Daily Practice Problems-02

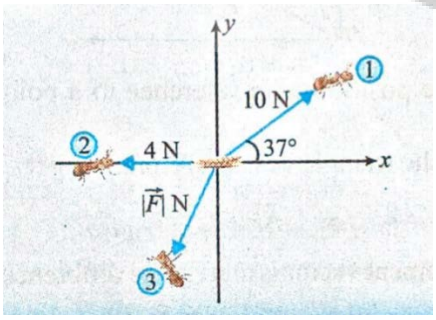
Q1. Given: $(2\hat{\imath} - \hat{\jmath} + 3\hat{k})$ *and* $\vec{B} = (3\hat{\imath} - 2\hat{\jmath} - 2\hat{k})$. Find the unit vector of

a. $(\vec{A} + \vec{B})$ and
b. $(\vec{A} - \vec{B})$

Q2. The unit vector parallel to the resultant of the vectors: $\vec{A} = 4\hat{\imath} + 3\hat{\jmath} + 6\hat{k}$ *and* $\vec{B} = -\hat{\imath} + 3\hat{\jmath} - 8\hat{k}$ is

a. $\frac{1}{7}(3\hat{\imath} + 6\hat{\jmath} - 2\hat{k})$
b. $\frac{1}{7}(3\hat{\imath} + 6\hat{\jmath} + 2\hat{k})$
c. $\frac{1}{49}(3\hat{\imath} + 6\hat{\jmath} - 2\hat{k})$
d. $\frac{1}{49}(3\hat{\imath} - 6\hat{\jmath} + 2\hat{k})$

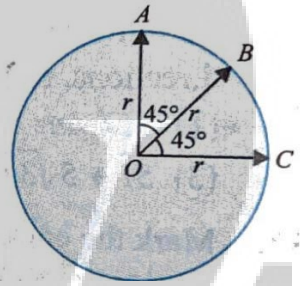
Q3. Three ants 1, 2 and 3 are pulling a grain with forces of magnitude 10 N, 4 N and $|\vec{F}|N$ as shown in the figure. Find the force $\vec{F}$ if the grain remains in equilibrium under the action of the above forces.



Q4. If vectors $\vec{A} = \hat{\imath} + 2\hat{\jmath} + 4\hat{k}$ *and* $\vec{B} = 5\vec{\imath}$ represent the two sides of a triangle, then the third side of the triangle can have length equal to

a. 6
b. $\sqrt{56}$
c. Both of the above
d. None of the above

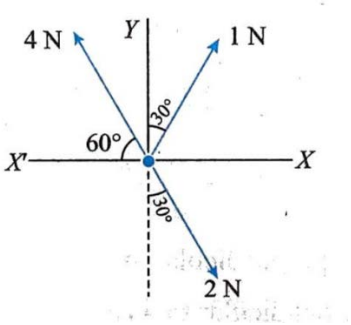
Q5. The resultant of the three vectors $\overrightarrow{OA}, \overrightarrow{OB}, and\ \overrightarrow{OC}$ shown



in figure is

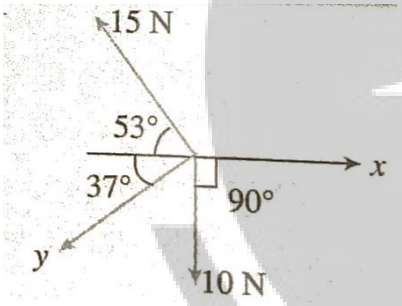
a. r
b. 2r
c. $r(1 + \sqrt{2})$
d. $r(\sqrt{2} - 1)$

Q6. Three forces are acting on a particle as shown in the figure. To have the resultant force only along the Y-direction, the magnitude of the minimum additional force needed is

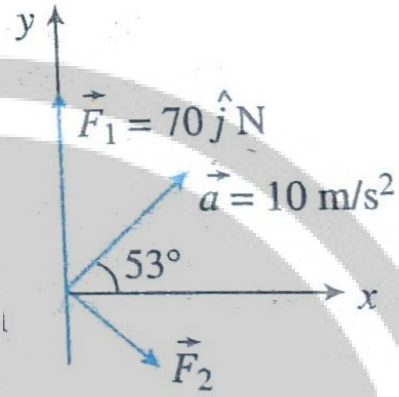


a. 0.866 N
b. 1.732 N
c. 0.5N
d. 4 N

Q7. Find the magnitude of the unknown forces if the sum of all forces is zero figure.



Q8. A particle of m = 5 kg is momentarily at rest at x = 0 at t = 0. It is acted upon by two forces $\vec{F_1}$ and $\vec{F_2}$. $\vec{F} = 70\,\hat{j}$ N The direction and magnitude of $\vec{F_2}$ are unknown. The particle experiences a constant acceleration, $\vec{a}$, in the direction as shown in figure. Neglect gravity.



(a) Find the missing force $\vec{F_2}$.

(b) What is the velocity vector of the particle at t = 10 s?

(c) What third force, $\vec{F_3}$, is required to make the acceleration of the particle zero? Either give magnitude and direction of $\vec{F_3}$, or its components.

ANSWERS

1. **(i)** $\frac{5\hat{\imath}-3\hat{\jmath}+\hat{k}}{\sqrt{35}}$ **(ii)** $\frac{-\hat{\imath}+\hat{\jmath}+5\hat{k}}{\sqrt{27}}$

2. a

3. $-(4\hat{\imath}+6\hat{\jmath})N$

4. b

5. c

6. c

7. $x=\frac{25}{3}\,N, \quad y=\frac{10}{3}\,N$

8. **(a)** $|\widehat{F_2}|=30\sqrt{2}\,N$ **(b)** $v=(60\hat{\imath}+80\hat{\jmath})m\backslash s$
(c) $\overrightarrow{F_3}=(-30\hat{\imath}-40\hat{\jmath})N$