Exercise - I (Conceptual Questions) Build Up Your Understanding

TRIGONOMETRY

1. As θ increases from 0° to 90°, the value of sinθ :-
(1) Increases
(2) Decreases
(3) Remains constant
(4) First decreases then increases.
PBM001

2. If $\sin\theta = \frac{\sqrt{2}}{\sqrt{3}}$ and θ lies in the first quadrant, the value of tan θ is :
(1) $\sqrt{2}$ (2) $\frac{1}{\sqrt{2}}$
(3) $\frac{\sqrt{3}}{\sqrt{2}}$ (4) $\frac{1}{2}$
PBM002

3. Find θ for which sinθ = cosθ, if 180° < θ < 360°
(1) 135° (2) 315°
(3) 225° (4) 150°
PBM003

4. If $\sin\theta_1 + \sin\theta_2 + \sin\theta_3 = 3$
then value of $\cos\theta_1 + \cos\theta_2 + \cos\theta_3$ is :-
(1) 3 (2) 0 (3) –3 (4) 1
PBM004

5. The greatest value of the function 7 sinθ – 24 cosθ is
(1) 12 (2) 13 (3) 25 (4) 17
PBM010

6. The length of hypotenuse of a right angle triangle exceeds the length of its base by 2 cm and exceeds twice the length of altitude by 1 cm. Find length of each side of the triangle.
(1) 6, 8, 10 (2) 7, 24, 25
(3) 8, 15, 17 (4) 7, 40, 41
PBM011

CALCULUS

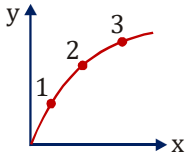
7. If $x = at^4$ and $y = bt^3$. Find $\frac{dy}{dx}$
(1) $\frac{4a}{3bt}$ (2) $\frac{3b}{4at}$
(3) $\frac{3a}{4bt}$ (4) $\frac{4b}{3at}$
PBM012

8. A metallic disc is being heated. Its area at any time t is given by $A = 5t^2 + 4t + 8$. Calculate rate of increase in area at t = 3s.
(1) 30 m^2/s (2) 34 m^2/s
(3) 28 m^2/s (4) 20 m^2/s
PBM013

9. The side of a square is increasing at the rate of 0.1 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
PBM014

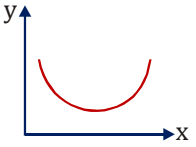
10. A particle moves along the straight line 3y =x+5. Which coordinate changes at a faster rate ?
(1) x–coordinate
(2) y–coordinate
(3) Both x and y coordinates
(4) Data insufficient.
PBM015

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



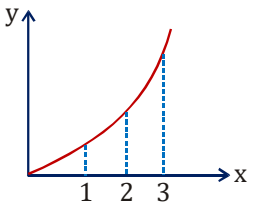
(1) $m_1 > m_2 > m_3$ (2) $m_1 < m_2 < m_3$
(3) $m_1 = m_2 = m_3$ (4) $m_1 = m_3 > m_2$
PBM016

12. Magnitude of slope of the shown graph.



(1) First increases then decreases
(2) First decreases then increases
(3) Increases
(4) Decreases
PBM017

13. Calculate the area enclosed under the curve $f(x) = x^2$ between the limits x = 2 and x = 3



(1) 5 (2) $\frac{19}{3}$ (3) $\frac{17}{3}$ (4) 8

PBM018

14. Find the value of $\int_0^4 |(1-x)|.dx$

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

PBM019

GEOMETRY & GRAPHS

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

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

(3) (0, 2) (4) No where

PBM020

16. 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 = 2 is :

(1) 12 (2) 13 (3) 5 (4) $\sqrt{12}$

PBM021

17. The distance between points (a + b, b + c) and (a – b, c – b) is :-

(1) $2\sqrt{a^2+b^2}$ (2) $2\sqrt{b^2+c^2}$

(3) $2\sqrt{2}b$ (4) $\sqrt{a^2-c^2}$

PBM022

18. A dog is at point A(0, 3, 4)m and cat is at B(5,3,–8)m The dog is free to move but cat is fixed. The minimum distance travelled by dog to catch the cat is :-

(1) 25m (2) 12m (3) 13m (4) 20m

PBM023

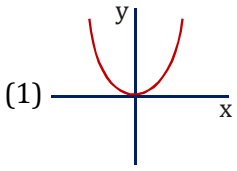
19. A particular straight line passes through origin and a point whose abscissa is equal to ordinate. The equation of such straight line is :

