ARJUNA

NEET FASTRACK 2024

Lecture No.- 03

Physics

Motion in Straight Line

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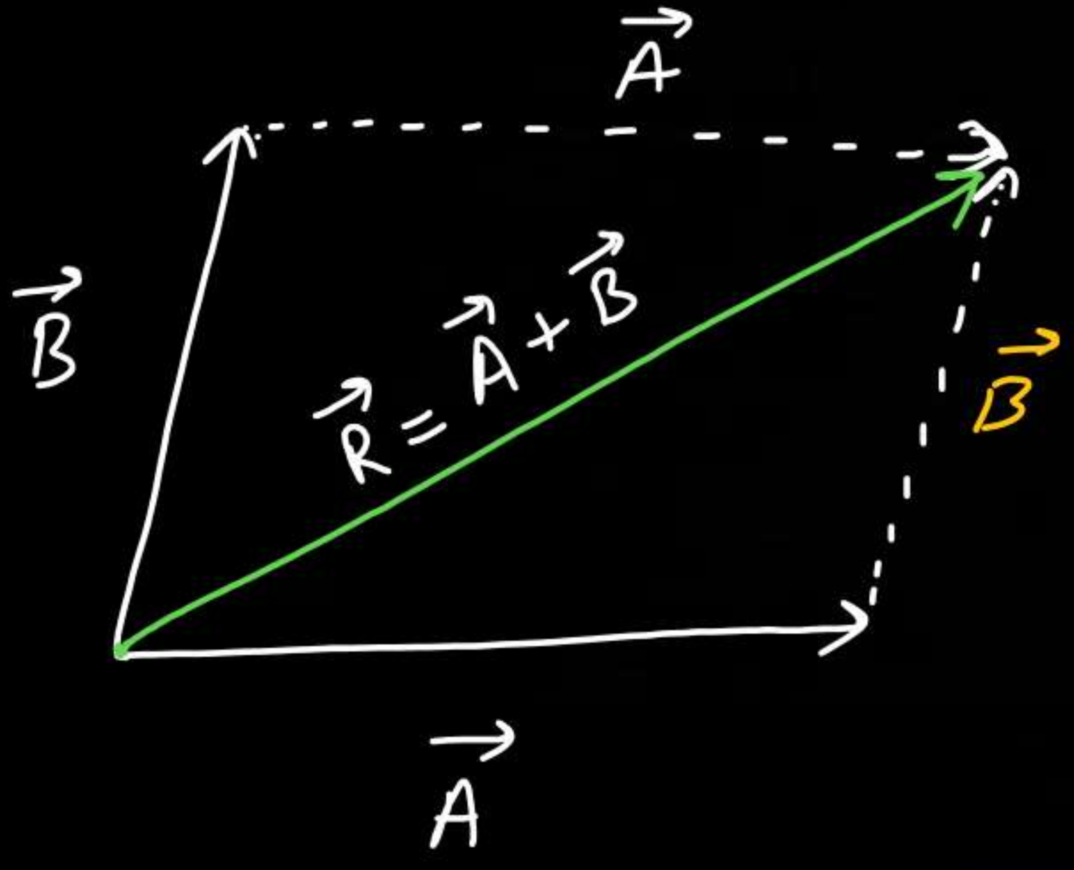
TODAYS TARGETS

1. Parallelogram Law
2. Magnitude of Resultant.

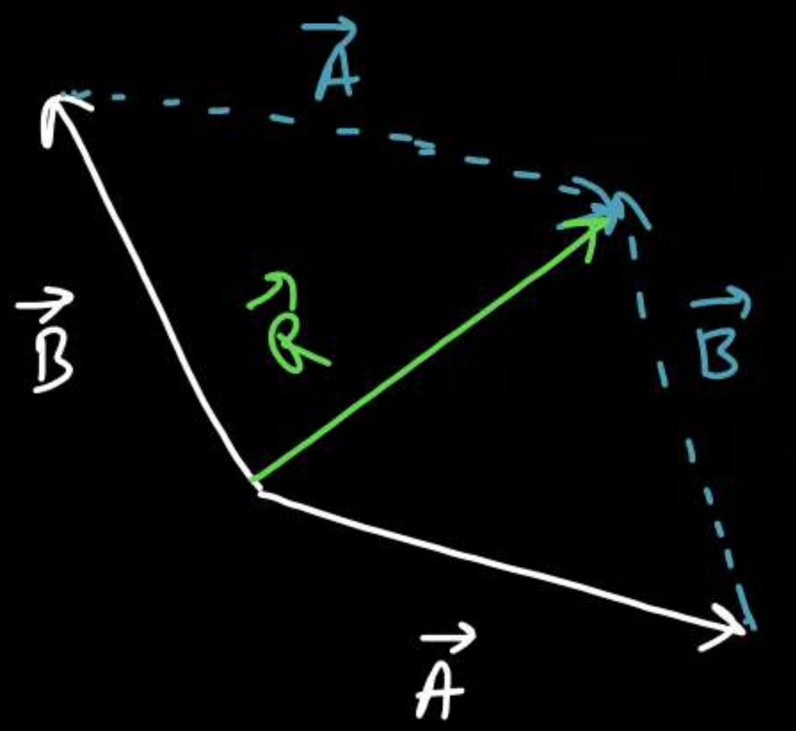
Parallelgram Law: If two vectors are Representing adjacent sides of Parallelogram then. There Resultant will be Diogonal passing through intersection of orignal vectors.

→ When (H–H) or (T–T) are joined.



