Physicsaholics

DPP – 1 (Vectors)

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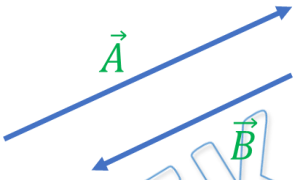
Q 1. Two vectors are said to be equal only if they have:
(a) Same magnitude and same direction (b) Same magnitude and opposite direction
(c) Same magnitude only (d) Same direction only

Q 2. Vectors shown in figure are:

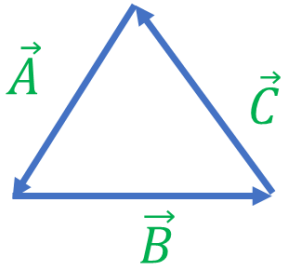


(a) Parallel vector (b) Antiparallel vector
(c) Equal vector (d) None of these

Q 3. Find angle between vectors $\vec{A}$ & $\vec{B}$:

(a) 150^0 (b) 120^0 (c) 60^0 (d) 30^0

Q 4. Vectors $\vec{A}$, $\vec{B}$ & $\vec{C}$ forms an equilateral triangle. Then angles between them are:



(a) $60^0, 60^0, 60^0$ (b) $60^0, 120^0, 60^0$
(c) $120^0, 120^0, 120^0$ (d) None of these

Q 5. Two vectors have magnitudes 6 and 8 units respectively. Find the magnitude of the resultant vector if the angle between vectors is 60^0:
(a) 10 unit (b) $2\sqrt{13}$ unit

(c) $2\sqrt{37}$ unit (d) $2\sqrt{2}$ unit

Q 6. Given that $\vec{A} + \vec{B} + \vec{C} = 0$. Out of three vectors, two are equal in magnitude and the magnitude of third vector is $\sqrt{2}$ times that of either of the two having equal magnitude. Then, the angles between the vectors are given by.
(a) 30^0, 60^0, 90^0 (b) 45^0, 45^0, 90^0
(c) 45^0, 60^0, 90^0 (d) 90^0, 135^0, 135^0

Q 7. Two non-zero vectors $\vec{A}$ and $\vec{B}$ are drawn from a common point and $\vec{C} = \vec{A} + \vec{B}$, then which of the option incorrect regarding the angle between $\vec{A}$ and $\vec{B}$
(a) 90^0 if $C^2 = A^2 + B^2$ (b) Greater than 90^0 if $C^2 < A^2 + B^2$
(c) Greater than 90^0 if $C^2 > A^2 + B^2$ (d) Less than 90^0 if $C^2 > A^2 + B^2$

Q 8. A vector **a** makes 30^0, and vector **b** makes 120^0 angle with the x-axis. The magnitude of these vectors are 3 unit and 4 unit, respectively. The magnitude of resultant vector is:
(a) 5 unit (b) 4 unit
(c) 3 unit (d) 7 unit

