ALLEN® CAREER INSTITUTE KOTA (RAJASTHAN)

path to success

PRE-MEDICAL

PHYSICS

ENTHUSIAST | LEADER | ACHIEVER

EXERCISE

Basic Mathematics used in physics & Vectors

ENGLISH MEDIUM

EXERCISE-I (Conceptual Questions)

Build Up Your Understanding

TRIGONOMETRY

1. As θ increases from 0° to 90°, the value of $\cos\theta$:-

(1) Increases

(2) Decreases

(3) Remains constant

(4) First decreases then increases.

BM0001

2. The greatest value of the function $-5\sin\theta + 12\cos\theta$ is

(1) 12 (2) 13 (3) 7 (4) 17

BM0002

3. If $\tan\theta = \frac{1}{\sqrt{5}}$ and θ lies in the first quadrant, the value of $\cos\theta$ is :

(1) $\sqrt{\frac{5}{6}}$ (2) $-\sqrt{\frac{5}{6}}$

(3) $\frac{1}{\sqrt{6}}$ (4) $-\frac{1}{\sqrt{6}}$

BM0003

CALCULUS

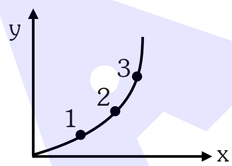
4. The coordinates of a particle moving in XY–plane vary with time as $x = 4t^2$; $y = 2t$. The locus of the particle is a :-

(1) Straight line (2) Circle

(3) Parabola (4) Ellipse

BM0004

5. The slope of graph as shown in figure at points 1, 2 and 3 is m_1, m_2 and m_3 respectively then



(1) $m_1 > m_2 > m_3$ (2) $m_1 < m_2 < m_3$

(3) $m_1 = m_2 = m_3$ (4) $m_1 = m_3 > m_2$

BM0005

6. A particle moves along the straight line $y = 3x + 5$. Which coordinate changes at a faster rate ?

(1) x–coordinate

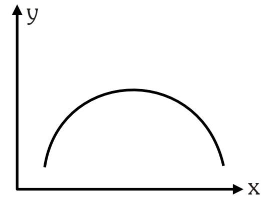
(2) y–coordinate

(3) Both x and y coordinates

(4) Data insufficient.

BM0006

7. Magnitude of slope of the shown graph.



(1) First increases then decreases

(2) First decreases then increases

(3) Increases

(4) Decreases

BM0007

GEOMETRY

8. The equation of a curve is given as $y = x^2+2-3x$. The curve intersects the x-axis at

(1) (1, 0) (2) (2, 0)

(3) Both (1) and (2) (4) No where

BM0008

9. Two particles A and B are moving in XY-plane. Their positions vary with time t according to relation :

$x_A(t) = 3t$, $x_B(t) = 6$

$y_A(t) = t$, $y_B(t) = 2 + 3t^2$

Distance between two particles at t = 1 is :

(1) 5 (2) 3 (3) 4 (4) $\sqrt{12}$

BM0009

10. A particular straight line passes through origin and a point whose abscissa is double of ordinate of the point. The equation of such straight line is:

(1) $y = \frac{x}{2}$ (2) $y = 2x$

(3) $y = -4x$ (4) $y = -\frac{x}{4}$

BM0010

11. The side of a square is increasing at the rate of 0.2 cm/s. The rate of increase of perimeter w.r.t. time is :

(1) 0.2 cm/s (2) 0.4 cm/s

(3) 0.6 cm/s (4) 0.8 cm/s

BM0011

12. Frequency f of a simple pendulum depends on its length ℓ and acceleration g due to gravity according to the following equation $f=\frac{1}{2\pi}\sqrt{\frac{g}{\ell}}$. Graph between which of the following quantities is a straight line ?

(1) f on the ordinate and ℓ on the abscissa

(2) f on the ordinate and $\sqrt{\ell}$ on the abscissa

(3) f^2 on the ordinate and ℓ on the abscissa

(4) f^2 on the ordinate and $1/\ell$ on the abscissa

BM0012

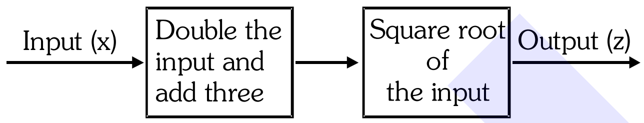
ALGEBRA

13. The sum of the series $1+\frac{1}{4}+\frac{1}{16}+\frac{1}{64}+\ldots\ldots\infty$ is

(1) $\frac{8}{7}$ (2) $\frac{6}{5}$ (3) $\frac{5}{4}$ (4) $\frac{4}{3}$

BM0013

14. In the given figure, each box represents a function machine. A function machine illustrates what it does with the input.