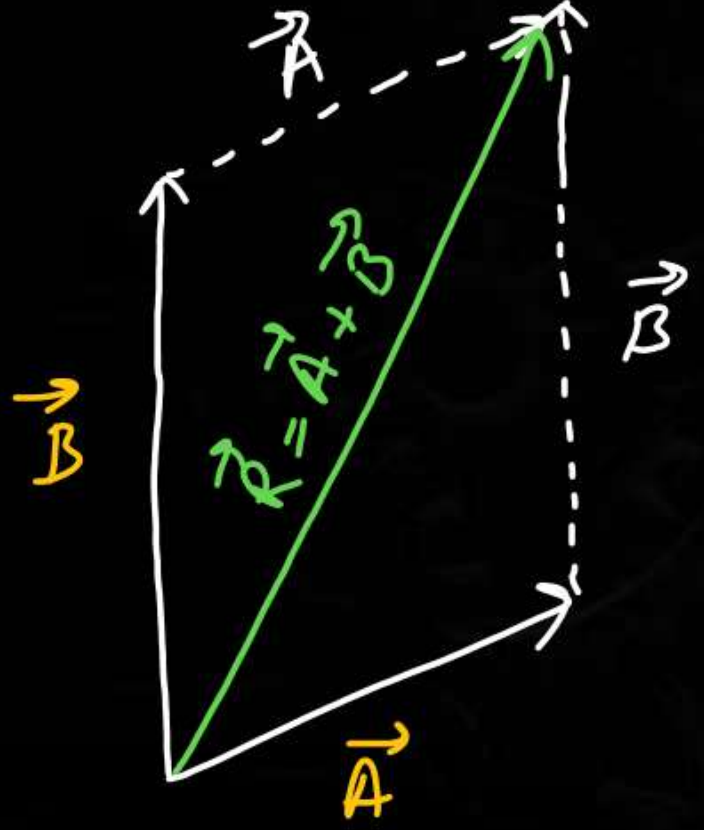
$$\boxed{\vec{R} = \vec{A} + \vec{B}}$$

Q:→



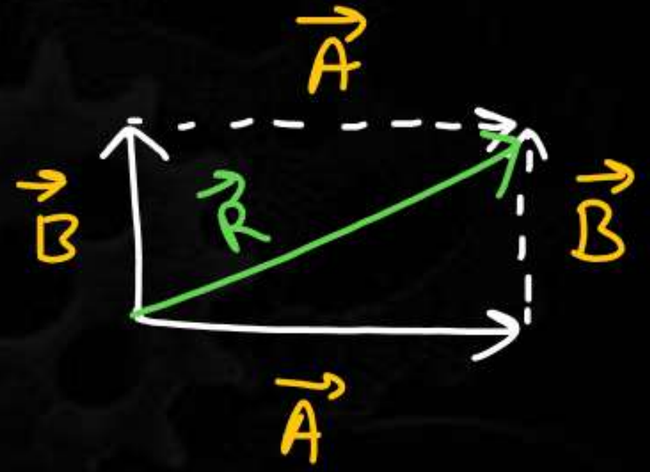
$$\vec{R} = \vec{A} + \vec{B}$$

Q:→



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

Q:→



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

Q: → Which of the following Can be Resultant of given two vector

↳ $\vec{A} + \vec{B}$

⟹

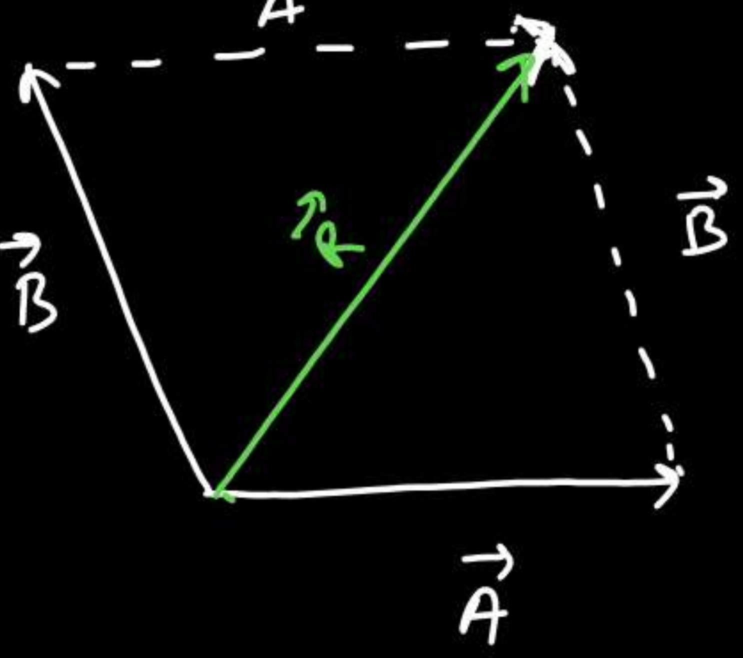
(A) 

(B) 

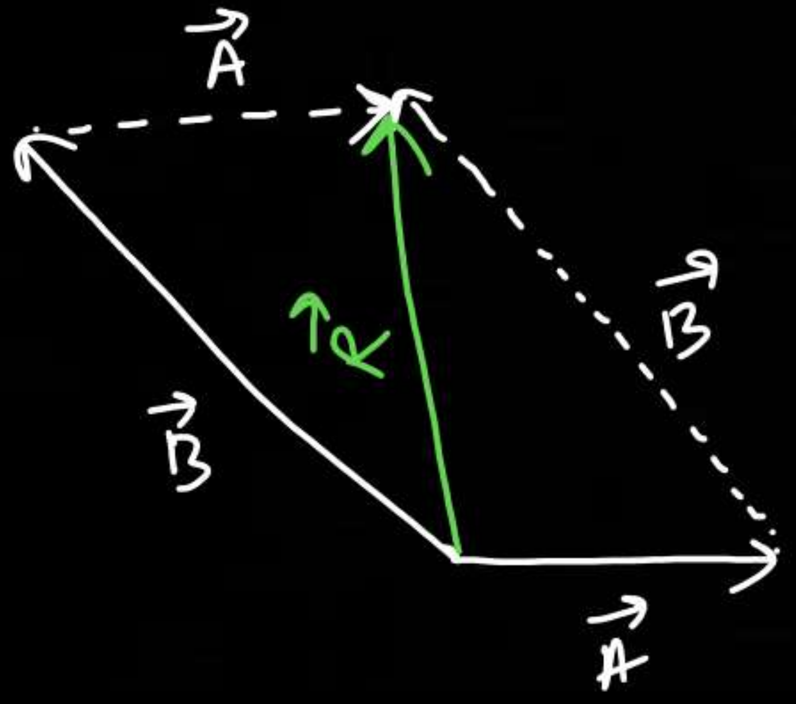
(C) ✓ 

(D) 