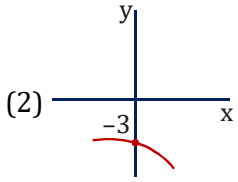
(1) y = x (2) y = 2x

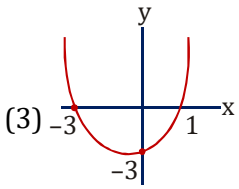
(3) y = –4x (4) $y = -\frac{x}{4}$

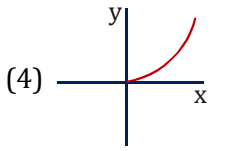
PBM024

20. If $y = x^2 + 2x - 3$, then y-x graph is :-

(1) 

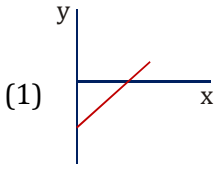
(2) 

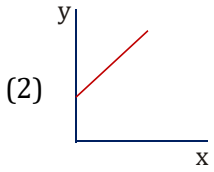
(3) 

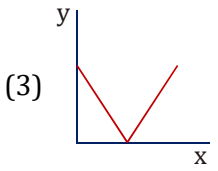
(4) 

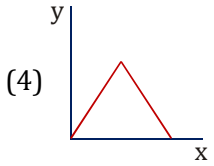
PBM025

21. If y =|x–1|, then y-x graph is :-

(1) 

(2) 

(3) 

(4) 

PBM026

22. 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 parabola ?

(1) f on the ordinate and $1/\ell$ 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

PBM028

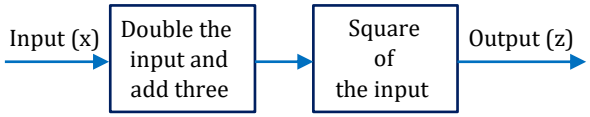
ALGEBRA

23. The sum of the series $1 + \frac{1}{3} + \frac{1}{9} + \frac{1}{27} + ...\infty$ is :-

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

PBM029

24. 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) $z = (2x+3)^2$ (2) $z = 2(x+3)$

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

PBM030

DEFINITION & TYPES OF VECTOR

25. 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 vector while displacement is a scalar

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

PBM031

26. A physical quantity which has a direction and obeys triangle law of vector addition :

(1) must be a vector (2) may be a vector

(3) must be a scalar (4) none of the above

PBM032

27. The forces, which meet at one point and their lines of action lie in one plane, are called :

(1) non-concurrent and non-coplanar forces

(2) non-concurrent and coplanar forces

(3) concurrent and non-coplanar forces

(4) concurrent and coplanar forces

PBM033

28. Which of the following physical quantities is not an axial vector ?

(1) angular velocity

(2) angular momentum

(3) velocity

(4) torque

PBM034

29. 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

PBM035

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

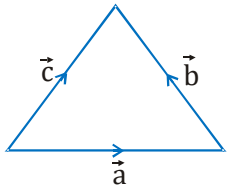
(1) $\hat{n}=\frac{\vec{A}}{|\vec{A}|}$ (2) $\hat{n}=\vec{A}|\vec{A}|$

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

PBM036

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

31. In the given figure, $\vec{a}+\vec{b}+\vec{c}$ is



(1) $2\vec{a}$ (2) $2\vec{b}$ (3) $2\vec{c}$ (4) $\vec{a}+\vec{b}$

PBM037

32. Vector sum of two forces of 10N and 5N can be :

(1) 4N (2) 18N (3) 12N (4) 2N

PBM038

33. The vector sum of the forces of 10 newton and 8 newton cannot be :

(1) 2N (2) 8N

(3) 18N (4) 20N

PBM039

34. Which of the following pair of forces can give a resultant force of 2 N ?

(1) 1 N and 2 N (2) 1 N and 5 N

(3) 2 N and 5 N (4) 1 N and 4 N

PBM040

35. Two vectors of equal magnitude have a resultant equal to either of them in magnitude. The angle between the vector is :

(1) 60° (2) 90°

(3) 105° (4) 120°

PBM041

36. $\vec{R}=\vec{a}+\vec{b}$, where $\vec{R},\vec{a}$ and $\vec{b}$ are non-zero vector.