Which of the following statements is correct ?

(1) z=2x+3 (2) z=2(x+3)

(3) $z=\sqrt{2x+3}$ (4) $z=\sqrt{2(x+3)}$

BM0014

DEFINITION & TYPES OF VECTOR

15. Which of the following statements is false :

(1) Mass, speed and energy are scalars

(2) Momentum, force and torque are vectors

(3) Distance is a scalar while displacement is a vector

(4) A vector has only magnitude whereas as a scalar has both magnitude and direction

VE0015

16. If $\hat{n}$ is a unit vector in the direction of the vector $\vec{A}$, then :-

(1) $\hat{n}=\frac{\vec{A}}{|\vec{A}|}$ (2) $\hat{n}=\vec{A}\,|\vec{A}|$

(3) $\hat{n}=\frac{|\vec{A}|}{\vec{A}}$ (4) None of the above

VE0016

17. A physical quantity which has a direction :

(1) must be a vector

(2) may be a vector

(3) must be a scalar

(4) none of the above

VE0017

18. Which of the following physical quantities is an axial vector ?

(1) displacement (2) force

(3) velocity (4) torque

VE0018

19. The forces, which meet at one point but their lines of action do not lie in one plane, are called :

(1) non-coplanar and non-concurrent forces

(2) coplanar and non-concurrent forces

(3) non-coplanar and concurrent forces

(4) coplanar and concurrent forces

VE0019

20. The direction of the angular velocity vector is along :

(1) Along the tangent of circular path

(2) Along the direction of radius vector

(3) Opposite to the direction of radius vector

(4) Along the axis of rotation

VE0020

ADDITION & SUBTRACTION, MULTIPLICATION & DIVISION OF A VECTOR BY A SCALAR

21. Two vectors $\vec{A}$ and $\vec{B}$ lie in a plane, another vector $\vec{C}$ lies outside this plane, then the resultant of these three vectors i.e. $\vec{A}+\vec{B}+\vec{C}$:

(1) can be zero

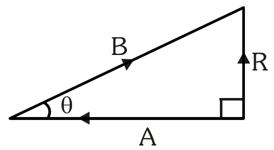
(2) cannot be zero

(3) lies in the plane containing $\vec{A}$ & $\vec{B}$

(4) lies in the plane containing $\vec{B}$ & $\vec{C}$

VE0021

22. In vector diagram shown in figure where ($\vec{R}$) is the resultant of vectors ($\vec{A}$) and ($\vec{B}$).



If $R=\frac{B}{\sqrt{2}}$, then value of angle θ is :

(1) 30° (2) 45° (3) 60° (4) 75°

VE0022

23. The resultant of $\vec{A}$ and $\vec{B}$ makes an angle α with $\vec{A}$ and β with $\vec{B}$, then :

(1) $\alpha < \beta$ (2) $\alpha < \beta$ if $A < B$

(3) $\alpha < \beta$ if $A > B$ (4) $\alpha < \beta$ if $A = B$

VE0023

24. Two vectors $\vec{A}$ and $\vec{B}$ are such that $\vec{A}+\vec{B}=\vec{C}$ and $A^2 + B^2 = C^2$. Which of the following statements, is correct ?