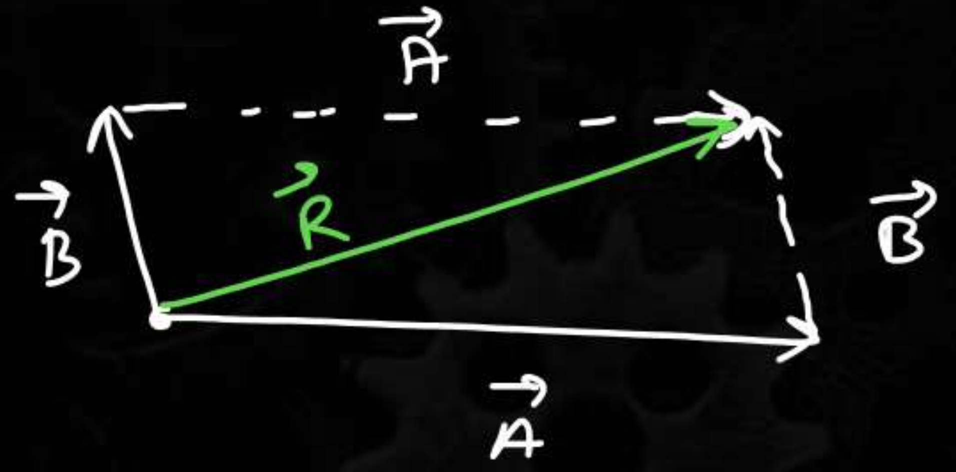
1

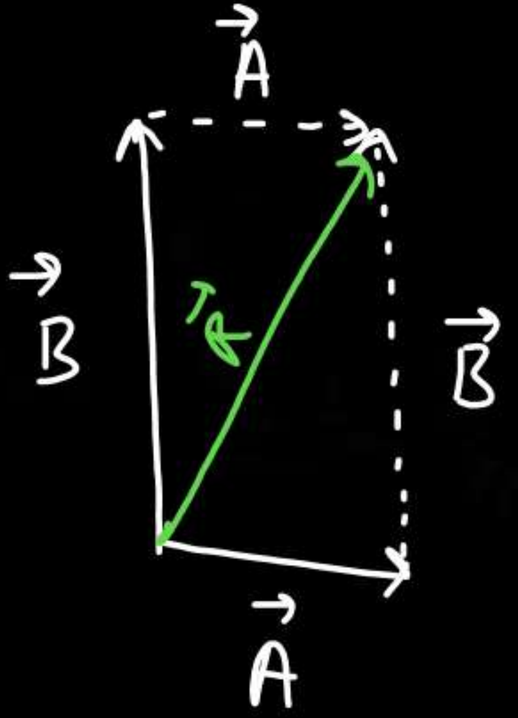

$\vec{A}$
$\vec{B}$
$\vec{R}$
$\vec{B}$
$\vec{A}$

2

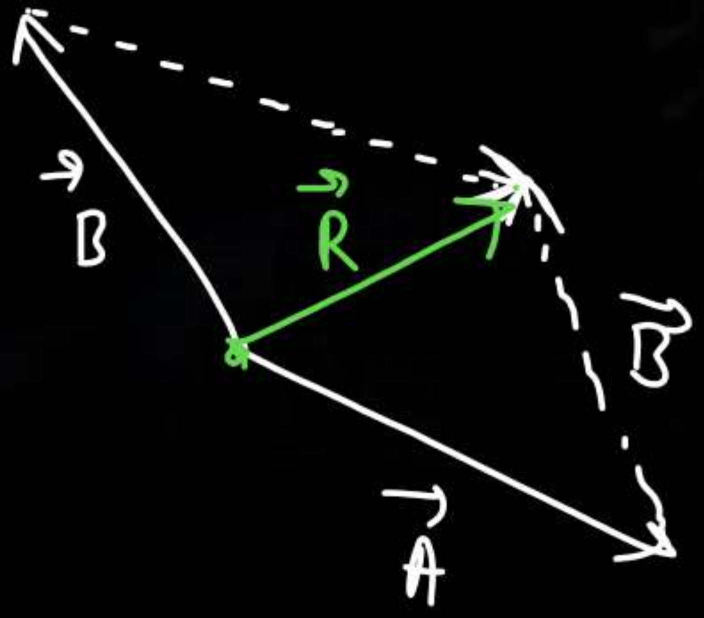

$\vec{A}$
$\vec{R}$
$\vec{B}$
$\vec{B}$
$\vec{A}$

3

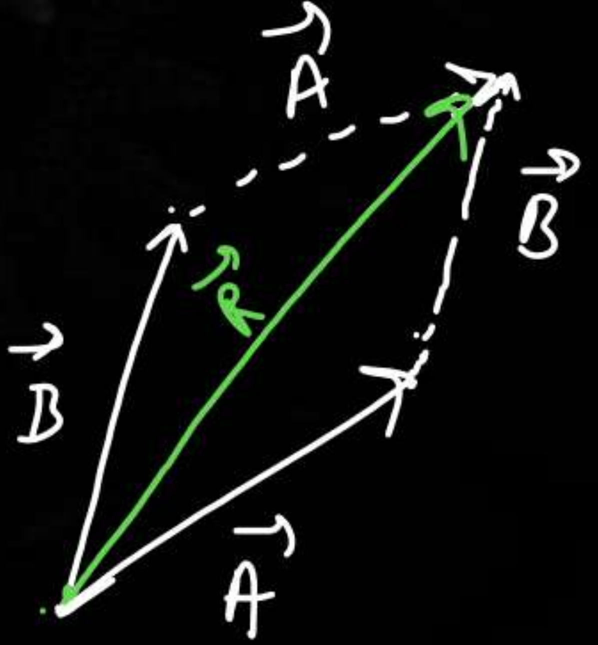

$\vec{A}$
$\vec{B}$
$\vec{R}$
$\vec{B}$
$\vec{A}$


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

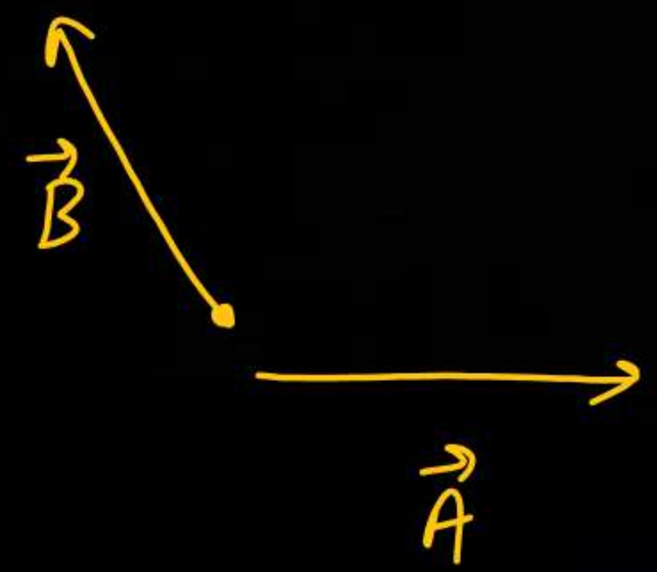
5

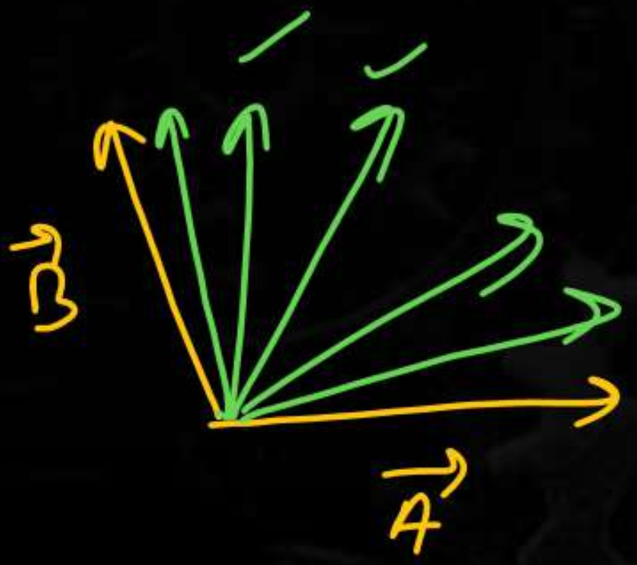

$\vec{B}$
$\vec{R}$
$\vec{B}$
$\vec{A}$

6


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

Q: → Which of the following can-not be Resultant of two vectors.





