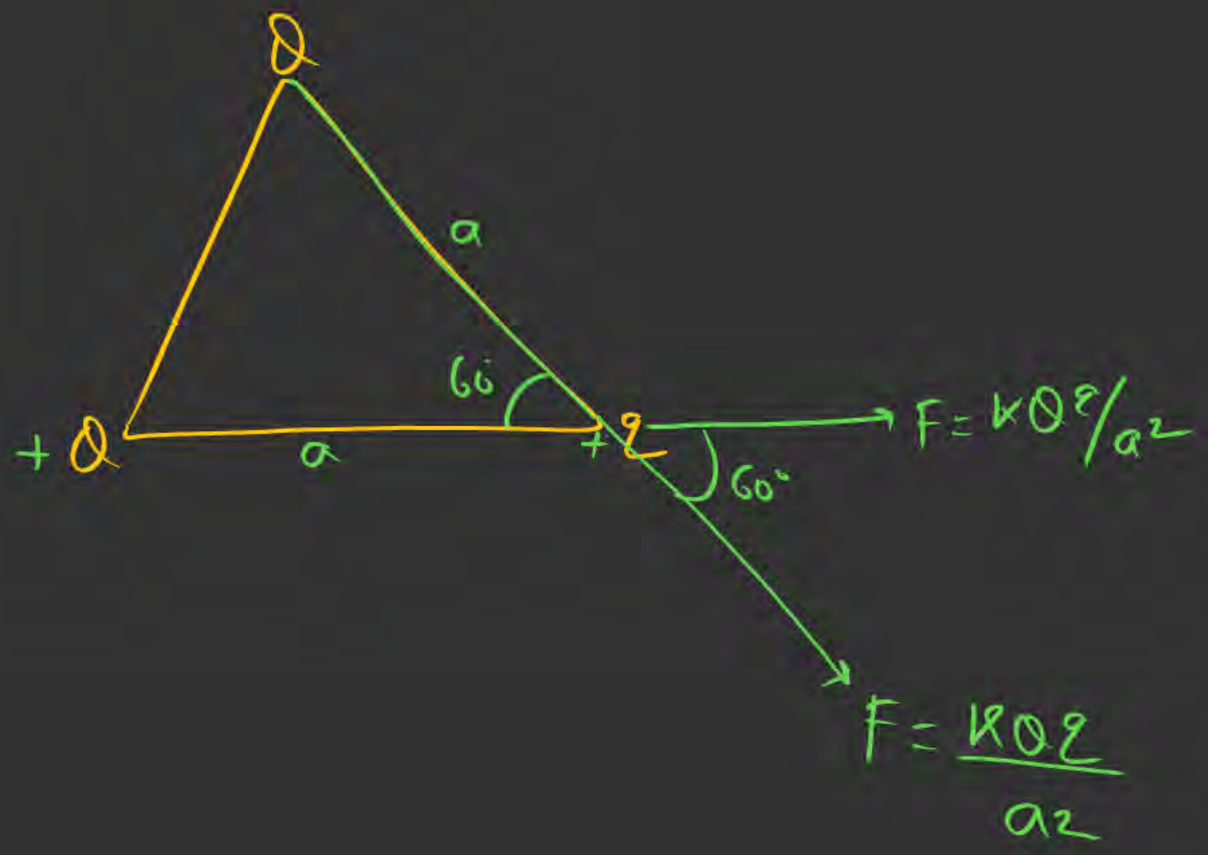
$$= 2\,\frac{KQ^2}{a^2}\,\frac{1}{2} = \frac{KQ^2}{a^2}$$

(a) $\sqrt{3}\,\frac{KQq}{a^2}$ (24.1) Ratta marke Aya

(b) $2\,\frac{KQq}{a^2}$

✓ (c) $\frac{KQq}{a^2}$ (58.1)

