Q32. The resultant of $\vec{A}$ & $\vec{B}$ is perpendicular to $\vec{A}$. What is the angle between $\vec{A}$ & $\vec{B}$?

(a) $\cos^{-1}\left(\frac{A}{B}\right)$ (b) $\cos^{-1}\left(-\frac{A}{B}\right)$ (c) $\sin^{-1}\left(\frac{A}{B}\right)$ (d) $\sin^{-1}\left(-\frac{A}{B}\right)$

Q33. What should be the angle between $\Delta\vec{A}$ & $\vec{A}$ so that $|\Delta\vec{A}| = \Delta|\vec{A}|$?

(a) 0^0 (b) 30^0 (c) 60^0 (d) 90^0

Q34. The diagonals of a parallelogram are represented by vectors $\vec{p} = 5\hat{i} - 4\hat{j} + 3\hat{k}$ & $\vec{q} = 3\hat{i} + 2\hat{j} - \hat{k}$. Then the area of the parallelogram is:

(a) $\sqrt{171}$ units (b) $\sqrt{72}$ units (c) 171 units (d) 72 units

Q35. The direction of a vector $\vec{A}$ is reversed. What are the values of $\Delta\vec{A}$ & $\Delta|\vec{A}|$?

(a) $+2\vec{A}, 0$ (b) $+\vec{A}, 0$ (c) $-2\vec{A}, 0$ (d) $-\vec{A}, 0$

Q36. At what angle should the two unit vectors be inclined so that their resultant is also a unit vector?

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

Q37. A vector of length l is turned through the angle θ about its tail. What is the change in the position vector of its head?

(a) $l\cos(\theta/2)$ (b) $2l\sin(\theta/2)$ (c) $2l\cos(\theta/2)$ (d) $l\sin(\theta/2)$

Q38. Given that A = B. What is the angle between $\vec{A} + \vec{B}$ & $\vec{A} - \vec{B}$?

(a) 30^0 (b) 60^0 (c) 90^0 (d) 180^0

Q39. Given that $\vec{A} + \vec{B} = \vec{R}$ & $\vec{A} + 2\vec{B}$ is perpendicular to $\vec{A}$. Then:

(a) $2B = R$ (b) $B = 2R$ (c) $B = R$ (d) $B^2 = 2R^2$

Q40. Angle between $\vec{P}$ & $\vec{Q}$ is θ. What is the value of $\vec{P}\cdot\vec{Q}\times\vec{P}$?

(a) $P^2Q\cos\theta$ (b) zero (c) $P^2Q\sin\theta\cos\theta$ (d) $P^2Q\sin\theta$

Q41. If the vectors $\vec{P} = a\hat{i} + a\hat{j} + 3\hat{k}$ & $\vec{Q} = a\hat{i} - 2\hat{j} - \hat{k}$ are perpendicular to each other, then the positive value of a is:

(a) 3 (b) 2 (c) 1 (d) 0

Q42. The area of the triangle whose vertices are ***A***(1, –1, 2), ***B***(2, 1, –1) & ***C***(3, –1, 2) is:

(a) 26 (b) $7\sqrt{13}$ (c) $\sqrt{13}$ (d) 8

Q43. Two forces P and Q have a resultant perpendicular to P. The angle between the forces is:

(a) $\tan^{-1}(-P/Q)$ (b) $\tan^{-1}(P/Q)$ (c) $\sin^{-1}(P/Q)$ (d) $\cos^{-1}(-P/Q)$

Shrinivas Academy

Tutorial Sheet No. 1.01 (Dimensions & Vectors) (IXth Foundation Batch)

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Q1. Consider the following equation of Bernoulli theorem: $P + \frac{1}{2}\rho v^2 + \rho gh = K$ (constant). The dimensions of K/P are same as:

(a) Thrust (b) Pressure (c) Angle (d) Viscosity

Q2. Dimensions of electrical resistance is:

(a) $[ML^2T^{-3}A^{-1}]$ (b) $[ML^2T^{-3}A^{-2}]$ (c) $[ML^3T^{-3}A^{-2}]$ (d) $[ML^{-1}T^3A^2]$