(1) $\vec{A}$ is parallel to $\vec{B}$

(2) $\vec{A}$ is anti-parallel to $\vec{B}$

(3) $\vec{A}$ is perpendicular to $\vec{B}$

(4) $\vec{A}$ and $\vec{B}$ are equal in magnitude

VE0024

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

(1) 2 (2) 3

(3) 4 (4) more than 4

VE0025

26. How many minimum number of coplanar vectors having different magnitudes can be added to give zero resultant ?

(1) 2 (2) 3 (3) 4 (4) 5

VE0026

27. How many minimum number of vectors in different planes can be added to give zero resultant ?

(1) 2 (2) 3 (3) 4 (4) 5

VE0027

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

(1) 2 (2) 3 (3) 4 (4) Infinite

VE0028

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

(1) 2 (2) 3 (3) 4 (4) Infinite

VE0029

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

(1) 2 (2) 3 (3) 4 (4) Infinite

VE0030

31. The vector sum of the forces of 10 newton and 6 newton can be :

(1) 2N (2) 8N (3) 18N (4) 20N

VE0031

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

(1) 4N (2) 8N (3) 12N (4) 2N

VE0032

33. Which of the following pair of forces will never give a resultant force of 2 N ?

(1) 2 N and 2 N (2) 1 N and 1 N

(3) 1 N and 3 N (4) 1 N and 4 N

VE0033

34. If $\vec{A}+\vec{B}=\vec{C}$ and A + B = C, then the angle between $\vec{A}$ and $\vec{B}$ is :

(1) 0 (2) $\frac{\pi}{4}$ (3) $\frac{\pi}{2}$ (4) π

VE0034

35. The resultant of $\vec{A}$ & $\vec{B}$ is $\vec{R}_1$. On reversing the vector $\vec{B}$, the resultant becomes $\vec{R}_2$. What is the value of $R_1^2+R_2^2$?

(1) $A^2 + B^2$ (2) $A^2 - B^2$

(3) $2(A^2 + B^2)$ (4) $2(A^2 - B^2)$

VE0035

36. Given that $\vec{P}+\vec{Q}=\vec{P}-\vec{Q}$. This can be true when:

(1) $\vec{P}=\vec{Q}$

(2) $\vec{Q}=\vec{0}$

(3) Neither $\vec{P}$ nor $\vec{Q}$ is a null vector

(4) $\vec{P}$ is perpendicular to $\vec{Q}$

VE0036

37. Which of the following sets of concurrent forces may be in equilibrium ?

(1) $F_1 = 3N, F_2 = 5N, F_3 = 1N$

(2) $F_1 = 3N, F_2 = 5N, F_3 = 9N$

(3) $F_1 = 3N, F_2 = 5N, F_3 = 6N$

(4) $F_1 = 3N, F_2 = 5N, F_3 = 15N$

VE0037

38. If vectors $\vec{A}$ and $\vec{B}$ are such that $|\vec{A}+\vec{B}|=|\vec{A}|=|\vec{B}|$, then $|\vec{A}-\vec{B}|$ may be equated to

(1) $\frac{\sqrt{3}}{2}|\vec{A}|$ (2) $|\vec{A}|$ (3) $\sqrt{2}|\vec{A}|$ (4) $\sqrt{3}|\vec{A}|$

VE0038

39. What happens, when we multiply a vector by (– 2) ?
(1) direction reverses and unit changes
(2) direction reverses and magnitude is doubled
(3) direction remains unchanged and unit changes
(4) none of these

VE0039

40. Two vectors of equal magnitude have a resultant equal to either of them in magnitude . The angle between them is :
(1) 60° (2) 90° (3) 105° (4) 120°

VE0040

41. If the sum of two unit vectors is a unit vector, then the magnitude of their difference is :
(1) $\sqrt{2}$ (2) $\sqrt{3}$ (3) $\frac{1}{\sqrt{2}}$ (4) $\sqrt{5}$

VE0041

RESOLUTION OF VECTOR

42. If a unit vector is represented by $0.5\hat{i}-0.8\hat{j}+c\hat{k}$ then the value of 'c' is :
(1) 1 (2) $\sqrt{0.11}$ (3) $\sqrt{0.01}$ (4) $\sqrt{0.39}$

VE0042

43. Vector $\vec{P}$ makes angles α, β & γ with the X, Y and Z axes respectively, then $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$ =
(1) 0 (2) 1 (3) 2 (4) 3

BM0043

44. The direction cosines of a vector $\hat{i}+\hat{j}+\sqrt{2}\,\hat{k}$ are :-
(1) $\frac{1}{2}, \frac{1}{2}, 1$ (2) $\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}, \frac{1}{2}$
(3) $\frac{1}{2}, \frac{1}{2}, \frac{1}{\sqrt{2}}$ (4) $\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}$