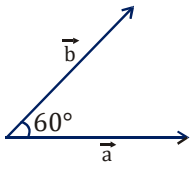
If R = a = b, the angle between $\vec{R}$ and $\vec{a}$ is :-

(1) $\frac{\pi}{3}$ (2) $\frac{2\pi}{3}$

(3) $\frac{\pi}{4}$ (4) $\frac{\pi}{6}$

PBM042

37. If resultant of two vectors $\vec{a}$ and $\vec{b}$ shown in the figure is $\sqrt{7}\,b$, then value of $\frac{b}{a}$ is :-



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

PBM043

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

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

PBM044

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

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

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

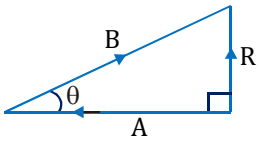
(3) $\vec{A}$ is perpendicular to $\vec{B}$

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

PBM045

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

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



(1) 30° (2) 45°

(3) 60° (4) 75°

PBM046

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

(1) α < β

(2) α < β if A < B

(3) α < β if A > B

(4) α < β if A = B

PBM047

42. If two forces of equal magnitude acting on a particle. The angle between forces is 60°. The resultant force on the particle is :-

(1) at an angle of 30° with each force.

(2) at an angle of 45° with one of the force

(3) at an angle of 15° with one of the force

(4) at an angle lying between 45° to 60°

PBM048

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

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

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

PBM049

44. The resultant of two forces make 30° and 60° angles with them and has magnitude 40 N. The magnitudes of two vectors are :-

(1) $20\sqrt{3}\,N, 20N$ (2) $30N, 20\sqrt{3}\,N$

(3) 40N, 30N (4) $3\sqrt{3}\,N, 40\sqrt{3}\,N$

PBM050

45. 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) Data Insufficient

PBM051

46. 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 $2(R_1^2+R_2^2)$?

(1) $4(A^2 + B^2)$ (2) $A^2 - B^2$

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

PBM052

47. 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) $\sqrt{3}|\vec{A}|$

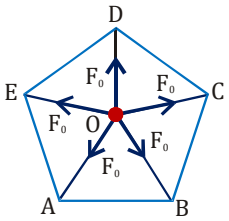
PBM053

48. If the difference of two unit vectors is a unit vector, then the magnitude of their sum is :

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

PBM054

49. In the given figure, O is the centre of the regular pentagon ABCDE. Five forces each of magnitude F_0 are acted as shown in the figure. The resultant force is :-



(1) 5 F_0 (2) 5 F_0 cos72°
(3) 5 F_0 sin72° (4) zero

PBM055

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

(1) may be zero
(2) cannot be zero
(3) lies in the plane containing $\vec{A}$ & $\vec{B}$
(4) Both 1 & 3

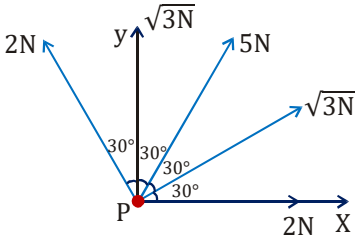
PBM056

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

(1) F_1 = 3N, F_2 = 5N, F_3 = 1N, F_4 = 10N
(2) F_1 = 3N, F_2 = 5N, F_3 = 9N, F_4 = 4N
(3) F_1 = 3N, F_2 = 5N, F_3 = 6N, F_4 = 15N
(4) F_1 = 3N, F_2 = 5N, F_3 =15N, F_4 = 5N

PBM057

52. Five forces 2N, $\sqrt{3}$N, 5N, $\sqrt{3}$N and 2N respectively act at a particle P as shown in the figure.



The resultant force on the particle P is.
(1) 10 N making angle 60° with x-axis.
(2) 10 N making angle 60° with y-axis.
(3) 20 N along y-axis
(4) None of these

PBM058

53. If $\vec{a}+\vec{b}+\vec{c}=0$. The angle between $\vec{a}$ and $\vec{b}$, $\vec{b}$ and $\vec{c}$ are 150° and 120°, respectively. Then, the magnitude of vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ are in ratio of :-

(1) 1 : 2 : 3 (2) 1 : 2 : $\sqrt{3}$
(3) $\sqrt{3}$: 2 : 1 (4) 2 : $\sqrt{3}$: 1

PBM059

54. The magnitudes of vectors $\vec{A}$, $\vec{B}$ and $\vec{C}$ are respectively 7, 24 and 25 units and $\vec{A}+\vec{B}=\vec{C}$, then the angle between $\vec{A}$ and $\vec{B}$ is :

(1) 0 (2) π/3
(3) π /2 (4) π /4

PBM060

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 $\vec{P}$ 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) $\cos^{-1}\left(\frac{2}{13}\right)$

PBM061

56. If the vectors $\left(\hat{i}+\hat{j}+\hat{k}\right)$ and $3\hat{i}$ form two sides of a triangle, then 3rd side of the triangle can be :

(1) $\sqrt{18}$ unit (2) $\sqrt{6}$ unit
(3) $\frac{3}{\sqrt{2}}$ unit (4) both (1) & (2)

