01) 4	02) 1	03) 4	04) 4	05) 4	06) 4
07) 4	08) 4	09) 2	10) 2	11) 4	12) 3

—

EXERCISE-2

1. If $\vec{A} = 3\hat{i} - 4\hat{j}$ **and $\vec{B} = -\hat{i} - 4\hat{j}$,

, calculate the direction of $\vec{A} + \vec{B}$:**

1) $\tan^{-1}(4)$ with positive X-axis in clockwise
2) $\tan^{-1}(4)$ with negative X-axis in clockwise
3) $\tan^{-1}(4)$ with positive X-axis in anticlockwise
4) $\tan^{-1}(4)$ with negative X-axis in anticlockwise

2. Two vectors are given by $\vec{a} = -2\hat{i} + \hat{j} - 3\hat{k}$ and $\vec{b} = 5\hat{i} + 3\hat{j} - 2\hat{k}$. If $3\vec{a} + 2\vec{b} - \vec{c} = 0$, then the third vector $\vec{c}$ is:

1) $4\hat{i} + 9\hat{j} - 13\hat{k}$
2) $-4\hat{i} - 9\hat{j} + 13\hat{k}$
3) $-4\hat{i} - 9\hat{j} - 13\hat{k}$
4) $2\hat{i} - 3\hat{j} + 13\hat{k}$

3. The vector sum of two vectors of magnitudes 10 units and 15 units can never be:

1) 28 units
2) 22 units
3) 18 units
4) 8 units

4. A car makes a displacement of 100 m towards east and then 200 m towards north. Find the magnitude and direction of the resultant:

1) 223.7 m, $\tan^{-1}(2)$, N of E
2) 223.7 m, $\tan^{-1}(2)$, E of N
3) 300 m, $\tan^{-1}(2)$, N of E
4) 100 m, $\tan^{-1}(2)$, N of E

5. If a vector has an x-component of -25.0 units and a y-component of 40.0 units, then the magnitude and direction of this vector is:

1) $5\sqrt{89}$ *units*; $\sin^{-1}\frac{5}{\sqrt{89}}$ with -ve x-axis

2) $5\sqrt{89}$ *units*; $\cos^{-1}\frac{5}{\sqrt{89}}$ with -ve x-axis

3) 45 *units*; $\cos^{-1}\frac{-5}{9}$ with x-axis

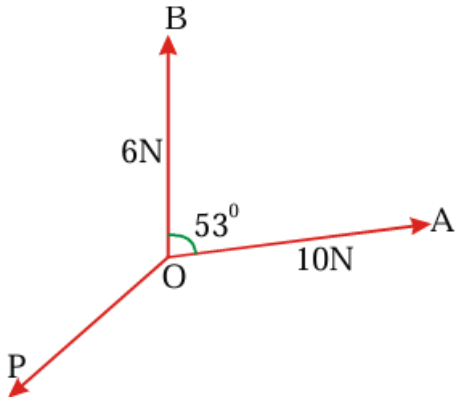
4) 45 *units*; $\sin^{-1}\frac{-5}{9}$ with x-axis

6. A force of 10 N is resolved into perpendicular components. If the first component makes 30° with the force, the magnitudes of the components are:

1) 5 N, 5 N
2) $5\sqrt{2}$ N, 5 N
3) $5\sqrt{3}$ N, 5 N
4) 10 N, $10\sqrt{3}$ N

---

7. If the system is in equilibrium ($\cos 53° = \frac{3}{5}$), then the value of 'P' is:



1) 16 N
2) 4 N
3) (208)^1/2 N
4) 232 N

8. Two billiard balls are moving on a table and the component velocities along the length and breadth are $\mathbf{5,5\ ms^{-1}}$ **for one ball $2\sqrt{3}, \mathbf{2ms^{-1}}$ for the other ball. The angle between the motion of balls is:**

1) 30°

2) 60°
3) 40°
4) 15°

9. If $\vec{A} = 2\hat{i} - 3\hat{j} + 4\hat{k}$, its components in the YZ-plane and ZX-plane are respectively:

1) $\sqrt{13}$ and $\sqrt{5}$
2) $\sqrt{5}$ and $2\sqrt{5}$
3) $2\sqrt{5}$ and $\sqrt{13}$
4) $\sqrt{13}$ and $\sqrt{29}$

10. A car weighing 1000 kg is on a slope that makes an angle of 30° with the horizontal. The component of the car's weight parallel to the slope is $(g = 10\,\mathrm{ms}^{-2})$:

1) 500 N
2) 1000 N
3) 15,000 N
4) 20,000 N

11. A room has dimensions $3\,m \times 4\,m \times 5\,m$. A fly starting at one corner ends up at the diametrically opposite corner. The magnitude of the displacement of the fly is:

1) 12 m
2) 60 m
3) $2\sqrt{5}\,m$
4) $5\sqrt{2}\,m$

12. If $\vec{P} = 2\hat{i} + \hat{j} + 6\hat{k}$, its direction cosines are:

1) $\frac{1}{41}, \frac{2}{41}$ and $\frac{6}{41}$ 2) $\frac{1}{\sqrt{41}}, \frac{2}{\sqrt{41}}$ and $\frac{6}{\sqrt{41}}$
3) $\frac{3}{\sqrt{41}}, \frac{8}{\sqrt{41}}$ and $\frac{7}{\sqrt{41}}$ 4) 1, 2 and 6

---

01) 1	02) 1	03) 1	04) 1	05) 2	06) 3
07) 3	08) 4	09) 2	10) 1	11) 4	12) 2

EXERCISE-3

1. If $\vec{A} = 3\hat{i} - 4\hat{j}$ **and** $\vec{B} = -\hat{i} - 4\hat{j}$, , calculate the direction of $\vec{A} - \vec{B}$.
   1. along the positive x-axis
   2. along the negative x-axis
   3. along the positive y-axis

4. along the negative y-axis

2. The resultant of the forces $\vec{F}_1 = 4\hat{i} - 3\hat{j}$ and $\vec{F}_2 = 6\hat{i} + 8\hat{j}$ is

1) $5\sqrt{5}$ 2) $10\hat{i} - 5\hat{j}$ 3) 125 4) $-2\hat{i} - 3\hat{j}$

3. The vector sum of two vectors of magnitudes 10 units and 15 units can never be

1. 20 units
2. 22 units
3. 18 units
4. 3 units

4. A car moves 40 m due east and turns towards the north and moves 30 m, then turns 45° east of north and moves $20\sqrt{2}$ m. The net displacement of the car is (east is taken as the positive x-axis, north as the positive y-axis)

1. $50\hat{i} + 60\hat{j}$
2. $60\hat{i} + 50\hat{j}$
3. $30\hat{i} + 40\hat{j}$
4. $40\hat{i} + 30\hat{j}$

5. A bird moves in such a way that it has a displacement of 12 m towards the east, 5 m towards the north, and 9 m vertically upwards. Find the magnitude of its displacement.

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

6. An aeroplane is heading northeast at a speed of $141.4\,\text{ms}^{-1}$. The northward component of its velocity is

1. $141.4\,\text{ms}^{-1}$
2. $100\,\text{ms}^{-1}$
3. zero
4. $50\,\text{ms}^{-1}$

7. The unit vector parallel to the resultant of the vectors

$\vec{A} = 4\hat{i} + 3\hat{j} + 6\hat{k}$
and
$\vec{B} = -\hat{i} + 3\hat{j} - 8\hat{k}$ is

1) $\frac{1}{7}\left(3\hat{i} + 6\hat{j} - 2\hat{k}\right)$ 2) $\frac{1}{7}\left(3\hat{i} + 6\hat{j} + 2\hat{k}\right)$

3) $\frac{1}{49}\left(3\hat{i} + 6\hat{j} - 2\hat{k}\right)$ 4) $\frac{1}{49}\left(3\hat{i} - 6\hat{j} + 2\hat{k}\right)$

8. The vector parallel to $4\hat{i} - 3\hat{j} + 5\hat{k}$ and whose length is the arithmetic mean of lengths of two vectors $2\hat{i} - 4\hat{j} + 4\hat{k}$ **and** $\hat{i} + \sqrt{6}\hat{j} + 3\hat{k}$ is

1) $4\hat{i}-3\hat{j}+5\hat{k}$ 2) $(4\hat{i}-3\hat{j}+5\hat{k})/\sqrt{3}$

3) $(4\hat{i}-3\hat{j}+5\hat{k})/\sqrt{2}$ 4) $(4\hat{i}-3\hat{j}+5\hat{k})/\sqrt{5}$

9. The direction cosines of a vector A

$\cos a=\frac{4}{5\sqrt{2}}$, $\cos b=\frac{1}{\sqrt{2}}$ **and** $\cos g=\frac{3}{5\sqrt{2}}$

1) $4\hat{i}+\hat{j}+3\hat{k}$ 2) $4\hat{i}+5\hat{j}+3\hat{k}$

3) $4\hat{i}-5\hat{j}-3\hat{k}$ 4) $\hat{i}+5\hat{j}-\hat{k}$

10. Given two vectors $\vec{A}=\hat{i}-2\hat{j}-3\hat{k}$ **and** $\vec{B}=4\hat{i}-2\hat{j}+6\hat{k}$ **. The angle made by** $(\vec{A}+\vec{B})$ **with the X - axis is** **(2007 M)**

1) 30^0 2) 45^0 3) 60^0 4) 90^0

11. To go from town A to town B, a plane must fly about 1780 km at an angle of 30° West of north. How far West of A is B?