(d) $\frac{\sqrt{2}KQq}{a^2}$

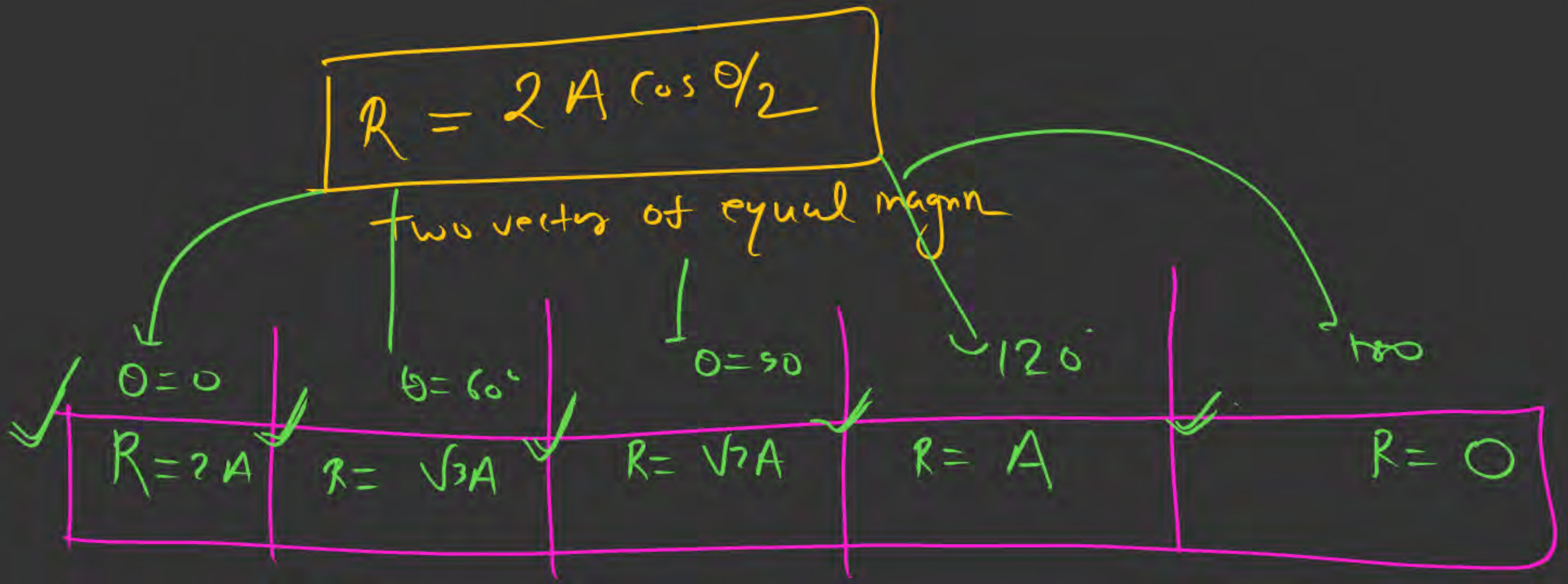


$$F_{net} = 2F\cos\theta/2$$

$$= 2\frac{KQq}{a^2}\cos\left(\frac{\theta}{2}\right)$$

$$= 2\frac{KQq}{a^2} \times \frac{\sqrt{3}}{2}$$

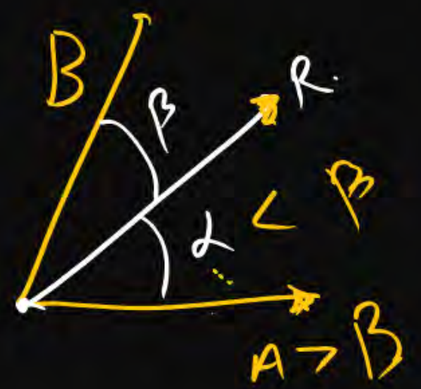
$$= \frac{\sqrt{3}KQq}{a^2}$$


$R = 2A\cos\theta/2$
two vectors of equal magnitude
$\theta = 0$
$\theta = 60°$
$\theta = 90$
120°
180
$R = 2A$
$R = \sqrt{3}A$
$R = \sqrt{2}A$
$R = A$
$R = 0$

Question

The resultant of $\vec{A}$ and $\vec{B}$ makes an angle α with $\vec{A}$ and β with $\vec{B}$ then correction option is