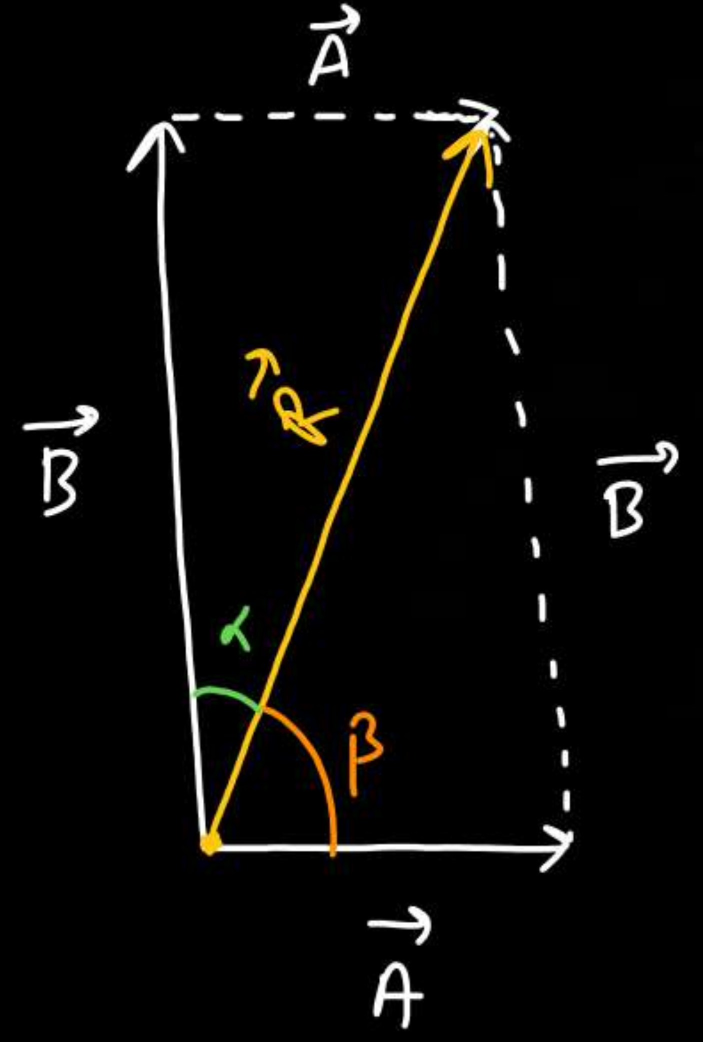
(A) 

(B) 

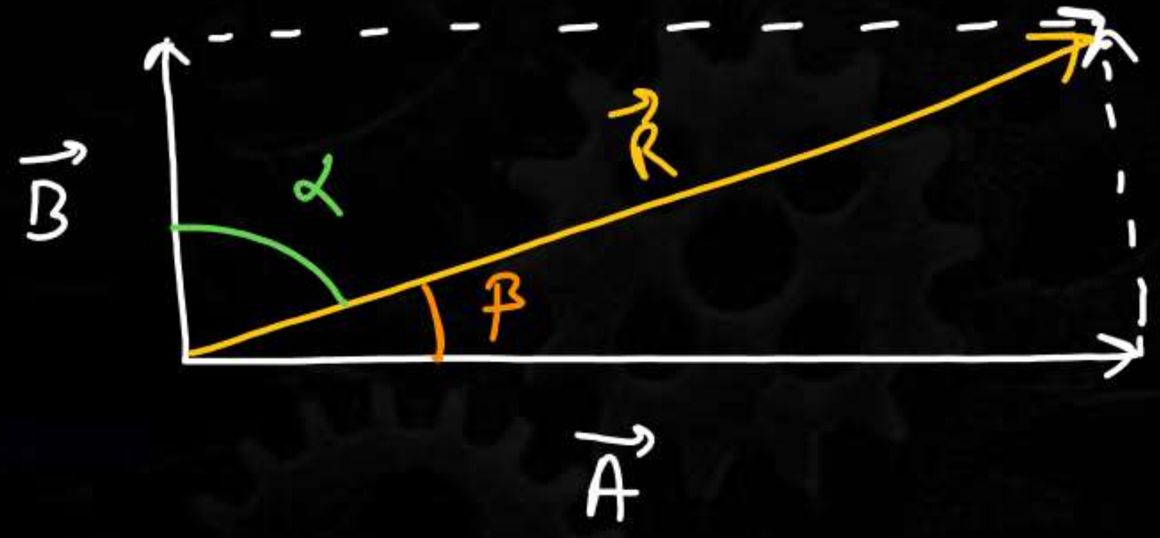
(C) 

(D) 

Q:→



$\boxed{\beta > \alpha}$



$\boxed{\alpha > \beta}$

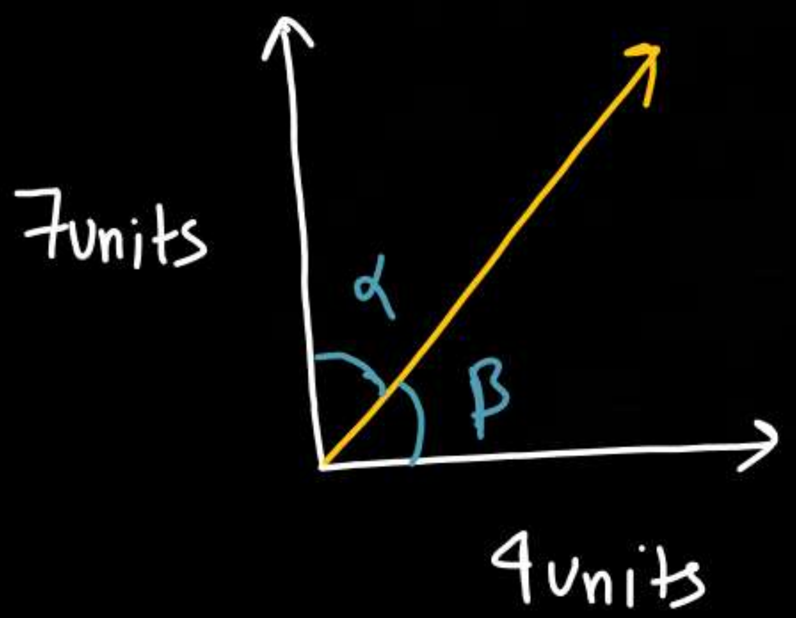
Note:

- Resultant (sum) of two vectors will be inclined towards vector of Higher Magnitude.

- Resultant (sum) Vector will make smaller Angle with Vector of Higher Magnitude.

- If two vectors of equal Magnitude will be added then Resultant will make equal Angle with Both.