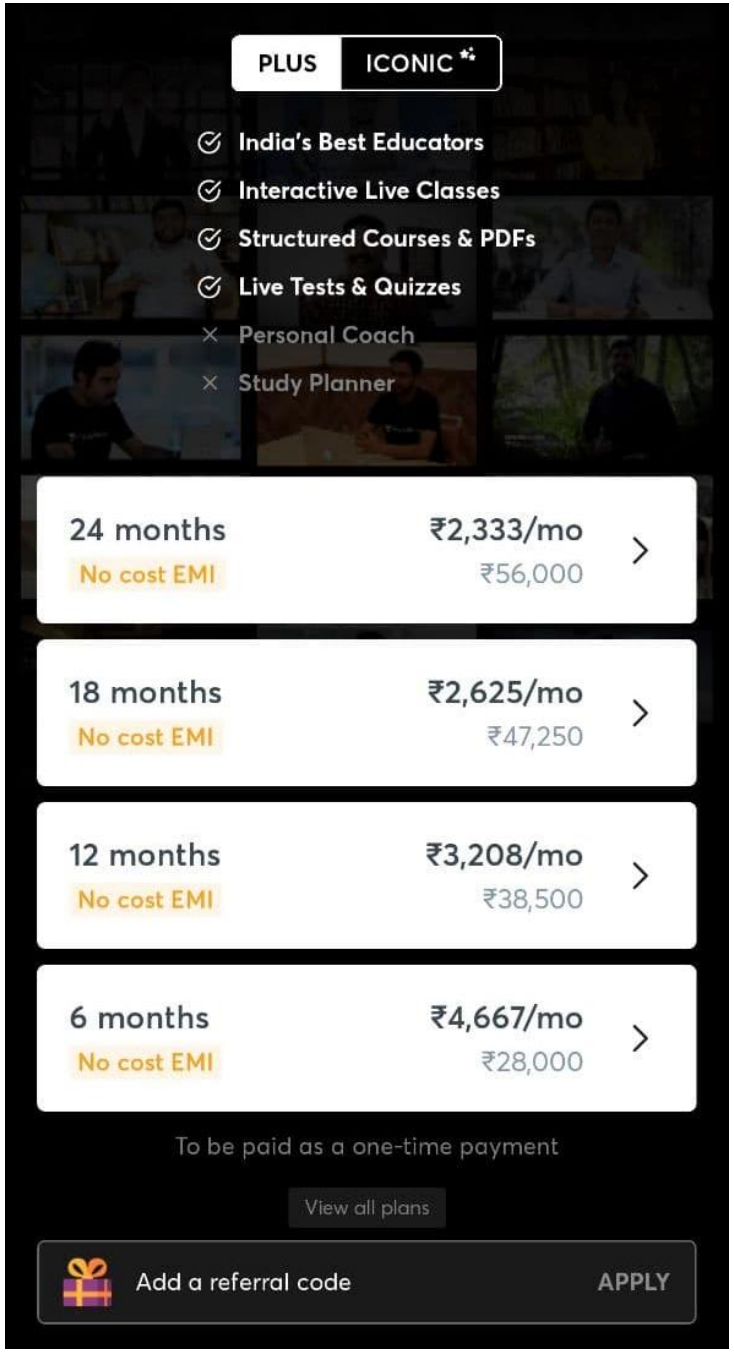
Q 9. Two Vectors having equal magnitude of 5 units, have an angle of 60^0 between them. Find the magnitude of their resultant vector and its angle α from one of the vectors:
(a) 8.66 unit, 90^0 (b) 8.66 unit, 30^0
(c) 16.8 unit, 30^0 (d) 8.66 unit, 45^0

Q 10. A force of 6 N and another of 8 N can be applied together to produce the effect of a single force of:
(a) 1 N (b) 11 N (c) 15 N (d) 20 N

Answer Key

Q.1 a	**Q.2 b**	**Q.3 d**	**Q.4 c**	**Q.5 c**

Q.6 d	Q.7 c	Q.8 a	Q.9 b	Q.10 b



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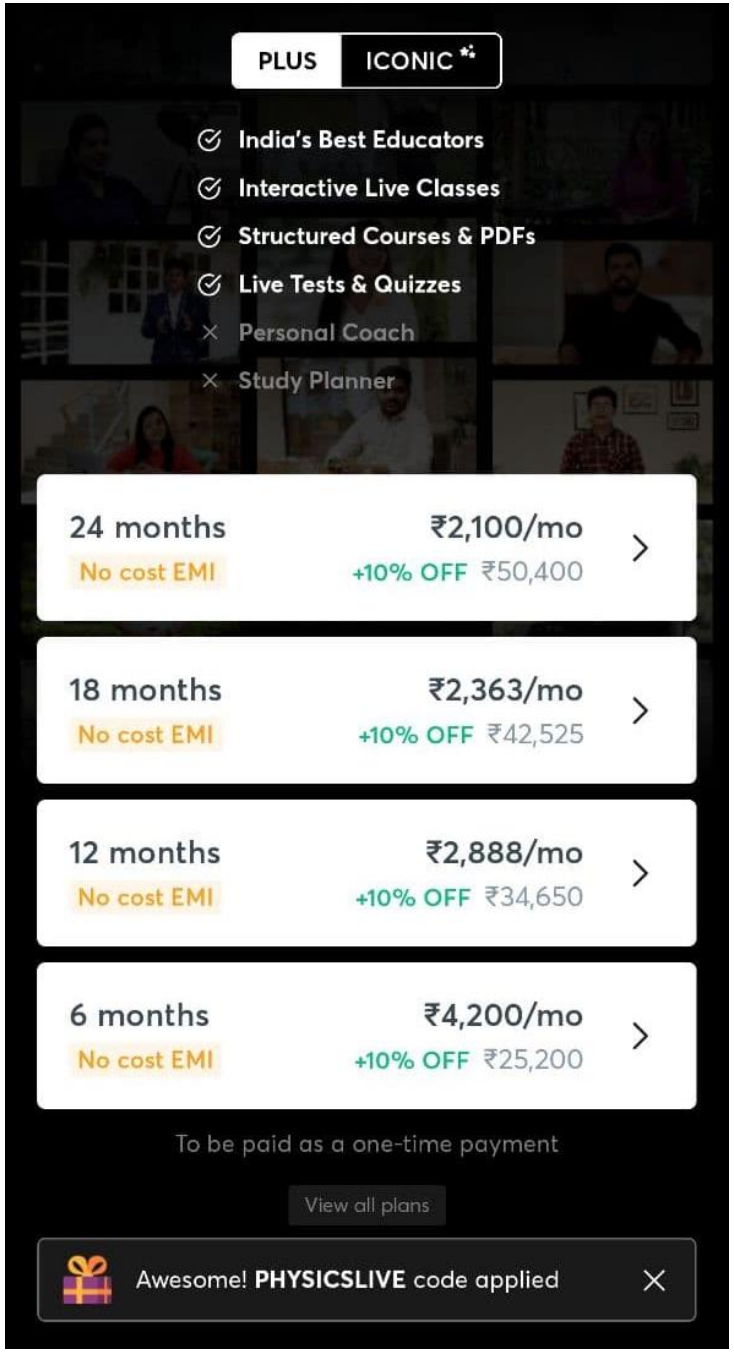