VE0044

45. The unit vector along $\hat{i}+\hat{j}$ is :
(1) $\hat{k}$ (2) $\hat{i}+\hat{j}$ (3) $\frac{\hat{i}+\hat{j}}{\sqrt{2}}$ (4) $\frac{\hat{i}+\hat{j}}{2}$

VE0045

46. 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) $\frac{1}{49}\left[3\hat{i}+6\hat{j}-2\hat{k}\right]$

VE0046

47. If $\vec{A}+\vec{B}$ is a unit vector along x-axis and $\vec{A}=\hat{i}-\hat{j}+\hat{k}$, then what is $\vec{B}$?
(1) $\hat{j}+\hat{k}$ (2) $\hat{j}-\hat{k}$
(3) $\hat{i}+\hat{j}+\hat{k}$ (4) $\hat{i}+\hat{j}-\hat{k}$

VE0047

48. Forces 3N, 4N and 12N act at a point in mutually perpendicular directions. The magnitude of the resultant force is :
(1) 19 N (2) 13 N
(3) 11 N (4) 5 N

VE0048

49. The angle that the vector $\vec{A}=2\hat{i}+3\hat{j}$ makes with y-axis is :
(1) $\tan^{-1}(3/2)$
(2) $\tan^{-1}(2/3)$
(3) $\sin^{-1}(2/3)$
(4) $\cos^{-1}(3/2)$

VE0049

DOT PRODUCT

50. What is the angle between $\vec{A}$ and the resultant of $(\vec{A}+\hat{B})$ and $(\vec{A}-\hat{B})$?
(1) 0°
(2) $\tan^{-1}\left(\frac{A}{B}\right)$
(3) $\tan^{-1}\left(\frac{B}{A}\right)$
(4) $\tan^{-1}\left(\frac{A-B}{A+B}\right)$

VE0050

51. If $\hat{n}=a\hat{i}+b\hat{j}$ is perpendicular to the vector $(\hat{i}+\hat{j})$, then the value of a and b may be :
(1) 1, 0 (2) –2, 0
(3) 3, 0 (4) $\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}$

VE0051

52. Given that A = B. What is the angle between $(\vec{A}+\vec{B})$ and $(\vec{A}-\vec{B})$?
(1) 30^0 (2) 60^0 (3) 90^0 (4) 180^0

VE0052

53. The vector sum of two forces is perpendicular to their vector difference. In that case, the force :

(1) Are equal to each other.

(2) Are equal to each other in magnitude.

(3) Are not equal to each other in magnitude.

(4) Cannot be predicted.

VE0053

54. The magnitudes of vectors $\vec{A}$, $\vec{B}$ and $\vec{C}$ are respectively 12, 5 and 13 units and $\vec{A}+\vec{B}=\vec{C}$, then the angle between $\vec{A}$ and $\vec{B}$ is :

(1) 0 (2) $\pi/3$ (3) $\pi/2$ (4) $\pi/4$

VE0054

55. If vectors $\vec{P}$, $\vec{Q}$ and $\vec{R}$ have magnitudes 5, 12 and 13 units and $\vec{P}+\vec{Q}=\vec{R}$, the angle between $\vec{Q}$ and $\vec{R}$ is :

(1) $\cos^{-1}\left(\frac{5}{12}\right)$ (2) $\cos^{-1}\left(\frac{5}{13}\right)$

(3) $\cos^{-1}\left(\frac{12}{13}\right)$ (4) $\cos^{-1}\left(\frac{2}{13}\right)$

VE0055

56. A vector perpendicular to $(4\hat{i}-3\hat{j})$ may be :

(1) $4\hat{i}+3\hat{j}$ (2) $7\hat{k}$

(3) $6\hat{i}$ (4) $3\hat{i}-4\hat{j}$

VE0056

57. A force $(3\hat{i}+2\hat{j})$ N displaces an object through a distance $(2\hat{i}-3\hat{j})$ m. The work (W = $\vec{F}\cdot\vec{S}$) done is:

(1) zero (2) 12 J (3) 5 J (4) 13 J

VE0057

58. If $\vec{P}.\vec{Q}$ = PQ, then angle between $\vec{P}$ and $\vec{Q}$ is :

(1) 0° (2) 30° (3) 45° (4) 60°

VE0058

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

(1) $\cos^{-1}\left(\frac{A}{B}\right)$ (2) $\cos^{-1}\left(-\frac{A}{B}\right)$

(3) $\sin^{-1}\left(\frac{A}{B}\right)$ (4) $\sin^{-1}\left(-\frac{A}{B}\right)$

VE0059

60. What is the component of $(3\hat{i}+4\hat{j})$ along $(\hat{i}+\hat{j})$?

(1) $\frac{1}{2}(\hat{j}+\hat{i})$ (2) $\frac{3}{2}(\hat{j}+\hat{i})$

(3) $\frac{5}{2}(\hat{j}+\hat{i})$ (4) $\frac{7}{2}(\hat{j}+\hat{i})$

VE0060

61. The vector $\vec{B}=5\hat{i}+2\hat{j}-S\hat{k}$ is perpendicular to the vector $\vec{A}=3\hat{i}+\hat{j}+2\hat{k}$ if S =

(1) 1 (2) 4.7

(3) 6.3 (4) 8.5

VE0061

62. What is the projection of $\vec{A}$ on $\vec{B}$?

(1) $\vec{A}.\vec{B}$ (2) $\vec{A}.\hat{B}$

(3) $\vec{B}.\vec{A}$ (4) $\hat{A}.\hat{B}$

VE0062

63. The angle between vectors $(\hat{i}+\hat{j})$ and $(\hat{j}+\hat{k})$ is:

(1) 90° (2) 180°

(3) 0° (4) 60°

VE0063

64. The angle between the two vectors $\vec{A}=3\hat{i}+4\hat{j}+5\hat{k}$ and $\vec{B}=3\hat{i}+4\hat{j}-5\hat{k}$ will be :

(1) zero (2) 180°

(3) 90° (4) 45°

VE0064

65. 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 :

(1) $\hat{i}B\cos\theta+\hat{j}B\sin\theta$ (2) $\hat{i}B\sin\theta+\hat{j}B\cos\theta$

(3) $\hat{i}B\sin\theta-\hat{j}B\cos\theta$ (4) $\hat{i}A\cos\theta-\hat{j}A\sin\theta$

VE0065

66. The vector $\vec{P}=a\hat{i}+a\hat{j}+3\hat{k}$ and $\vec{Q}=a\hat{i}-2\hat{j}-\hat{k}$ are perpendicular to each other. The positive value of a is :

(1) 3 (2) 2 (3) 1 (4) zero

VE0066

67. A force $\vec{F} = (3\hat{i} + 4\hat{j})N$ acts on a body and displaces it by $\vec{S} = (3\hat{i} + 4\hat{j})m$. The work done $(W = \vec{F} \cdot \vec{S})$ by the force is :

(1) 10J (2) 12J
(3) 19J (4) 25J

VE0067

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

(1) 3 (2) 4
(3) 5 (4) zero

VE0068

69. If a vector $(2\hat{i} + 3\hat{j} + 8\hat{k})$ is perpendicular to the vector $(4\hat{j} - 4\hat{i} + \alpha\hat{k})$, then the value of α is :

(1) –1 (2) 1/2
(3) –1/2 (4) 1

VE0069

CROSS PRODUCT

70. If $\vec{A} = 3\hat{i} + 4\hat{j}$ and $\vec{B} = 6\hat{i} + 8\hat{j}$ and A and B are the magnitudes of $\vec{A}$ and $\vec{B}$, then which of the following is not true ?

(1) $\vec{A} \times \vec{B} = \vec{0}$ (2) $\frac{A}{B} = \frac{1}{2}$
(3) $\vec{A}.\vec{B} = 48$ (4) A = 5

VE0070

71. A vector $\vec{F}_1$ is along the positive X-axis. If its vector product with another vector $\vec{F}_2$ is zero then $\vec{F}_2$ may be :-

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

VE0071

72. If $\hat{i}, \hat{j}$ and $\hat{k}$ are unit vectors along X, Y & Z axis respectively, then tick the wrong statement :

(1) $\hat{i}.\hat{i} = 1$ (2) $\hat{i} \times \hat{j} = \hat{k}$
(3) $\hat{i}.\hat{j} = 0$ (4) $\hat{i} \times \hat{k} = -\hat{i}$

VE0072

73. Two vectors $\vec{P}$ and $\vec{Q}$ are inclined to each other at angle θ. Which of the following is the unit vector perpendicular to $\vec{P}$ and $\vec{Q}$?