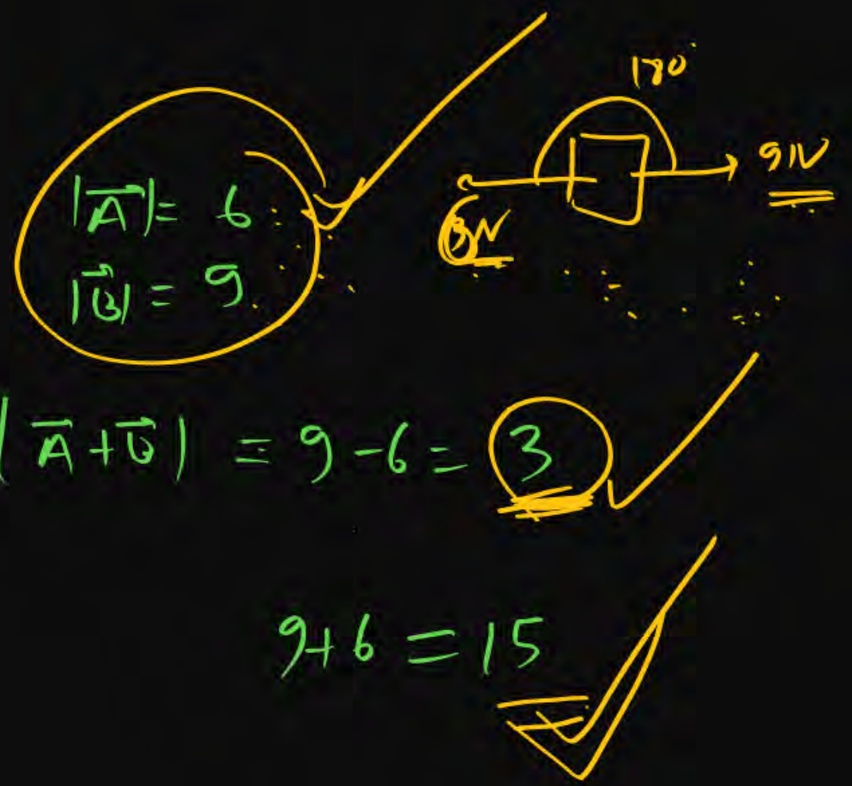
1. $\alpha > \beta$
2. $\beta < \alpha$
3. $\alpha < \beta$ if $A > B$
4. $\alpha = \beta$



Question

Which of the following relation is correct between $\vec{A}$, $\vec{B}$ and $\vec{C}$ if $\vec{C} = \vec{A} + \vec{B}$

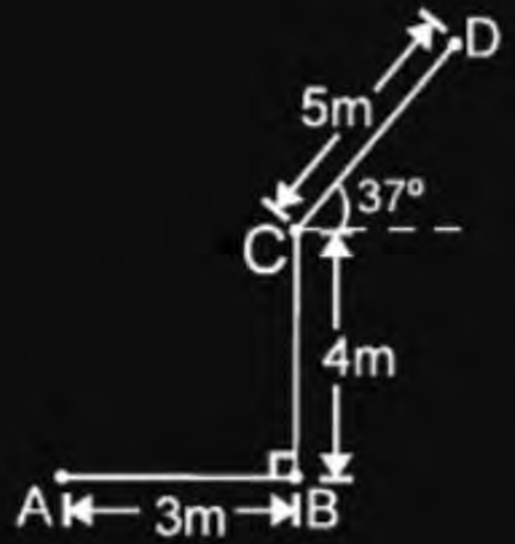
1. $B + A < C < B - A$
2. $A \leq C \geq B$
3. $A - B \leq C \leq A + B$
4. $A - B < C < A + B$



Question

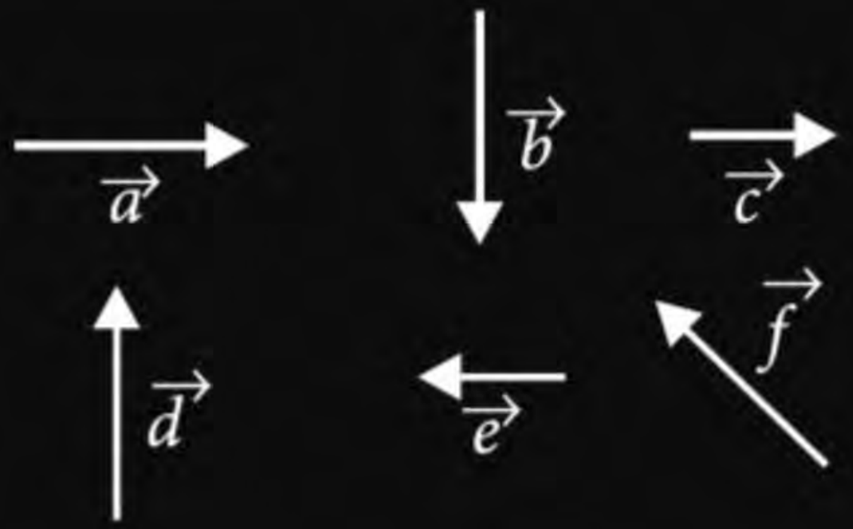
A particle moves along a path ABCD as shown in the figure. Then the magnitude of net displacement of the particle from position A to D is:

1. 10 m
2. $5\sqrt{2}$ m
3. 9 m
4. $7\sqrt{2}$ m



Question

Six vectors, $\vec{a}$ through $\vec{f}$ have the magnitudes and directions indicates in the figure. Which of the following statements is true? **(2010)**