Q3. In a system of units, if force (F), acceleration (A) and time (T) are taken as fundamental units then the dimensional formula of energy is:

(a) $[FA^2T]$ (b) $[FAT^2]$ (c) $[F^2AT]$ (d) $[FAT]$

Q4. Dimensional formula of intensity of radiation is:

(a) $[M^1L^2T^{-2}]$ (b) $[M^1L^0T^3]$ (c) $[M^1L^0T^{-3}]$ (d) $[M^0L^2T^{-2}]$

Q5. Solar constant may be defined as the amount of solar energy received per cm^2 per minute. The dimension of solar constant is:

(a) $[ML^2T^{-3}]$ (b) $[ML^0T^{-1}]$ (c) $[ML^0T^{-2}]$ (d) $[M^1L^0T^{-3}]$

Q6. If E = energy, G = gravitational constant, I = impulse and M = mass, the dimensions of GIM^2/E^2 are same as that of:

(a) Time (b) Mass (c) Length (d) Force

Q7. If force is proportional to square of velocity, then the dimensions of proportionality constant is:

(a) $[ML^{-1}T]$ (b) $[ML^{-1}T^0]$ (c) $[MLT^0]$ (d) $[M^0LT^{-1}]$

Q8. Dimensions of power are:

(a) $[ML^2T^{-3}]$ (b) $[ML^3T^{-2}]$ (c) $[ML^2T^{-2}]$ (d) $[ML^{-1}T^{-1}]$

Q9. A gas bubble formed from an explosion under water oscillates with a period T proportional to $p^a d^b E^c$, where P is pressure d is the density of water and E is the total energy of explosion. The value of a,b,c are:

(a) $a = 1$, b = 1, c = 2 (b) $a = 1$, b = 2, c = 1

(c) $a = \frac{5}{6}$, b = $\frac{1}{2}$, c = $\frac{1}{3}$ (d) $a = -\frac{5}{6}$, b = $\frac{1}{2}$, c = $\frac{1}{3}$

Q10. A vector $\vec{A}$ points vertically upwards and $\vec{B}$ points towards north. The vector product $\vec{A}\times\vec{B}$ is:

(a) along west (b) along east (c) zero (d) vertically downwards

Q11. If $\left|\vec{A}\times\vec{B}\right|=\sqrt{3}\left(\vec{A}\cdot\vec{B}\right)$, then the value of $\left|\vec{A}+\vec{B}\right|$ is:

(a) $\left(A^2+B^2+AB\right)^{1/2}$ (b) $\left(A^2+B^2+\frac{AB}{\sqrt{3}}\right)^{1/2}$ (c) $A+B$ (d) $\left(A^2+B^2+\sqrt{3}AB\right)^{1/2}$

Q12. The minimum number of vectors of equal magnitude required to produce a zero resultant is:

(a) 2 (b) 3 (c) 4 (d) more than 4

Q13. The minimum number of vectors of unequal magnitude required to produce a zero resultant is:

(a) 2 (b) 3 (c) 4 (d) more than 4

Q14. What is the maximum number of components into which a vector can be split?

(a) 2 (b) 3 (c) 4 (d) infinite

Q15. What is the maximum number of rectangular components into which a vector can be split in space?

(a) 2 (b) 3 (c) 4 (d) infinite

Q16. What is the maximum number of rectangular components into which a vector can be split in its own plane?

(a) 2 (b) 3 (c) 4 (d) infinite

Q17. Vector sum of two forces of 10 N and 6 N cannot be:

(a) 4 N (b) 8 N (c) 12 N (d) 2 N

Q18. If $\vec{A}+\vec{B}=\vec{C}$ and the magnitudes of $\vec{A}$, $\vec{B}$ and $\vec{C}$ are 5, 4 and 3 units respectively, the angle between $\vec{A}$ and $\vec{C}$ is:

(a) $\cos^{-1}\left(\frac{3}{5}\right)$ (b) $\cos^{-1}\left(\frac{4}{5}\right)$ (c) $\frac{\pi}{2}$ (d) $\sin^{-1}\left(\frac{3}{4}\right)$

Q19. If $\vec{A}\cdot\vec{B}=\left|\vec{A}\times\vec{B}\right|$, then angle θ between vectors $\vec{A}$ and $\vec{B}$ is:

(a) 0 (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{2}$ (d) π

Q20. A force vector applied on a mass is represented as $\vec{F}=6\hat{i}-8\hat{j}+10\hat{k}$ and the mass accelerates with 1 m/s². What will be the mass of the body?