1. 1542 km
2. 1452 km
3. 1254 km
4. 890 km

12. A vector $\hat{i}+\sqrt{3}\hat{j}$ rotates about its tail through an angle 60^0 in clockwise direction then the new vector is

1) $\hat{i}+\sqrt{3}\hat{j}$ 2) $3\hat{i}-4\hat{j}$ 3) $2\hat{j}$ 4) $2\hat{i}$

---

01) 1 02) 1 03) 4 04) 2 05) 2 06) 2
07) 1 08) 3 09) 2 10) 2 11)4 12)4

EXERCISE-4

1. A man travels 1 mile due east, then 5 miles due south, then 2 miles due east, and finally 9 miles due north. His displacement is

1. 3 miles
2. 5 miles
3. 4 miles
4. between 5 and 9 miles

2. Three forces $\vec{F}_1=a(\hat{i}-\hat{j}+\hat{k})$, $\vec{F}_2=2\hat{i}-3\hat{j}+4\hat{k}$ **and** $\vec{F}_3=8\hat{i}-7\hat{j}+6\hat{k}$ **act simultaneously on a particle. If the particle is in equilibrium, the value of a is**

1) 10 2) -10 3) 8 4) 2

3. If a particle is displaced from (0,0,0) to a point in the XY-plane which is at a distance of 4 units in a direction making an angle 60° clockwise with the negative x-axis, what is the final position vector of the particle?

1) $-2\hat{i}+2\sqrt{3}\hat{j}$ 2) $2\hat{i}+2\sqrt{3}\hat{j}$

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

4. Cosines of angles made by a vector with the X, Y axes are $\frac{3}{5\sqrt{2}}, \frac{4}{5\sqrt{2}}$ respectively. If the magnitude of the vector is $10\sqrt{2}$, then that vector is

1. $8\hat{i}+6\hat{j}-10\hat{k}$
2. $6\hat{i}-8\hat{j}-10\hat{k}$
3. $6\hat{i}-8\hat{j}+10\hat{k}$
4. $6\hat{i}+8\hat{j}+10\hat{k}$

5. If a vector $\vec{A}$ makes angles 45° and 60° with the x and y axes respectively, then the angle made by it with the z-axis is

1. 30°
2. 60°
3. 90°
4. 120°

6. A vector $\vec{Q}$ which has a magnitude of 8 is added to the vector $\vec{P}$ which lies along the X-axis. The resultant of these two vectors is a third vector $\vec{R}$ which lies along the Y-axis and has a magnitude twice that of $\vec{P}$. The magnitude of $\vec{P}$ is

1) $\frac{6}{\sqrt{5}}$ 2) $\frac{8}{\sqrt{5}}$ 3) $\frac{12}{\sqrt{5}}$ 4) $\frac{16}{\sqrt{5}}$

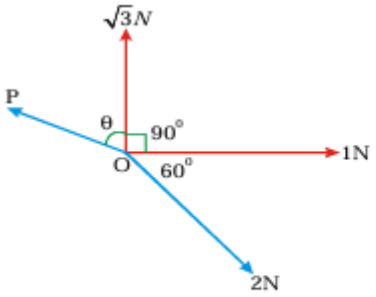
---

1) 2 2) 2 3) 1 4) 4 5) 2 6)2

EXERCISE-5

1. A particle has a displacement of 12 m towards east, then 5 m towards north, and then 6 m vertically upwards. The resultant displacement is nearly
   1. 10.04 m
   2. 12.10 m
   3. 14.32 m
   4. 13.06 m

2. 2. Four co-planar concurrent forces are acting on a body as shown in the figure to keep it in equilibrium. Then the values of P and q are



1) P = 4N , $q = 0^0$
2) P= 2N, $q = 90^0$
3) P = 2N , $q = 0^0$
4) P= 4N, $q = 90^0$

3. O is a point on the ground chosen as origin. A body first suffers a displacement of $10\sqrt{2}$ m North-East, next 10 m north, and finally $10\sqrt{2}$ m North-West. How far is it from the origin?
   1. 30 m north
   2. 30 m south
   3. 30 m west
   4. 30 m east

4. If the two directional cosines of a vector are $\frac{1}{\sqrt{2}}$ **and** $\frac{1}{\sqrt{3}}$, then the value of the third directional cosine is

1. $\frac{1}{\sqrt{6}}$ 2. $\frac{1}{\sqrt{5}}$ 3. $\frac{1}{\sqrt{7}}$ 4. $\frac{1}{\sqrt{10}}$

---

1) 3 2) 2 3) 1 4) 1