Q:→



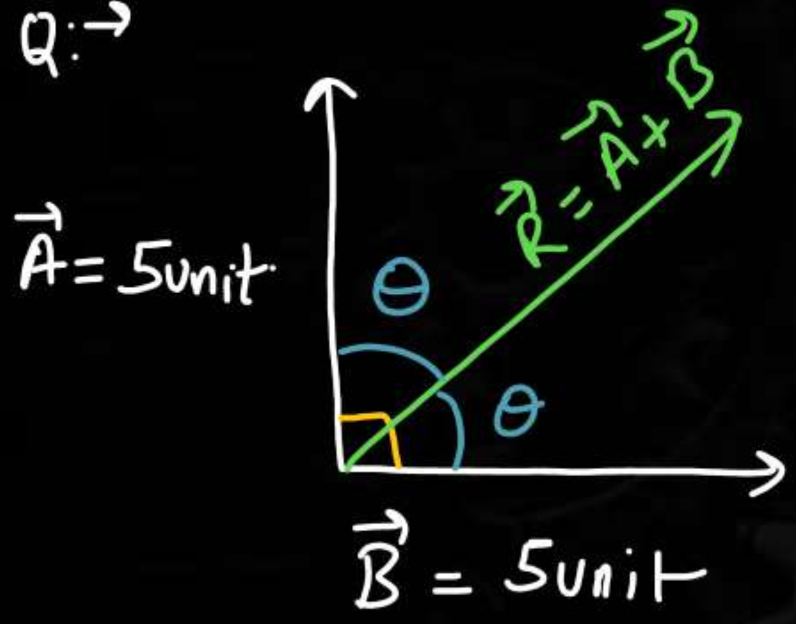
(A) $\alpha > \beta$

(B) $\alpha < \beta$

(C) $\alpha = \beta$

(D) None.

Q:→



Find Value of θ.

(A) 0°

(B) 30°

(C) 45°

(D) 90°

$2\theta = 90^\circ$

$\theta = \frac{90}{2} = 45^\circ$

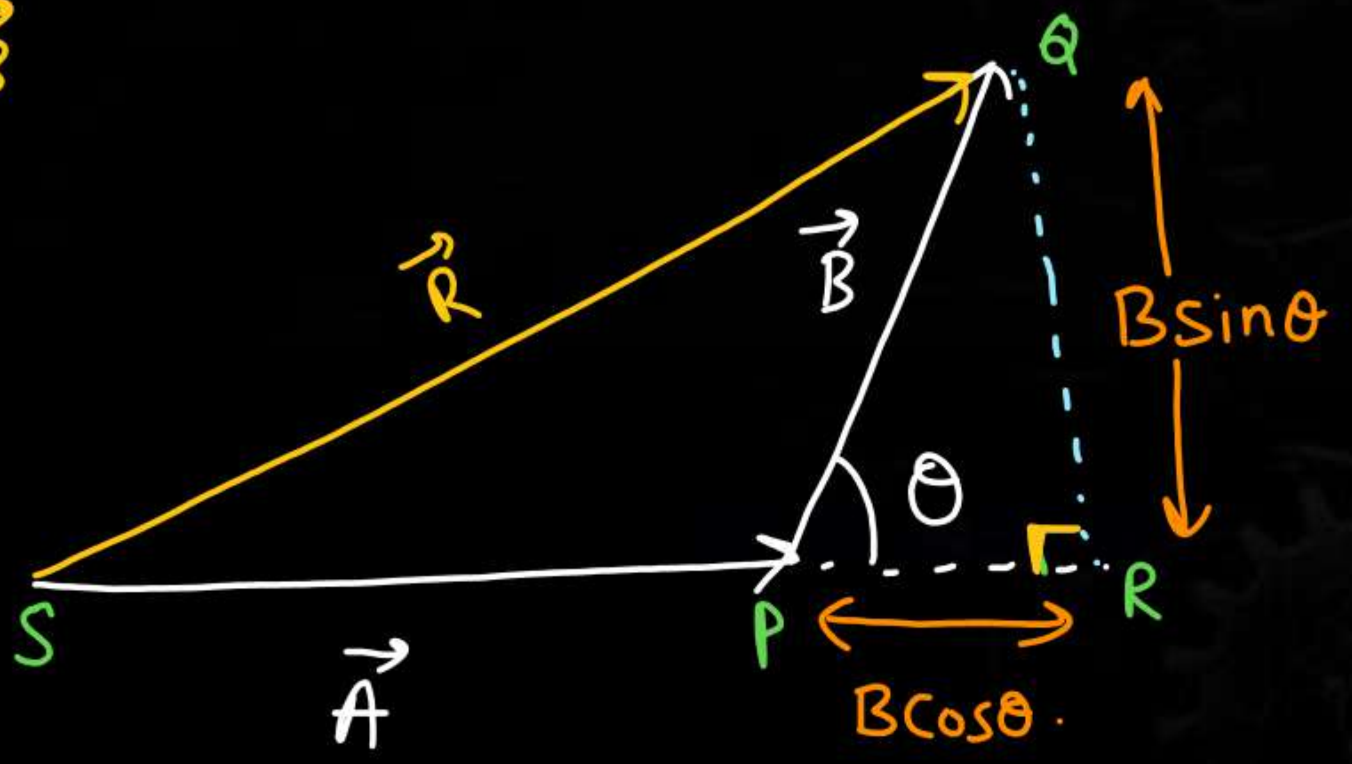
Magnitude of Sum of two Vectors :

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

$|\vec{R}| = R = ?$

$|\vec{A}| = A$

$|\vec{B}| = B$



For ΔPQR.

