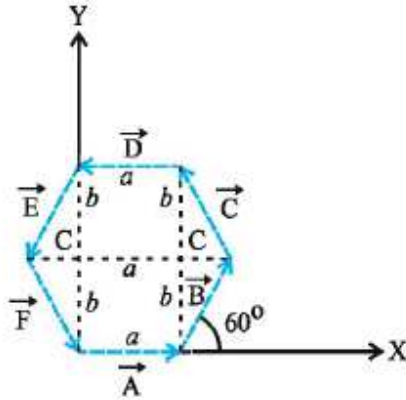# XI Physics: 04 Motion in a Plane (Vectors) Numerical Series — 2018

1. As shown in fig., six vectors A, B, C, D, E and F fform a regular hexagon. Using the algebraic method of addition of vectors show that their resultant is zero.



2. Find the angle between two vectors A = -2i + 2j – 4k and B = 2i + 4j – 2k. **(Ans: 60°)**

3. Using vector product show that for a plane triagle

$$\frac{sin\alpha}{A} = \frac{sin\beta}{B} = \frac{sin\gamma}{C}$$ where α, β and γ are angles and A, B and C are length of sides opposite to them respectively

4. Three non zero vectors $\vec{A}$, $\vec{B}$ and $\vec{C}$ satisfy the equation $\vec{A} + \vec{B} = \vec{C}$ and their magnitude satisfy the equation $A^2 + B^2 = C^2$. How would A be oriented with respect to B? Account for your answer.

5. Obtain the component of vector A = 2i + 3j in the direction i + j. **(Ans: 5/√2)**

6. Find the angle between A and B vectors if $|A + B| = |A – B|$ **(Ans: 90°)**

7. The magnitude of x component of the position vector of a particle is 3 m and it is in negatie X direction. The magnitude of y component of this vector is 4 m and it is in negative Y direction. Find the magnitude of this vector and its direction with respect to negative X axis. **(Ans: 5 m, tan⁻¹ (4/3) )**

8. Two forces of equal magnitude act on a particle. If the angle between them is θ, show that the magnitude of the resultant force is **2Fcos(θ/2)**.

9. A, B and C are three non-collinear, non co-planar vectors.What can you say about direction of A × (B × C)?

10. The resultant of to vectors P and Q is perpendicular to P and its magnitude is half that of Q. What is the angle between P and Q? **(Ans: 150°)**

**11.** Two vectors both equal in magnitude have their resultant equal in magnitude of the either. Find the angle between the two vectors. **(Ans: 120$^o$)**

**12.** Two forces whose magnitudes are in the ratio of 3:5 give a resultant of 35 N. If the angle of inclination be 60$^o$, calculate the magnitude of each force. **(Ans: 15 N, 25 N)**

**13.** The sum of the magnitudes of two forces acting at a point is 18 N and the magnitude of their resultant is 12 N. If the resultant makes an angle of 90$^o$ with the force of smaller magnitude, what are the magnitudes of the two forces? **(Ans: 5 N, 13 N)**

**14.** If unit vectors a and b are inclined at angle θ then prove that |**a** - **b**| = 2sin(θ/2).

**15.** If A = 3i + 4j and B = 7i + 24j, find a vector having the same magnitude as B and parallel to A. **(Ans: 15i + 20j)**

**16.** Prove that A = 6i + 9j – 12k and B = 2i + 3j – 4k are parallel.

**17.** Find the area of parallelogram whose adjacent sides are given by, A = 3i + 2j and B = -3i + 7j. **(Ans: 27 sq.units)**

**18.** Find a vector whose length is 7 and which is perpendicular to both A = 2i – 3j + 6k and B = i + j – k. **(Ans: $\frac{-3i+8j+5k}{\sqrt{2}}$)**

**19.** The diagonals of a parallelogram are given by A = 3i + 2j – 7k and B = 5i + 6j – 3k. Find the area of the parallelogram. **(Ans: 22.56 sq.units)**

**20.** Identify whether A = i + j –k, B = i -2j + k and C = i – j – k are coplanar vectors or not?

**21.** If P = 4i – 2j + 6k and Q = i – 2j - 3k then the angle which P + Q makes with x-axis is? **(Ans: cos$^{-1}$(5/√50))**

**22.** If A + B = C and A = √3, B = √3 and C = 3, then the angle between A and B is? **(Ans: 60$^o$)**

**23.** P + Q is a unit vector along X axis. If P = i – j + k, then find Q. **(Ans: j – k)**

**24.** The magnitude of vector product of two vectors is √3 times their scalar product. The angle between the two vectors is? **(Ans: 60$^o$)**

**25.** If A, B and C are the unit vectors along the incident ray, reflected ray and outward normal to the reflecting surface then show that **B = A – 2(A.C)C**.