(1) $\frac{\vec{P} \times \vec{Q}}{P.Q}$ (2) $\frac{\hat{P} \times \hat{Q}}{\sin\theta}$
(3) $\frac{\hat{P} \times \hat{Q}}{PQ\sin\theta}$ (4) $\frac{\hat{P} \times \vec{Q}}{PQ\sin\theta}$

VE0073

74. The magnitude of the vector product of two vectors $\vec{A}$ and $\vec{B}$ may not be :

(1) Greater than AB (2) Less than AB
(3) Equal to AB (4) Equal to zero

VE0074

75. If $\vec{P} \times \vec{Q} = \vec{R}$, then which of the following statements is not true ?

(1) $\vec{R} \perp \vec{P}$ (2) $\vec{R} \perp \vec{Q}$
(3) $\vec{R} \perp (\vec{P} + \vec{Q})$ (4) $\vec{R} \perp (\vec{P} \times \vec{Q})$

VE0075

76. Which of the following vector identities is false ?

(1) $\vec{P} + \vec{Q} = \vec{Q} + \vec{P}$ (2) $\vec{P} + \vec{Q} = \vec{Q} \times \vec{P}$
(3) $\vec{P}.\vec{Q} = \vec{Q}.\vec{P}$ (4) $\vec{P} \times \vec{Q} \neq \vec{Q} \times \vec{P}$

VE0076

77. What is the value of $(\vec{A} + \vec{B}) \bullet (\vec{A} \times \vec{B})$?

(1) 0 (2) $A^2 - B^2$
(3) $A^2 + B^2 + 2AB$ (4) none of these

VE0077

78. If $\vec{A} \times \vec{B} = \vec{0}$ and $\vec{B} \times \vec{C} = \vec{0}$, then the angle between $\vec{A}$ and $\vec{C}$ may be :

(1) zero (2) $\frac{\pi}{4}$
(3) $\frac{\pi}{2}$ (4) None

VE0078

79. If the vectors $(\hat{i} + \hat{j} + \hat{k})$ and $3\hat{i}$ form two sides of a triangle, then area of the triangle is :

(1) $\sqrt{3}$ unit (2) $2\sqrt{3}$ unit
(3) $\frac{3}{\sqrt{2}}$ unit (4) $3\sqrt{2}$ unit

VE0079

80. For a body, angular velocity $\vec{\omega}=\hat{i}-2\hat{j}+3\hat{k}$ and radius vector $\vec{r}=\hat{i}+\hat{j}+\hat{k}$, then its velocity $(\vec{v}=\vec{\omega}\times\vec{r})$ is:

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

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

VE0080

81. Area of a parallelogram, whose diagonals are $3\hat{i}+\hat{j}-2\hat{k}$ and $\hat{i}-3\hat{j}+4\hat{k}$ will be :

(1) 14 unit (2) $5\sqrt{3}$ unit

(3) $10\sqrt{3}$ unit (4) $20\sqrt{3}$ unit

VE0081

82. The angle between vectors $(\vec{A}\times\vec{B})$ and $(\vec{B}\times\vec{A})$ is:

(1) π rad (2) $\frac{\pi}{2}$ rad

(3) $\frac{\pi}{4}$ rad (4) zero

VE0082

83. A vector $\vec{A}$ points vertically upward and $\vec{B}$ points towards north. The vector product $\vec{A}\times\vec{B}$ is

(1) zero

(2) along west

(3) along east

(4) vertically downward

VE0083

84. If $|\vec{A}\times\vec{B}|=|\vec{A}.\vec{B}|$, then the angle between $\vec{A}$ and $\vec{B}$ will be :

(1) 30° (2) 45°

(3) 60° (4) 75°

VE0084

85. Two vectors $\vec{A}$ and $\vec{B}$ are such that $\vec{A}+\vec{B} = \vec{A}-\vec{B}$. Then select incorrect alternative