$\sin\theta = \frac{P}{H} = \frac{QR}{B}$

$\boxed{QR = B\sin\theta.}$

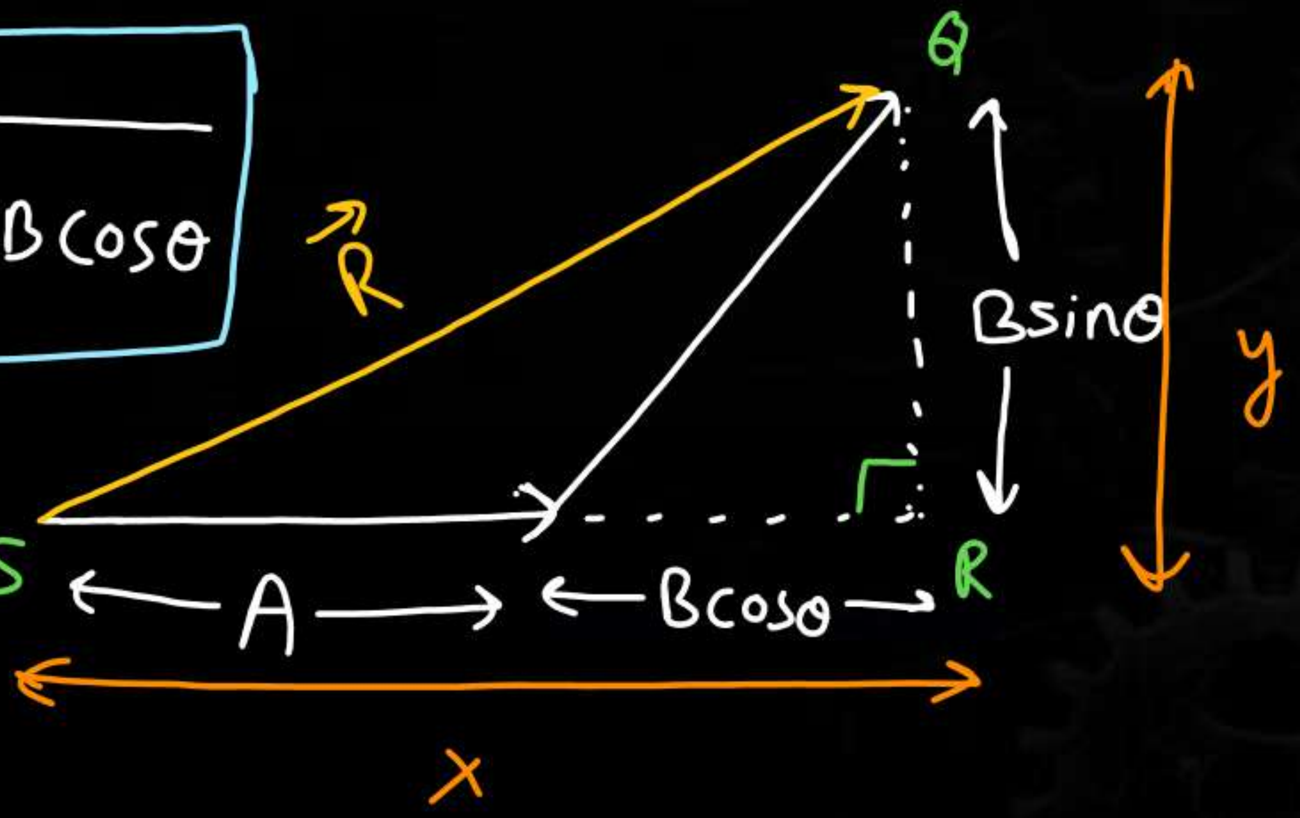
Similarly

$\cos\theta = \frac{B}{H} = \frac{PR}{B}$

$\boxed{PR = B\cos\theta}$

$\because \sin^2\theta + \cos^2 = 1$

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



Where

θ is Angle b/w Vectors.

From Δ SQR.

$$R^2 = x^2 + y^2$$

$$R = \sqrt{x^2 + y^2}$$

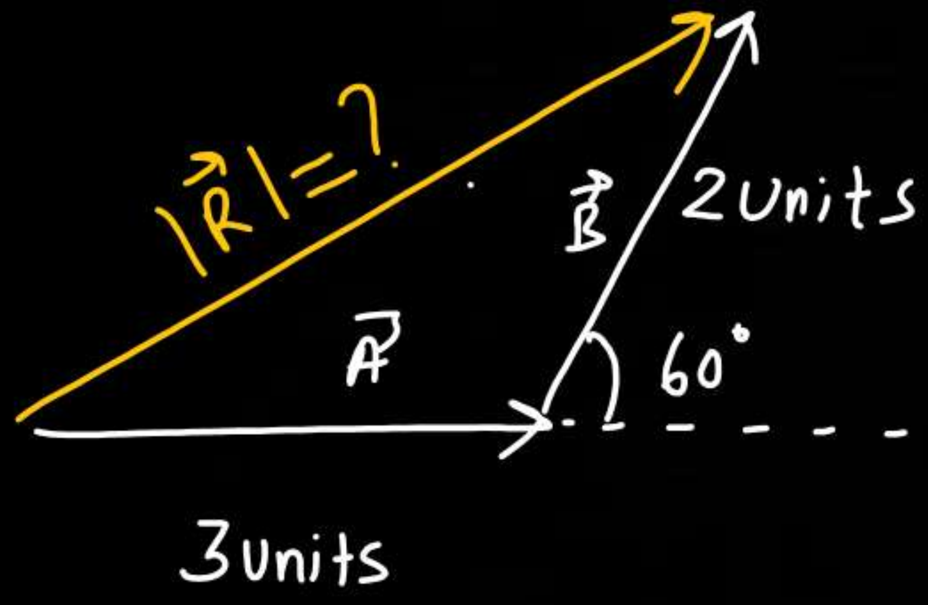
$$R = \sqrt{(A + B\cos\theta)^2 + (B\sin\theta)^2}$$

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

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

$\because$

e.g



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

θ is Angle b/w Vectors.

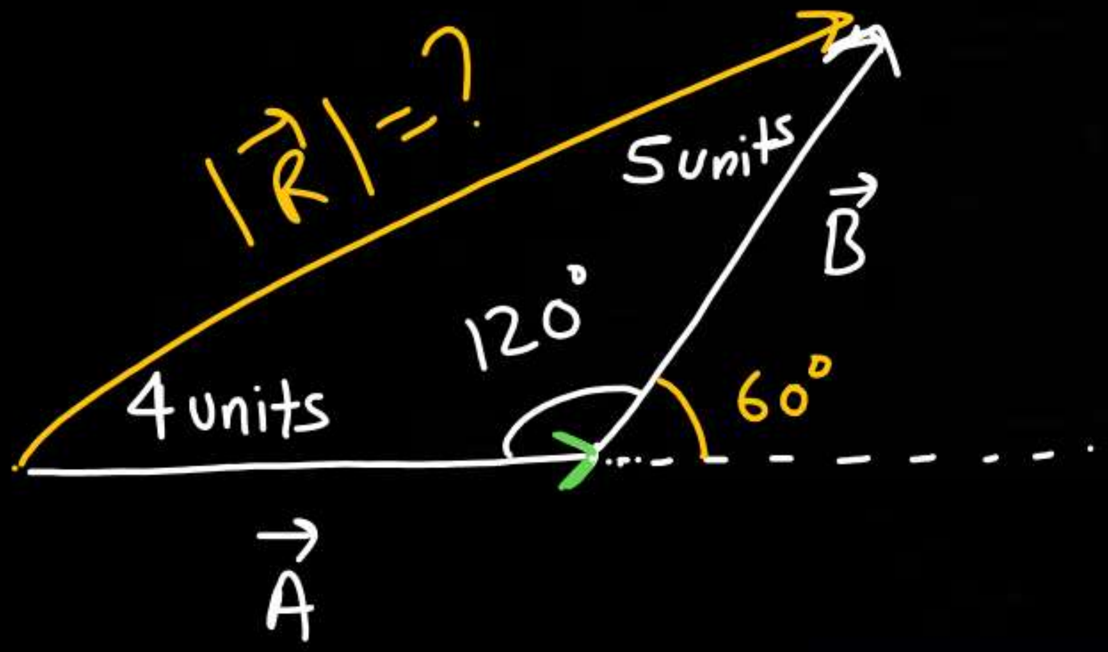
$$R = \sqrt{3^2 + 2^2 + 2(3)(2)\cos(60°)}$$