PBM062

57. 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

PBM063

58. 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
PBM064

59. How many minimum number of vectors in different planes can be added to give zero resultant ?
(1) 2 (2) 3 (3) 4 (4) 5
PBM065

60. What happens, when we multiply a vector by 2?
(1) direction reverses and unit changes
(2) direction remains same and magnitude is doubled
(3) direction remains unchanged and unit changes
(4) none of these
PBM066

RESOLUTION OF VECTOR

61. What is the maximum number of components into which a vector can be split ?
(1) 2 (2) 3
(3) 4 (4) Infinite
PBM067

62. 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
PBM068

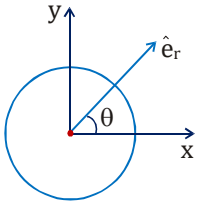
63. What is the maximum number of rectangular components into which a vector can be split in space ?
(1) 2 (2) 3 (3) 4 (4) ∞
PBM069

64. The unit vector along $\hat{i}-2\hat{j}$ is :
(1) $\frac{\hat{i}-2\hat{j}}{\sqrt{5}}$ (2) $\hat{i}+\hat{j}$
(3) $\frac{\hat{i}+\hat{j}}{\sqrt{2}}$ (4) $\frac{\hat{i}-\hat{j}}{\sqrt{5}}$
PBM070

65. If $\vec{A}+\vec{B}$ is a unit vector along y-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) $2\hat{j}-\hat{i}-\hat{k}$
PBM071

66. If a unit vector is represented by $0.3\hat{i}-0.4\hat{j}+c\hat{k}$, then the value of 'c' is :
(1) $\sqrt{0.75}$ (2) $\sqrt{0.25}$
(3) $\sqrt{0.01}$ (4) $\sqrt{0.39}$
PBM072

67. $\hat{e}_r$ is unit vector along radius of a circle shown in figure. $\hat{e}_r$ can be represented as :-



(1) $\cos\theta\hat{i}+\sin\theta\hat{j}$ (2) $\sin\theta\hat{i}+\cos\theta\hat{j}$
(3) $\cos\theta\hat{i}-\sin\theta\hat{j}$ (4) $-\cos\theta\hat{i}+\sin\theta\hat{j}$
PBM073

68. Forces 7N, 24N, 25N act at a point in mutually perpendicular directions. The magnitude of the resultant force is :
(1) 19 N (2) 13 N
(3) 26 N (4) $25\sqrt{2}$ N
PBM074

69. The angle that the vector $\vec{A}=2\hat{i}+3\hat{j}$ makes with x-axis is :
(1) $\tan^{-1}(3/2)$ (2) $\tan^{-1}(2/3)$
(3) $\sin^{-1}(2/3)$ (4) $\cos^{-1}(3/2)$
PBM075

70. What vector must be added to the other vectors $\hat{i}-2\hat{j}+2\hat{k}$ and $2\hat{i}+\hat{j}-\hat{k}$, so that the resultant may be a unit vector along y-axis?
(1) $2\hat{i}+\hat{j}-\hat{k}$ (2) $-3\hat{i}+2\hat{j}-\hat{k}$
(3) $-2\hat{i}-\hat{j}-\hat{k}$ (4) $3\hat{i}-2\hat{j}-\hat{k}$
PBM076

71. The unit vector parallel to the resultant of the vectors $\vec{A}=4\hat{i}+3\hat{j}+6\hat{k}$ and $\vec{B}=2\hat{i}-3\hat{j}+2\hat{k}$ is :
(1) $\frac{1}{10}\left[8\hat{i}+6\hat{k}\right]$ (2) $\frac{1}{10}\left[6\hat{i}+8\hat{k}\right]$
(3) $\frac{1}{10}\left[6\hat{i}+6\hat{k}+6\hat{j}\right]$ (4) $\frac{1}{10}\left[6\hat{j}+8\hat{k}\right]$
PBM077

72. If $\vec{a}=2\hat{i}+2\hat{j}-\hat{k}$ and $\vec{b}=\hat{i}+\hat{j}+\hat{k}$. Find a vector $\vec{c}$ which is parallel to $\vec{a}$ but has magnitude three times that of $\vec{b}$.