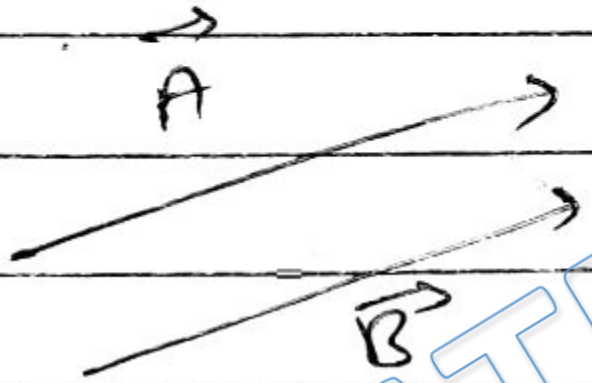
Written Solution

DPP-1 Vectors
(Basics, Angle between vectors & Triangle law of vector addition)

By Physicsaholics Team

Solution.1

For two vectors to be equal



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

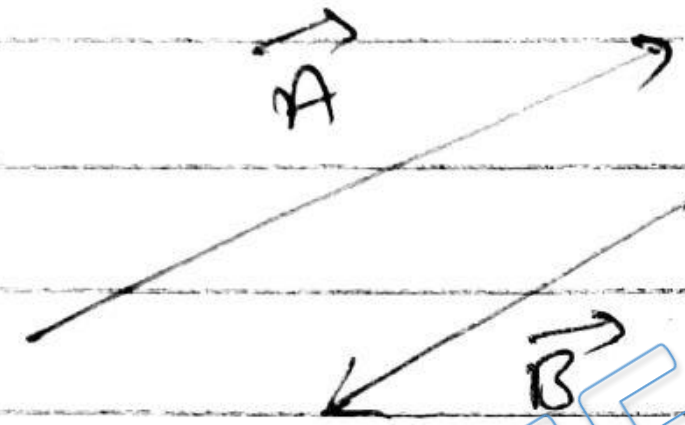
$|\vec{A}| = |\vec{B}|$

direction of $\vec{A}$ = direction of $\vec{B}$

∴ They should have same magnitude and same direction.