$$R = \sqrt{9 + 4 + \cancel{12}^{6} \times \frac{1}{\cancel{2}}}$$

$$R = \sqrt{9 + 4 + 6} = \sqrt{19}$$

$$\boxed{|\vec{R}| = \sqrt{19} \text{ units}}$$

Q:→



$$\boxed{|\vec{R}| = \sqrt{61}}$$

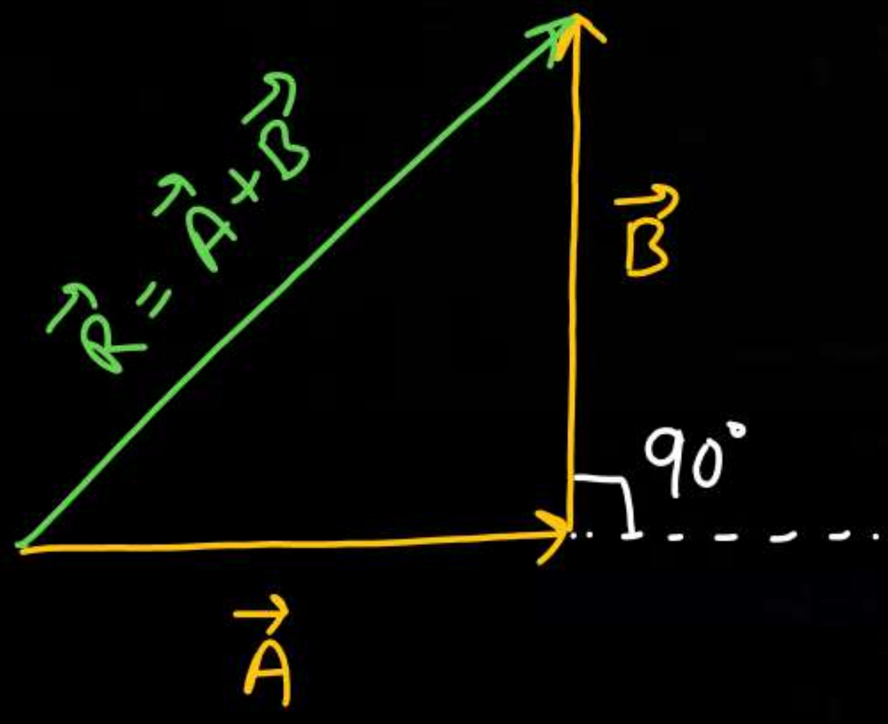
$$|\vec{R}| = \sqrt{A^2 + B^2 + 2AB\cos\theta}$$