(1) $\vec{c}=3\hat{i}+3\hat{j}+3\hat{k}$

(2) $\vec{c}=2\sqrt{3}\hat{i}+2\sqrt{3}\hat{j}-\sqrt{3}\hat{k}$

(3) $\vec{c}=6\hat{i}+6\hat{j}-3\hat{k}$

(4) $\vec{c}=3\hat{i}+6\hat{j}-6\hat{k}$

PBM078

73. The velocity of a particle is $\vec{v}=(\hat{i}+\hat{j}-\hat{k})$m/s. A force of $10\sqrt{3}$N parallel to velocity in vector form is :-

(1) $(10\hat{i}+10\hat{j}-10\hat{k})$N

(2) $(\hat{i}+\hat{j}-\hat{k})10\sqrt{3}$N

(3) $(\hat{i}+\hat{j}-\hat{k})$N

(4) None of these

PBM079

74. The direction cosines of a vector $\sqrt{2}\hat{i}+\sqrt{2}\hat{j}+\hat{k}$ are:-

(1) $\frac{\sqrt{2}}{\sqrt{5}},\frac{\sqrt{2}}{\sqrt{5}},\frac{1}{\sqrt{5}}$ (2) $\frac{1}{\sqrt{5}},\frac{1}{\sqrt{5}},\frac{1}{5}$

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

PBM080

75. Vector $\vec{P}$ makes angles α, β & γ with the X, Y and Z axes respectively, then $\cos^2\alpha+\cos^2\beta+\cos^2\gamma=$

(1) 0 (2) 1 (3) 2 (4) 3

PBM081

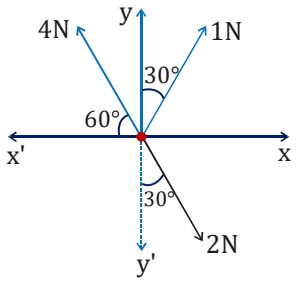
76. Find the direction cosines of vector $(\vec{a}-\vec{b})$, if $\vec{a}=2\hat{i}+3\hat{j}+\hat{k}$ and $\vec{b}=2\hat{i}+2\hat{j}+3\hat{k}$

(1) $0,\frac{1}{\sqrt{5}},\frac{-2}{\sqrt{5}}$ (2) 0, 0, 0

(3) $\frac{1}{\sqrt{5}},\frac{-2}{\sqrt{5}},\frac{2}{\sqrt{5}}$ (4) 1, 1, –1

PBM082

77. Three forces are acting on a particles as shown in the figure. To have the resultant forces only along the y-direction, the magnitude of the minimum additional force needed is :-



(1) 0.866 N (2) 1.732 N

(3) 0.5 N (4) 4 N

PBM083

78. The force $\vec{F}=(\hat{i}+b\hat{j}+3\hat{k})$N is rotated through an angle α, then it becomes $\{2\hat{i}+(2b-1)\hat{j}+\hat{k}\}$N. The value of b is :-

(1) 2 (2) $-\frac{2}{3}$

(3) $\frac{2}{3}$ (4) Both (1) and (2)

PBM084

DOT PRODUCT

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

(1) 0° (2) 180° (3) 45° (4) 60°

PBM085

80. A force $\vec{F}=(2\hat{i}+3\hat{j})$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) 18J (4) 25J

PBM086

81. A force $(2\hat{i}+2\hat{j})$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) –2J (2) 12J (3) 5J (4) 13J

PBM087

82. A force of 14 N acts on a particle along the vector $(3\hat{i}+2\hat{j}-6\hat{k})$. If the particle displaces from (0, 0, 0) to (2, 4, –2), the work $(W=\vec{F}\cdot\vec{S})$ done by force on the particle is :-

(1) 10J (2) 52J (3) –48J (4)14 J

PBM088

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

(1) –1 (2) 1/2 (3) –1/2 (4) 2

PBM089

84. 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
PBM090

85. A vector perpendicular to $\left(4\hat{i}+3\hat{j}\right)$ may be :
(1) $4\hat{i}+3\hat{j}$ (2) $7\hat{k}$
(3) $6\hat{i}$ (4) $3\hat{i}+4\hat{j}$
PBM091

86. 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) $\hat{i}A\cos\theta-\hat{j}A\sin\theta$
PBM092

87. If $\hat{n}=a\hat{i}+b\hat{j}$ is perpendicular to the vector $\left(\hat{i}-\hat{j}\right)$, then the value of a and b may be :
(1) 1, 0 (2) –2, 0
(3) 3, 0 (4) $\frac{1}{\sqrt{2}},\frac{1}{\sqrt{2}}$
PBM094

88. 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.
PBM095

89. Given that A = B and $\vec{A}\perp\vec{B}$. 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
PBM096

90. A parallelogram is formed with $\vec{a}$ and $\vec{b}$ as the sides. Let $\vec{d}_1$ and $\vec{d}_2$ be the diagonals of the parallelogram. The value of $a^2 + b^2$ is :-
(1) $d_1^2+d_2^2$ (2) $\frac{d_1^2+d_2^2}{2}$
(3) $(d_1+d_2)^2$ (4) $d_1^2+d_2^2+d_1d_2$
PBM097