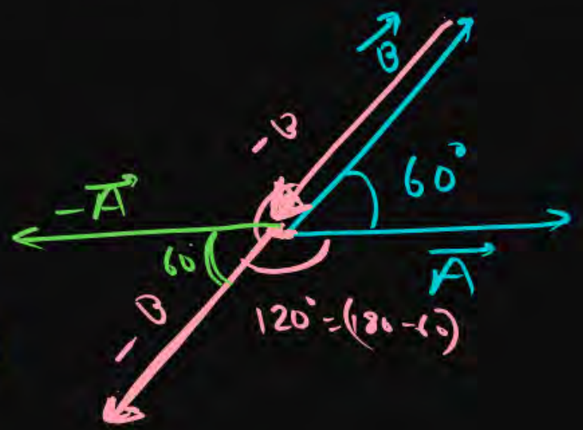


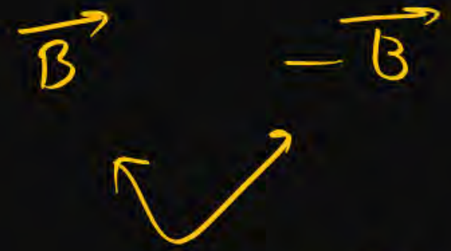
1. $\vec{b} + \vec{c} = \vec{f}$
2. $\vec{d} + \vec{c} = \vec{f}$
3. $\vec{d} + \vec{e} = \vec{f}$
4. $\vec{b} + \vec{e} = \vec{f}$

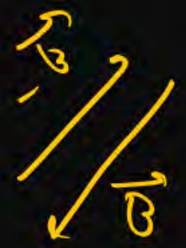
Question

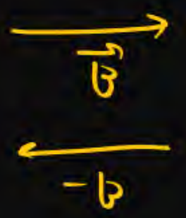
If angle between $\vec{A}$ and $\vec{B}$ is $60°$, then find angle between $\vec{A}$ and $-\vec{B}$ & $-\vec{A}$ and $-\vec{B}$.

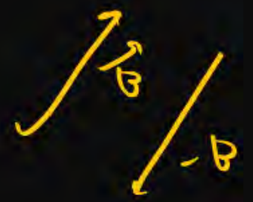
1. $30°, 60°$
2. $120°, 30°$
3. $120°, 60°$
4. $120°, 120°$











Question

$\vec{A} = 2\hat{i} + 2\hat{j} - 3\hat{k}$ and $\vec{B} = 3\hat{i} - 3\hat{j} - 2\hat{k}$ find $\vec{A} - \vec{B}$. and $\vec{A} + \vec{B}$

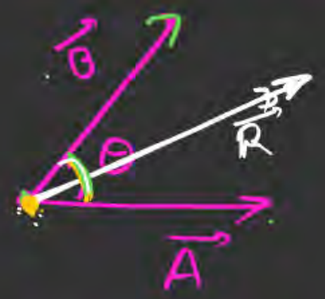
$\vec{A} + \vec{B} = (2i + 2J - 3K) + (3i - 3J - 2\hat{k})$

$= 5i - J - 5\hat{k}$ ⟵ Ans

$\vec{A} - \vec{B} = \vec{A} + (-\vec{B}) = (2i + 2J - 3K) + (-3i + 3J + 2\hat{k})$

$\vec{A} - \vec{B} = -\hat{i} + 5\hat{j} - \hat{k}$

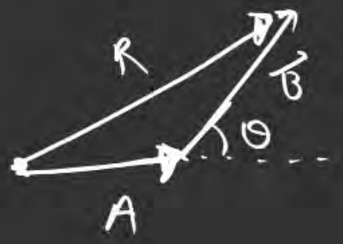
Vector addition



θ = Angle b/w A → B

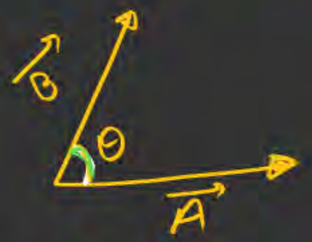
* $|R| = \sqrt{A^2 + B^2 + 2AB\cos\theta}$

Triangle law



Since

Vector subtraction



A = magnitude of $\vec{A}$

B = magnitude of $-\vec{B}$

D = magnitude of diff

Angle b/w $\vec{A} \to -\vec{B} = 180 - \theta$

$\vec{A} - \vec{B} = \vec{A} + (-\vec{B})$

Triangle law of vector addition

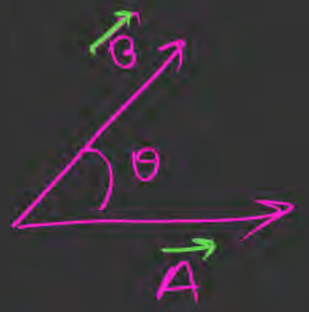
$\vec{A} + (-\vec{B}) = \vec{A} - \vec{B}$