$$|\vec{R}| = \sqrt{4^2 + (5)^2 + 2 \times 4 \times 5 \times \cos(60^\circ)}$$

$$= \sqrt{16 + 25 + \cancel{40}^{20} \times \frac{1}{\cancel{2}}}$$

Important

$$\boxed{\cos(90^\circ) = 0}$$



if $|\vec{A}| = A$

$|\vec{B}| = B$

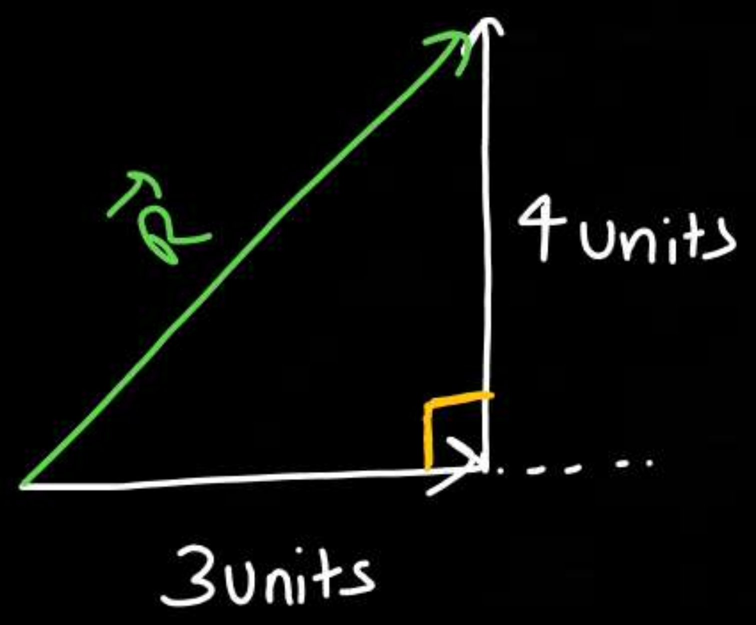
$|\vec{R}| = R = ?$

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

$$R = \sqrt{A^2 + B^2 + 2A.B\underbrace{\cos(90^\circ)}_{0}}$$

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

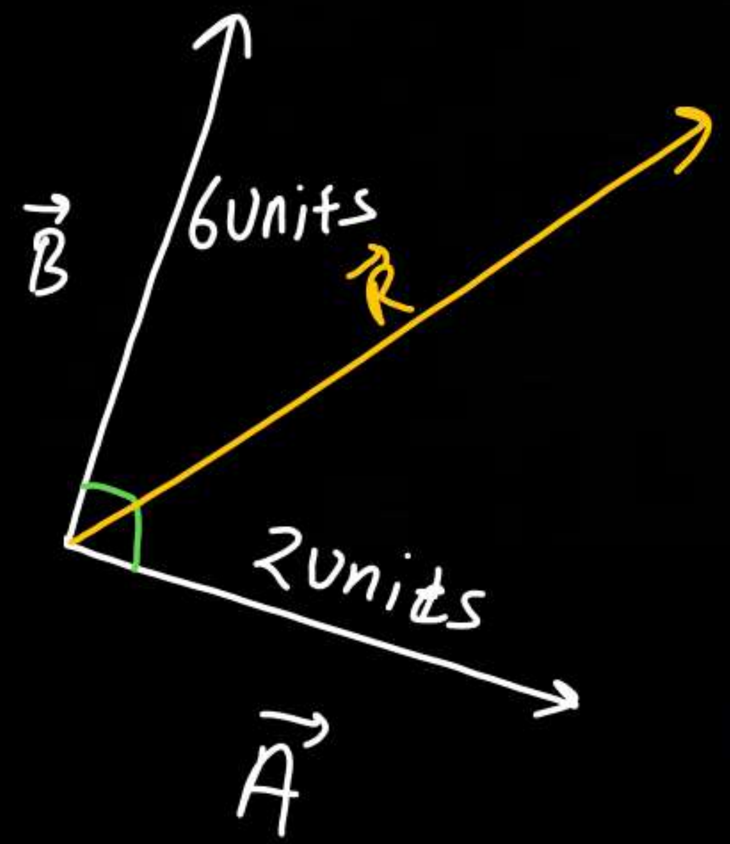
Q: →



Q: → Find $|\vec{R}| = ?$

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

$$= \sqrt{(3)^2 + (4)^2} = \sqrt{9 + 16} = \sqrt{25} = 5.$$



Find $|\vec{R}| = ?$

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

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

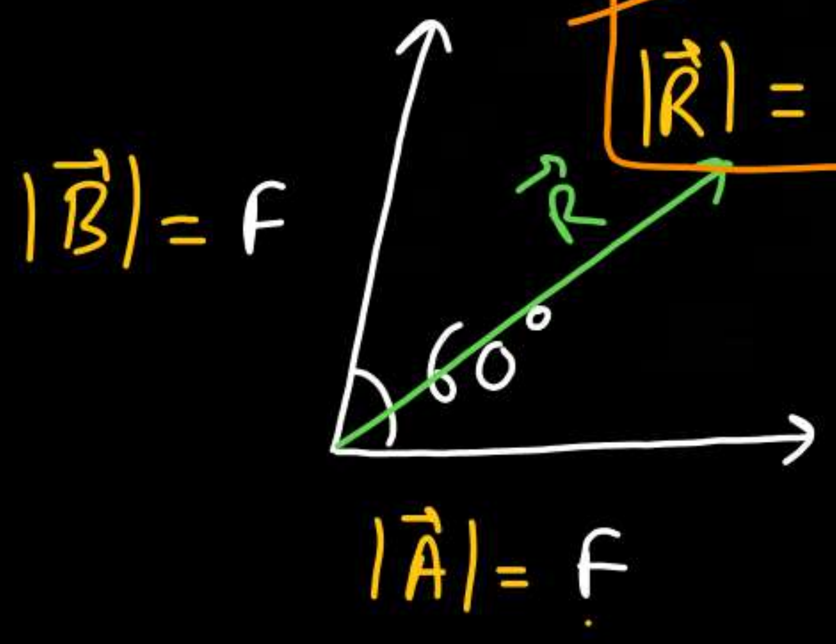
$$|\vec{R}| = \sqrt{2^2 + 6^2}$$

$$|\vec{R}| = \sqrt{4 + 36}$$

$$|\vec{R}| = \sqrt{40} \text{ units.}$$

Key Point :

①



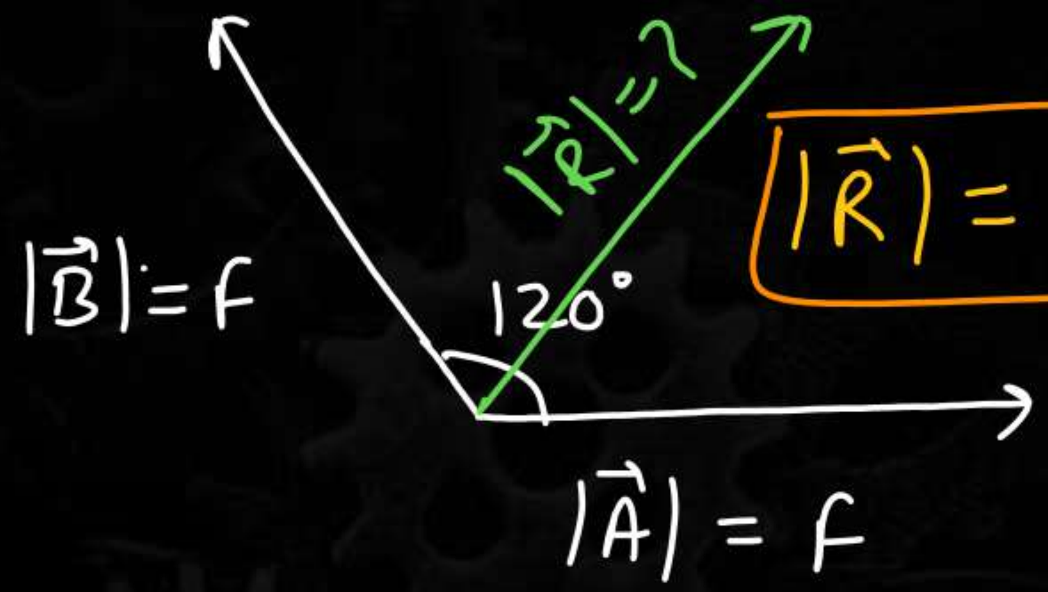
$\boxed{|\vec{R}| = \sqrt{3}F}$

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

$$R = \sqrt{F^2 + F^2 + \cancel{2}.F.F \times \frac{1}{\cancel{2}}}$$

$$R = \sqrt{F^2 + F^2 + F^2} = \sqrt{3F^2} = \sqrt{3}F$$

$\cos(120°) = -\frac{1}{2}$

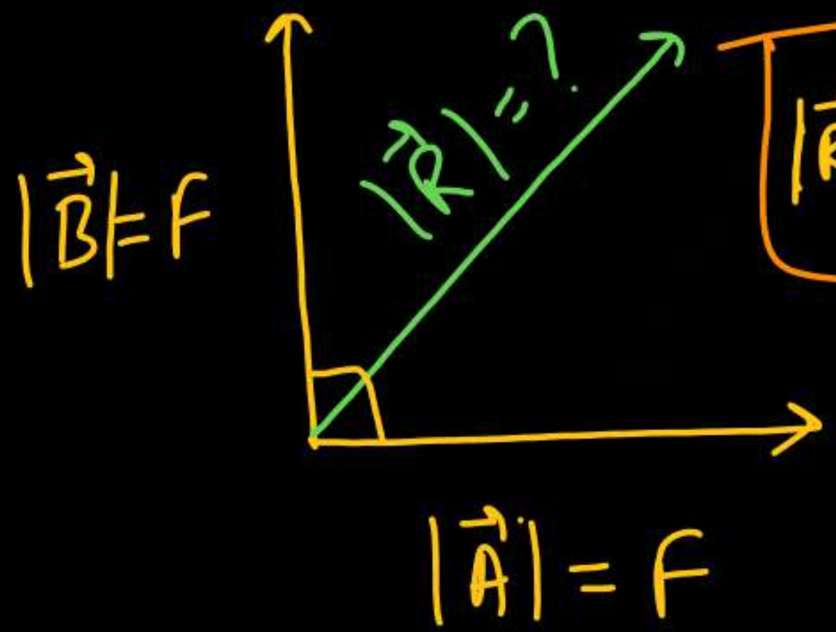


$\boxed{|\vec{R}| = F}$

$$|\vec{R}| = \sqrt{A^2 + B^2 + 2 \cdot A \cdot B\cos(120°)}$$

$$= \sqrt{F^2 + F^2 + \cancel{2}F^2\left(-\frac{1}{\cancel{2}}\right)}$$

$$|\vec{R}| = \sqrt{F^2 + \cancel{F^2} - \cancel{F^2}} = F$$



$$|\vec{R}| = \sqrt{2}F.$$

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

$$= \sqrt{F^2 + F^2}$$

$$\boxed{R = \sqrt{2}F}$$


THANK You