91. The angle between the two vectors $\vec{A}=3\hat{i}+4\hat{j}+5\hat{k}$ and $\vec{B}=6\hat{i}+8\hat{j}+10\hat{k}$ will be :
(1) 0° (2) 180° (3) 90° (4) 45°
PBM098

92. What is the angle between $\vec{A}$ and the resultant of $\left(\vec{A}+2\hat{B}\right)$ and $\left(2\vec{A}-2\hat{B}\right)$?
(1) 0° (2) $\tan^{-1}\left(\frac{A}{B}\right)$
(3) $\tan^{-1}\left(\frac{B}{A}\right)$ (4) $\tan^{-1}\left(\frac{A-B}{A+B}\right)$
PBM099

93. The angle between vectors $\left(\hat{i}+\hat{j}\right)$ and $\left(\hat{i}+\hat{k}\right)$ is:
(1) 90° (2) 180° (3) 0° (4) 60°
PBM100

94. The angle between $2\hat{i}+\hat{j}+2\hat{k}$ and $\hat{i}-\hat{j}+\hat{k}$ is :-
(1) 30° (2) 60°
(3) $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$ (4) $\cos^{-1}\left(\frac{2}{3}\right)$
PBM101

95. What is the projection of $3\hat{i}+4\hat{k}$ on the z-axis ?
(1) 3 (2) 4
(3) 5 (4) zero
PBM102

96. What is the projection of $\vec{B}$ on $\vec{A}$?
(1) $\vec{A}.\vec{B}$ (2) $\vec{A}.\hat{B}$ (3) $\vec{B}.\hat{A}$ (4) $\hat{A}.\hat{B}$
PBM103

CROSS PRODUCT

97. If $\hat{i}$, $\hat{j}$ and $\hat{k}$ are unit vectors along X, Y & Z axis respectively, then tick the wrong statement :
(1) $\hat{i}\times\hat{i}=\vec{0}$ (2) $\hat{i}\times\hat{j}=\hat{k}$
(3) $\hat{i}.\hat{j}=1$ (4) $\hat{i}\times\hat{k}=-\hat{j}$
PBM105

98. The magnitude of the vector product of two vectors $\vec{A}$ and $\vec{B}$ may be :
(1) Equal to 0 (2) Less than AB
(3) Equal to AB (4) All of above
PBM106

99. If $\vec{P}\times\vec{Q}=\vec{R}$, then which of the following statements is true ?

(1) $\vec{R}\perp\vec{P}$ (2) $\vec{R}\perp\vec{Q}$

(3) $\vec{R}\perp(\vec{P}+\vec{Q})$ (4) All of above

PBM107

100. 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) $\frac{\vec{P}\times\vec{Q}}{|\vec{P}\times\vec{Q}|}$ (4) Both 2 and 3

PBM108

101. Which of the following vector identities is false ?

(1) $\vec{P}+\vec{Q}=\vec{Q}+\vec{P}$ (2) $\vec{P}\times\vec{Q}=\vec{Q}\times\vec{P}$

(3) $\vec{P}.\vec{Q}=\vec{Q}.\vec{P}$ (4) $\vec{P}\times\vec{Q}=-(\vec{Q}\times\vec{P})$

PBM109

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

(1) $-2(\vec{A}\times\vec{B})$ (2) $2(\vec{B}\times\vec{A})$

(3) $\vec{0}$ (4) both 1 and 2

PBM110

103. 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

PBM111

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

(1) zero

(2) along west

(3) along east

(4) vertically downward

PBM112

105. If $\frac{3}{4}|\vec{A}\times\vec{B}|=|\vec{A}.\vec{B}|$, then the angle between $\vec{A}$ and $\vec{B}$ will be :

(1) 30° (2) 45° (3) 60° (4) 53°

PBM113

106. 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 true ?