(1) $\vec{A}.\vec{B}=0$ (2) $\vec{A}\times\vec{B}=\vec{0}$

(3) $\vec{A}=\vec{0}$ (4) $\vec{B}=\vec{0}$

VE0085

86. If three vectors satisfy the relation $\vec{A}.\vec{B}=0$ and $\vec{A}.\vec{C}=0$, then $\vec{A}$ can be parallel to

(1) $\vec{C}$ (2) $\vec{B}$ (3) $\vec{B}\times\vec{C}$ (4) $\vec{B}.\vec{C}$

VE0086

EXERCISE-I (Conceptual Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	2	2	1	3	2	2	2	3	1	1	4	4	4	3	4
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	1	2	4	3	4	2	2	3	3	1	2	3	4	1	2
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	2	4	4	1	3	2	3	4	2	4	2	2	3	3	3
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	1	2	2	2	1	4	3	2	3	3	2	1	1	2	4
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	4	2	4	3	3	1	4	4	3	3	4	4	2	1	4
Que.	76	77	78	79	80	81	82	83	84	85	86				
Ans.	2	1	1	3	1	2	1	2	2	3	3				

EXERCISE-II (Previous Year Questions) AIPMT/NEET

AIPMT 2006

1. The vectors $\vec{A}$ and $\vec{B}$ are such that $|\vec{A}+\vec{B}| = |\vec{A}-\vec{B}|$. The angle between vectors $\vec{A}$ and $\vec{B}$ is -

(1) 90° (2) 60° (3) 75° (4) 45°

VE0087

AIPMT 2007

2. If $|\vec{A}\times\vec{B}| = \sqrt{3}\,\vec{A}.\vec{B}$, then the value of $|\vec{A}+\vec{B}|$ is :

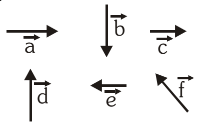
(1) $\left(A^2 + B^2 + \dfrac{AB}{\sqrt{3}}\right)^{1/2}$ (2) A + B

(3) $(A^2 + B^2 + \sqrt{3}\,AB)^{1/2}$ (4) $(A^2+B^2+AB)^{1/2}$

VE0088

AIPMT 2010

3. Six vectors, $\vec{a}$ through $\vec{f}$ have the magnitudes and directions indicated in the figure. Which of the following statements is true ?



(1) $\vec{b}+\vec{e}=\vec{f}$ (2) $\vec{b}+\vec{c}=\vec{f}$

(3) $\vec{d}+\vec{c}=\vec{f}$ (4) $\vec{d}+\vec{e}=\vec{f}$

VE0090

Re-AIPMT 2015

4. If vectors

$\vec{A} = \cos\omega t\,\hat{i} + \sin\omega t\,\hat{j}$ and $\vec{B} = \cos\dfrac{\omega t}{2}\hat{i} + \sin\dfrac{\omega t}{2}\hat{j}$

are functions of time, then the value of t at which they are orthogonal to each other is :

(1) t = 0 (2) $t=\dfrac{\pi}{4\omega}$ (3) $t=\dfrac{\pi}{2\omega}$ (4) $t=\dfrac{\pi}{\omega}$

VE0091

NEET-I 2016

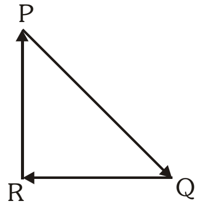
5. If the magnitude of sum of two vectors is equal to the magnitude of difference of the two vectors, the angle between these vectors is :-

(1) 0° (2) 90° (3) 45° (4) 180°

VE0092

NEET(UG) 2019

6. A particle moving with velocity $\vec{V}$ is acted by three forces shown by the vector triangle PQR. The velocity of the particle will :



(1) increase

(2) decrease

(3) remain constant

(4) change according to the smallest force $\overrightarrow{QR}$

VE0116

NEET(UG) 2020 (Covid-19)

7. The angle of 1' (minute of arc) in radian is nearly equal to

(1) 2.91×10^{-4} rad (2) 4.85×10^{-4} rad

(3) 4.80×10^{-6} rad (4) 1.75×10^{-2} rad

VE0117

NEET(UG) 2021 (Paper-2)

8. Two adjacent side of a parallelogram are represented by the two vectors $3\hat{i}+4\hat{j}+5\hat{k}$ and $\hat{i}-\hat{j}-\hat{k}$. The area of parallelogram is

(1) $\sqrt{74}$ (2) $\sqrt{94}$

(3) $\sqrt{104}$ (4) $\sqrt{114}$

VE0118

Re-NEET(UG) 2022

9. If $\vec{F}=2\hat{i}+\hat{j}-\hat{k}$ and $\vec{r}=3\hat{i}+2\hat{j}-2\hat{k}$, then the scalar and vector products of $\vec{F}$ and $\vec{r}$ have the magnitudes respectively as :