(a) $10\sqrt{2}$ kg (b) $2\sqrt{10}$ kg (c) 10 kg (d) 20 kg

Q21. The angle between two vectors $2\hat{i}+3\hat{j}+\hat{k}$ & $-3\hat{i}+6\hat{k}$ is:

(a) 0^0 (b) 45^0 (c) 60^0 (d) 90^0

Q22. If a unit vector is represented by $0.5\hat{i}+0.8\hat{j}+c\hat{k}$, then the value of c is:

(a) 1 (b) $\sqrt{0.11}$ (c) $\sqrt{0.01}$ (d) $\sqrt{0.39}$

Q23. Let $\vec{A}=\hat{i}A\cos\theta+\hat{j}A\sin\theta$, be any vector. Another vector $\vec{B}$ which is normal to $\vec{A}$ is:

(a) $\hat{i}B\cos\theta+\hat{j}B\sin\theta$ (b) $\hat{i}B\sin\theta+\hat{j}B\cos\theta$

(c) $\hat{i}B\sin\theta-\hat{j}B\cos\theta$ (d) $\hat{i}A\cos\theta-\hat{j}A\sin\theta$

Q24. Which of the following is ***not essential*** for the three vectors to produce zero resultant?

(a) The resultant of any two vectors should be equal and opposite to the third vector

(b) They should lie in the same plane

(c) They should act along the sides of a parallelogram

(d) It should be possible to represent them by the three sides of triangle taken in order

Q25. If $\vec{A}+\vec{B}$ is unit vector along x-axis and $\vec{A}=\hat{i}-\hat{j}+\hat{k}$, then what is $\vec{B}$?

(a) $\hat{j}+\hat{k}$ (b) $\hat{j}-\hat{k}$ (c) $\hat{i}+\hat{j}+\hat{k}$ (d) $\hat{i}+\hat{j}-\hat{k}$

Q26. What is the angle between $\hat{i}+\hat{j}+\hat{k}$ & $\hat{i}$?

(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{3}$ (d) None of these

Q27. A truck travelling due north at 30 m/s turns west and travels at the same speed, then the change in velocity is:

(a) 60 m/s north-west (b) $30\sqrt{2}$ m/s north-west

(c) $30\sqrt{2}$ m/s south-west (d) 60 m/s south-west

Q28. Resultant of two vectors $\vec{A}$ & $\vec{B}$ is inclined at 45^0 to either of them. What is the magnitude of resultant?

(a) A + B (b) A – B (c) $\sqrt{A^2+B^2}$ (d) $\sqrt{A^2-B^2}$

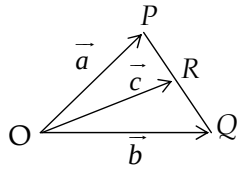
Q29. The unit vector along $\hat{i}+\hat{j}$ is:

(a) $\hat{k}$ (b) $\hat{i}+\hat{j}$ (c) $\frac{\hat{i}+\hat{j}}{\sqrt{2}}$ (d) $\frac{\hat{i}+\hat{j}}{2}$

Q30. What is the projection of $3\hat{i}+4\hat{k}$ on the y-axis?

(a) 3 (b) 4 (d) 5 (d) none of these

Q31. The figure besides shows three vectors $\vec{a},\vec{b}$ & $\vec{c}$, where R is the midpoint of PQ. Then which of the following relations is correct?



(a) $\vec{a}+\vec{b}=2\vec{c}$ (b) $\vec{a}+\vec{b}=\vec{c}$

(c) $\vec{a}-\vec{b}=2\vec{c}$ (d) $\vec{a}-\vec{b}=\vec{c}$