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

(3) $\vec{A}.\vec{B}=48$ (4) A = 10

PBM114

107. Two non zero vectors $\vec{A}$ and $\vec{B}$ are such that $|\vec{A}+\vec{B}|=|\vec{A}-\vec{B}|$. Then select correct alternative

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

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

PBM115

108. A vector $\vec{F}_1$ is along the positive Y-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) $-4\hat{i}$

PBM116

109. 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) π (2) $\frac{\pi}{4}$

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

PBM117

110. The vector $\vec{B}=6\hat{i}+2\hat{j}+S\hat{k}$ is parallel to the vector $\vec{A}=3\hat{i}+\hat{j}+2\hat{k}$ if S =

(1) 1 (2) 4 (3) 6 (4) 8

PBM118

111. 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) $\vec{B}.\vec{C}$

PBM119

112. For a body, angular velocity $\vec{\omega}=\hat{i}-\hat{j}+\hat{k}$ 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) $-2\hat{i}+2\hat{k}$ (4) $-5\hat{i}-2\hat{j}-3\hat{k}$

PBM120

113. Find unit vector perpendicular to the plane of $\vec{a}=2\hat{i}-2\hat{j}+\hat{k}$ and $\vec{b}=\hat{i}+2\hat{j}+2\hat{k}$

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

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

PBM121

EXERCISE-I (Conceptual Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	1	1	3	2	3	3	2	2	2	1	1	2	2	4	3
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	1	3	3	1	3	3	1	4	1	3	1	4	3	4	1
Question	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Answer	3	3	4	1	4	1	1	1	2	1	3	1	2	1	2
Question	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Answer	1	4	2	4	4	2	1	3	3	2	4	1	2	3	2
Question	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Answer	4	1	2	1	4	1	1	4	1	2	2	2	1	1	2
Question	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Answer	1	3	4	2	3	1	2	4	1	2	2	4	2	3	2
Question	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Answer	1	1	4	3	2	3	3	4	4	4	2	4	4	3	4
Question	106	107	108	109	110	111	112	113							
Answer	1	1	1	1	2	3	3	3							

Exercise - II (Previous Year Questions) AIPMT/NEET

Re-AIPMT 2015

1. If vectors $\vec{A}=\cos\omega t\hat{i}+\sin\omega t\hat{j}$ and

$\vec{B}=\cos\frac{\omega t}{2}\hat{i}+\sin\frac{\omega t}{2}\hat{j}$

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

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

(3) $t=\frac{\pi}{2\omega}$ (4) $t=\frac{\pi}{\omega}$

PBM131

NEET-I 2016

2. 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 :-

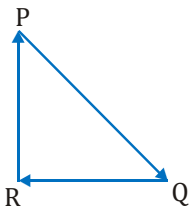
(1) 0° (2) 90°

(3) 45° (4) 180°

PBM132

NEET(UG) 2019

3. 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 $\overrightarrow{QR}$

PBM133

RE-NEET(UG) 2022

4. 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

PBM134

EXERCISE-II (Previous Year Questions) ANSWER KEY

Question	1	2	3	4
Answer	4	2	3	3

Exercise - III (Analytical Questions) Master Your Understanding

1. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
Assertion (A) : Current has magnitude as well as direction but still not considered as vector.
Reason (R) : Current do not follow vector algebra.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

PBM135

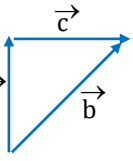
2. Two vectors $\vec{A}$ & $\vec{B}$ have equal magnitude equal to Z. If angle between $\vec{A}$ & $\vec{B}$ is 60° then match the following :

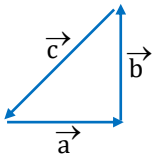
(A) $\lvert\vec{A}+\vec{B}\rvert$	(P) $\frac{\sqrt{3}}{2}Z^2$
(B) $\lvert\vec{A}-\vec{B}\rvert$	(Q) Z
(C) $\vec{A}\cdot\vec{B}$	(R) $\sqrt{3}Z$
(D) $\lvert\vec{A}\times\vec{B}\rvert$	(S) None

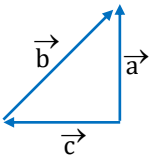
(1) (A)–(R), (B)–(S), (C)–(Q), (D)–(P)
(2) (A)–(R), (B)–(Q), (C)–(S), (D)–(P)
(3) (A)–(P), (B)–(Q), (C)–(R), (D)–(S)
(4) (A)–(Q), (B)–(P), (C)–(S), (D)–(P)

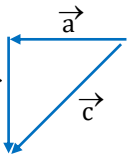
PBM137

3. Match the following

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

(B) $\vec{a}-\vec{c}=\vec{b}$ (Q) 

(C) $\vec{b}-\vec{a}=\vec{c}$ (R) 

(D) $\vec{a}+\vec{b}+\vec{c}=\vec{0}$ (S) 

(1) (A)–(S), (B)–(R), (C)–(P), (D)–(Q)
(2) (A)–(R), (B)–(S), (C)–(Q), (D)–(P)
(3) (A)–(P), (B)–(Q), (C)–(R), (D)–(S)
(4) (A)–(S), (B)–(R), (C)–(Q), (D)–(P)

PBM138

4. Given below are two statements :
Statement I : Resultant of 2 forces of magnitude 4N and 5N can be 2N in magnitude.
Statement II : $\big|\lvert\vec{a}\rvert-\lvert\vec{b}\rvert\big| \le \lvert\vec{a}+\vec{b}\rvert \le \lvert\vec{a}\rvert+\lvert\vec{b}\rvert$
In the light of the above statements, choose the most appropriate answer from the options given below :
(1) Both statement I and statement II are correct.
(2) Statement I is correct and statement II is incorrect.
(3) Statement I is incorrect and statement II is correct.
(4) Both statements I and statements II are incorrect.