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

VE0119

EXERCISE-II (Previous Year Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9
Ans.	**1**	**4**	**4**	**4**	**2**	**3**	**1**	**4**	**3**

EXERCISE-III (Analytical Questions) — Master Your Understanding

1. The moon's distance from the earth is 360000 km and its diameter subtends an angle of 42' at the eye of the observer. The diameter of the moon is
(1) 4400 km (2) 1000 km
(3) 3600 km (4) 8800 km
VE0093

2. If velocity of a particle is given by v = (2t + 3) m/s, then average velocity in interval $0 \le t \le 1$s is :
(1) $\frac{7}{2}$ m/s (2) $\frac{9}{2}$ m/s
(3) 4 m/s (4) 5 m/s
VE0095

3. The sum of magnitudes of two forces acting at a point is 16N. If the resultant force is 8N and its direction is perpendicular to smaller force, then the forces are :
(1) 6N & 10N (2) 8N & 8N
(3) 4N & 12N (4) 2N & 14N
VE0097

4. At what angle must the two forces (x + y) and (x – y) act so that the resultant may be $\sqrt{(x^2+y^2)}$?
(1) $\cos^{-1}\left[\frac{-(x^2+y^2)}{2(x^2-y^2)}\right]$
(2) $\cos^{-1}\left[\frac{-2(x^2-y^2)}{x^2+y^2}\right]$
(3) $\cos^{-1}\left[\frac{-(x^2+y^2)}{x^2-y^2}\right]$
(4) $\cos^{-1}\left[\frac{(x^2-y^2)}{x^2+y^2}\right]$
VE0098

5. 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 ?
(1) $\ell \cos(\theta/2)$ (2) $2\ell \sin(\theta/2)$
(3) $2\ell \cos(\theta/2)$ (4) $\ell \sin(\theta/2)$
VE0099

6. Given that $\vec{A}+\vec{B}+\vec{C}=\vec{0}$. Out of these three vectors two are equal in magnitude and the magnitude of the third vector is $\sqrt{2}$ times that of either of the two having equal magnitude. Then the angles between vectors are :
(1) 30°, 60°, 90° (2) 45°, 45°, 90°
(3) 45°, 60°, 90° (4) 90°, 135°, 135°
VE0100

7. The resultant of two vectors $\vec{P}$ and $\vec{Q}$ is $\vec{R}$. If $\vec{Q}$ is doubled then the new resultant vector is perpendicular to '$\vec{P}$'. Then R is equal to :
(1) $\left(\frac{P^2-Q^2}{2PQ}\right)$ (2) Q
(3) $\frac{P}{Q}$ (4) $\frac{P+Q}{P-Q}$
VE0101

8. Given that P = Q = R. If $\vec{P}+\vec{Q}=\vec{R}$ then the angle between $\vec{P}$ & $\vec{R}$ is θ_1. If $\vec{P}+\vec{Q}+\vec{R}=\vec{0}$ then the angle between $\vec{P}$ & $\vec{R}$ is θ_2. What is the relation between θ_1 and θ_2 ?
(1) $\theta_1 = \theta_2$ (2) $\theta_1 = \frac{\theta_2}{2}$
(3) $\theta_1 = 2\theta_2$ (4) None of the above
VE0102

9. Square of the resultant of two forces of equal magnitude is equal to three times the product of their magnitude. The angle between them is :
(1) 0° (2) 45°
(3) 60° (4) 90°
VE0103

10. A unit radial vector $\hat{r}$ makes angles of $\alpha = 30°$ relative to the x-axis, $\beta = 60°$ relative to the y-axis, and $\gamma = 90°$ relative to the z-axis. The vector $\hat{r}$ can be written as :
(1) $\frac{1}{2}\hat{i}+\frac{\sqrt{3}}{2}\hat{j}$ (2) $\frac{\sqrt{3}}{2}\hat{i}+\frac{1}{2}\hat{j}$
(3) $\frac{\sqrt{2}}{3}\hat{i}+\frac{1}{\sqrt{3}}\hat{j}$ (4) None of these
VE0104

EXERCISE-III (Analytical Questions) — ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	1	3	1	1	2	4	2	2	3	2