EXERCISE-I (Conceptual Questions) — Build Up Your Understanding

TRIGONOMETRY

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

(1) Increases
(2) Decreases
(3) Remains constant
(4) First decreases then increases.

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

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

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

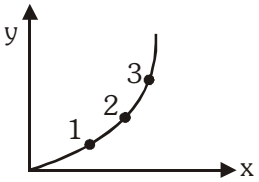
(1) $\sqrt{\frac{5}{6}}$ (2) $-\sqrt{\frac{5}{6}}$ (3) $\frac{1}{\sqrt{6}}$ (4) $-\frac{1}{\sqrt{6}}$

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

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

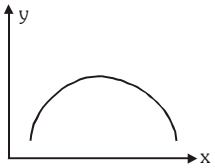


(1) $m_1 > m_2 > m_3$ (2) $m_1 < m_2 < m_3$
(3) $m_1 = m_2 = m_3$ (4) $m_1 = m_3 > m_2$

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.

7. Magnitude of slope of the shown graph.



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

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

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) $\sqrt{12}$

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

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

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 ?

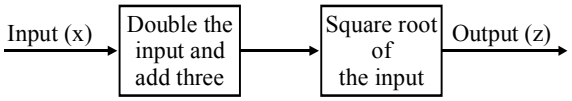
(1) f on the ordinate and ℓ on the abscissa
(2) f on the ordinate and $\sqrt{\ell}$ on the abscissa
(3) f^2 on the ordinate and ℓ on the abscissa
(4) f^2 on the ordinate and $1/\ell$ on the abscissa

ALGEBRA

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

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

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

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

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

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

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

(1) displacement (2) force

(3) velocity (4) torque

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

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

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. $\vec{A}+\vec{B}+\vec{C}$:

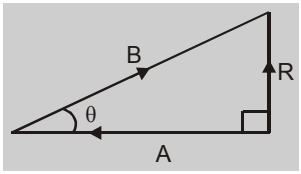
(1) can be zero

(2) cannot be zero

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

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

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°

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 $A=B$

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

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

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

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