Ans.a

Solution.2

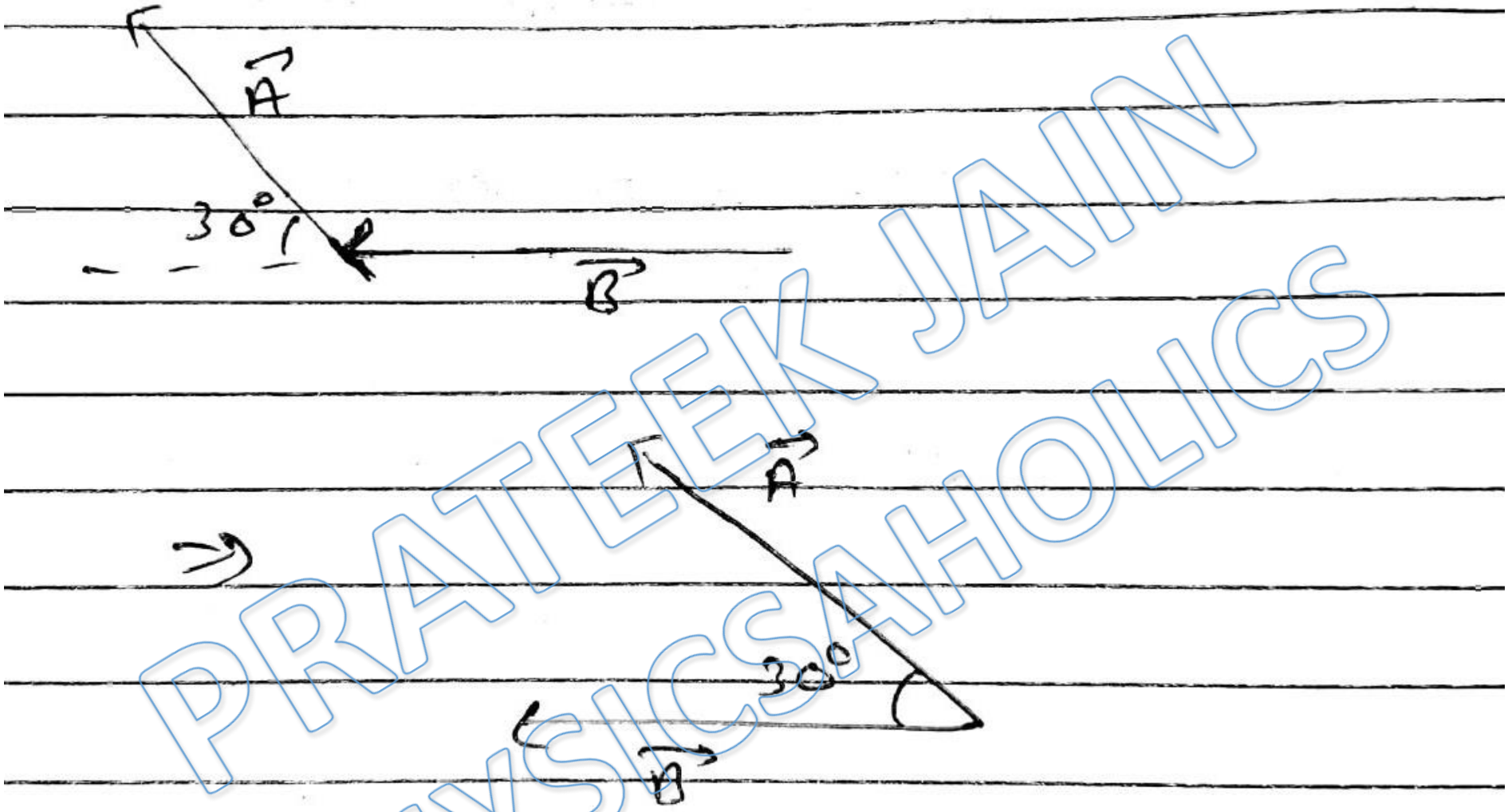


$\vec{A}$ & $\vec{B}$ are opposite in direction.

$\therefore$ $\vec{A}$ & $\vec{B}$ are antiparallel vectors.