PBM139

5. Given below are two statements :
Statement I : Two null vector have same direction.
Statement II : $\vec{A}\times\vec{B}$ lies in the plane of $\vec{A}+\vec{B}$
In the light of the above statements, choose the most appropriate answer from the options given below :
(1) Both statement I and statement II are correct.
(2) Statement I is correct and statement II is incorrect.
(3) Statement I is incorrect and statement II is correct.
(4) Both statements I and statements II are incorrect.

PBM140

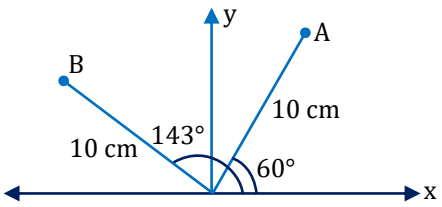
6. Which of the following is correct :
(i) $\vec{A}\cdot\vec{B}$ is a vector quantity
(ii) $\vec{A}\times\vec{B}$ is perpendicular to plane of $\vec{A}+\vec{B}$
(iii) For two orthogonal vectors $\vec{A}\cdot\vec{B}=0$
(iv) If vectors are parallel or antiparallel, then $\vec{A}\times\vec{B}=\vec{0}$
(1) (i) only (2) (i) & (ii)
(2) (iii) & (iv) only (4) (ii), (iii) & (iv)

PBM141

7. Given below are two statements :
Statement-I : For every small angle θ, we may use approximation $\sin\theta \approx \theta \approx \tan\theta$.
Statement-II : For very small angle θ, the hypotenuse and the base become approximately of the same length.
(1) Statement-I is true, Statement-II is true; Statement-II is a correct explanation for Statement-I.
(2) Statement-I is true, Statement-II is true; Statement-II is not a correct explanation for Statement-I.
(3) Statement-I is true, Statement-II is false.
(4) Statement-I is false, Statement-II is true.

PBM143

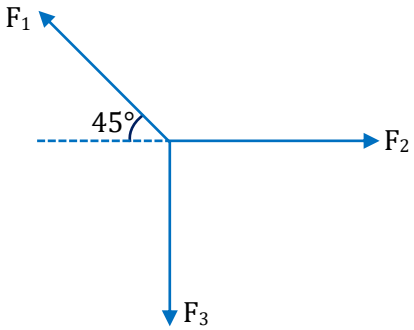
8. Refer the given figure and identify correct statement(s)
(A) Distance of A from x-axis is $5\sqrt{3}$ cm.
(B) Distance of B from x-axis is 6 cm.
(C) Distance of A from y-axis is 5 cm.
(D) Distance of B from y-axis is 8 cm.



Options :-
(1) A, C (2) A, D
(3) A, B, C (4) A, B, C, D

PBM145

9. Three forces $\vec{F}_1$, $\vec{F}_2$ and $\vec{F}_3$ are represented as shown. Each of them is of equal magnitude.



Column I (Combination)	Column II (Approximate Direction)
(A) $\vec{F}_1+\vec{F}_2+\vec{F}_3$	(P)
(B) $\vec{F}_1-\vec{F}_2+\vec{F}_3$	(Q)
(C) $\vec{F}_1-\vec{F}_2-\vec{F}_3$	(R)
(D) $\vec{F}_2-\vec{F}_1-\vec{F}_3$	(S)

Options :-
(1) A → R, B → Q, C → P, D → S
(2) A → Q, B → P, C → R, D → S
(3) A → Q, B → R, C → P, D → S
(4) A → S, B → P, C → R, D → Q

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10. Which of the following statement is/are true ?
(a) Two vectors of unequal magnitude can add up to zero.
(b) Three vectors of unequal magnitude can add up to zero, if they lie in a plane.
(c) Three vectors of unequal magnitude can added upto zero, if they do not lie in same plane.

Options :-
(1) Only a (2) a, b and c
(3) only b (4) only c

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EXERCISE-III (Analytical Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10
Answer	1	2	1	1	4	4	1	4	3	3