$|\vec{D}| = \sqrt{A^2 + B^2 + 2AB\cos(180-\theta)}$

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

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

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



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

Parallel

$\theta = 0^\circ$

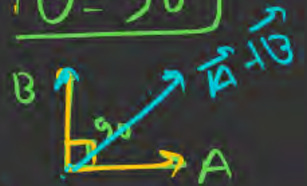
\# $R = A + B$

\# $D = A - B$

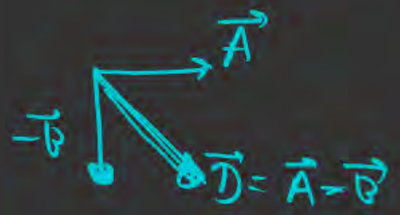
$\vec{A}$

$\vec{B}$

$\theta = 90^\circ$



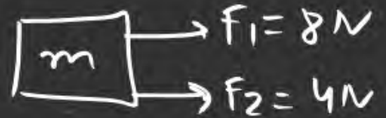
Same $\begin{cases} R = \sqrt{A^2 + B^2} \\ D = \sqrt{A^2 + B^2} \end{cases}$



$\theta = 180$

$R = A - B$ ✓

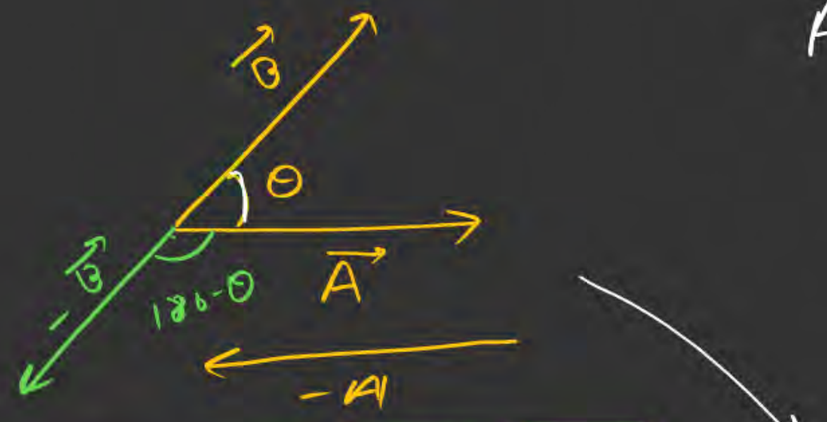
$D = A + B$ ✓



$$\vec{A} - \vec{B} = \vec{A} + (-\vec{B})$$

$$|\vec{D}| = \sqrt{A^2 + B^2 - 2AB\cos\theta}$$

magnitude of $|\vec{A} - \vec{B}|$ or $|\vec{B} - \vec{A}|$



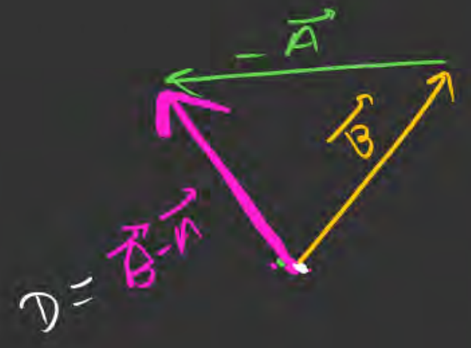
Angle b/w $\vec{A} \to \vec{B} = \theta$

Angle b/w $-\vec{A} \to \vec{B} = 180-\theta$

Angle b/w $\vec{A} \to -\vec{B} = 180-\theta$

$$\vec{A} - \vec{B} \neq \vec{B} - \vec{A}$$

fed



Diagram

Question

The vectors $\vec{A}$ and $\vec{B}$ are such that $|\vec{A}+\vec{B}| = |\vec{A}-\vec{B}|$. The angle between the two vectors is

1. $45°$
2. $90°$
3. $60°$
4. $75°$

H/W

Question

Initial velocity of object is 10 m/s east after some time its velocity becomes 10 m/s North then find change in velocity is?

H/W

Question

Majnu Majedar is moving with 6 m/s in east and Ramlal is moving with 6 m/s at 30° east of North, then find relative velocity of Ramlal w.r.t. MM.

H/W

Question

Initial velocity of Ramlal is 5 m/s in north after some time it is moving 5 m/s in east then find

(i) Change in velocity

(ii) Magnitude of change in velocity

(iii) Change in magnitude of velocity

H/W

THANK YOU