Ans.b

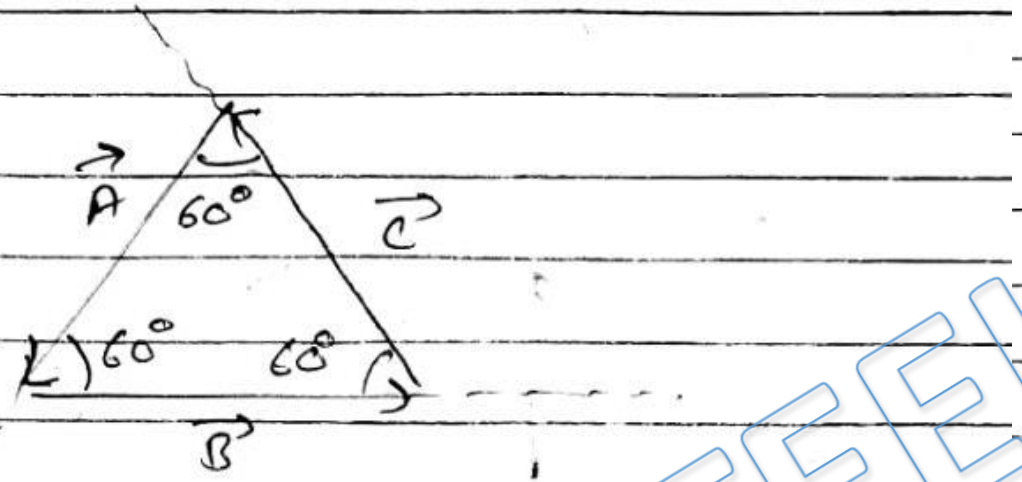
Solution.3



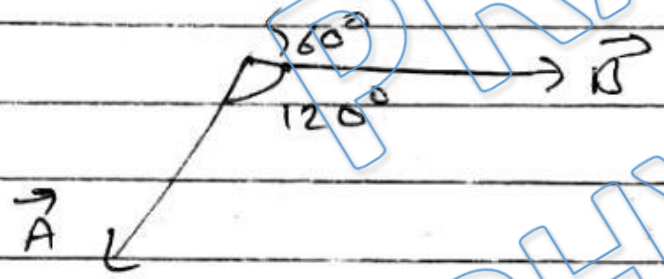
∴ Angle between $\vec{A}$ & $\vec{B}$ = 30°

Ans.d

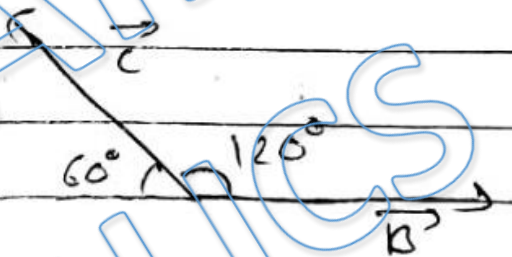
Solution.4



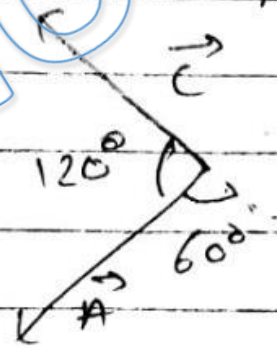
∴ Angle between $\vec{A}$ & $\vec{B}$ is : 120°



Angle between $\vec{B}$ & $\vec{C}$ is : 120°



Angle between $\vec{A}$ & $\vec{C}$



∴ Angles are 120°, 120°, 120°

Ans.c

Solution.5

$|\vec{A}| = A = 6$ units

$|\vec{B}| = B = 8$ units

$\theta = 60^\circ$

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

$$= \sqrt{6^2 + 8^2 + 2(6)(8)\cos 60^\circ}$$

$$= \sqrt{6^2 + 8^2 + 2(6)(8)\left(\frac{1}{2}\right)}$$

$$= \sqrt{36 + 64 + 48}$$

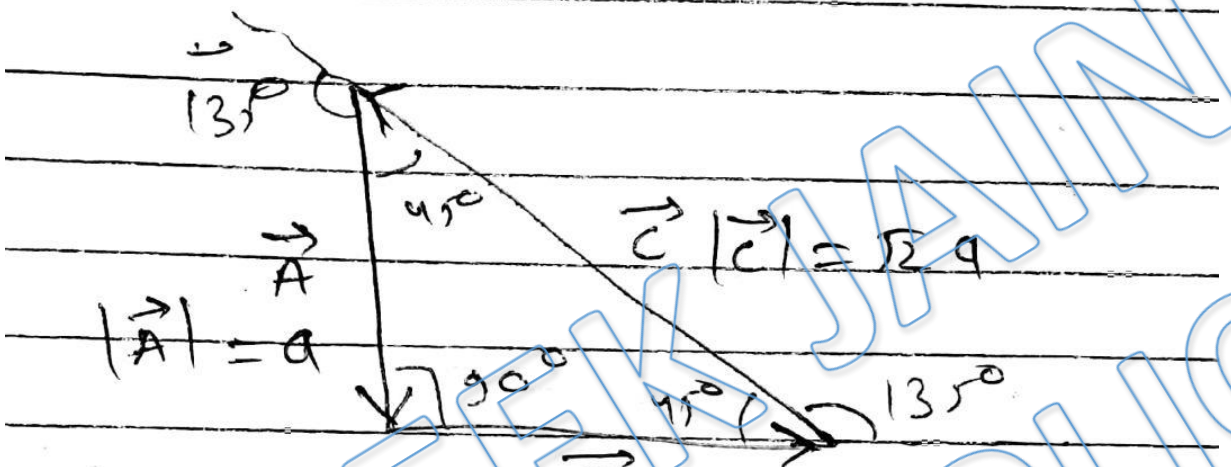
$$= \sqrt{148} = \sqrt{4 \times 37}$$

$$\boxed{R = 2\sqrt{37} \text{ units}}$$

Ans.c

Solution.6

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



Angles are:

$\angle \vec{A}\,\vec{B} = 90°$

$\angle \vec{B}\,\vec{C} = 135°$

$\angle \vec{C}\,\vec{A} = 135°$

$\therefore$ Angles are: $90°, 135°, 135°$

Ans.d

Solution.7

(a) if $\theta = 90^\circ$

$R^2 = A^2 + B^2 + 2AB\cos 90^\circ$

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

(b) if $\theta > 90^\circ$

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

for $\theta > 90^\circ \Rightarrow \cos\theta = -ve$

$\therefore R^2 < A^2 + B^2$

$\Rightarrow c^2 < A^2 + B^2$

(d) if $\theta < 90^\circ$

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

for $\theta < 90^\circ$, $\cos\theta = +ve$

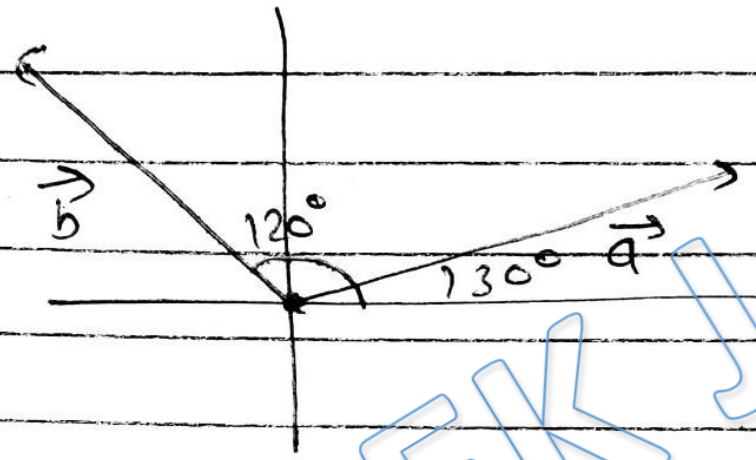
$\therefore R^2 > A^2 + B^2$

$\Rightarrow c^2 > A^2 + B^2$

$\therefore$ Incorrect option is (c)

Ans.c

Solution.8



Angle between $\vec{a}$ & $\vec{b}$ is $= 120 - 30^\circ$

$= 90^\circ$

$\therefore R^2 = A^2 + B^2 + 2AB\cos 90^\circ$

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

$R^2 = A(3)^2 + (4)^2 = 5^2$

$R = 5$ unit

Ans.a

Solution.9

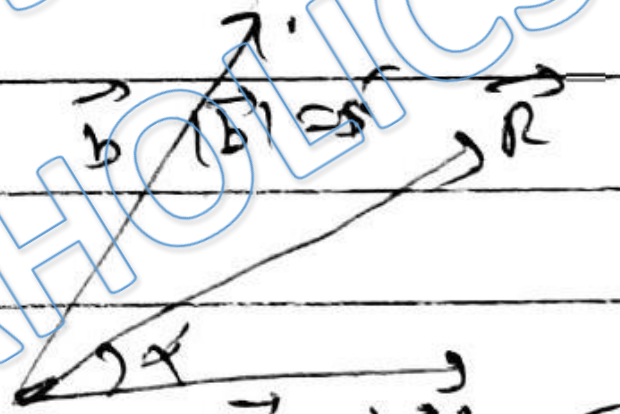
$$R^2 = A^2 + B^2 + 2AB\cos\theta$$

$$R^2 = (5)^2 + (5)^2 + 2(5)(5)\cos 60^\circ$$

$$R^2 = 2(5)^2 + 2(5)^2 \cdot \frac{1}{2} = 3(5)^2$$

$$R = 5\sqrt{3} \text{ unit}$$

$$R = 8.66 \text{ unit}$$



$$\tan\alpha = \frac{b\sin\theta}{a + b\cos\theta}$$

$$\tan\alpha = \frac{(5)(\sin 60^\circ)}{5 + 5(\cos 60^\circ)} = \frac{5\sqrt{3}/2}{1 + 1/2} = \frac{1}{\sqrt{3}}$$

$$\boxed{\alpha = 30^\circ}$$

Ans.b

Solution.10

F_{net} of GN & SN:

$|(F_1 - F_2)| \leq |F_{net}| \leq |(F_1 + F_2)|$

$2 \leq F_{net} \leq 14$

$\therefore F_{net}$ can be 11 N.

Ans.b

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