PHYSICS

BOOKS - TARGET PHYSICS (MARATHI ENGLISH)

SCALARS AND VECTORS

Classical Thinking

1. Vectors are physical quantities which are completely specified by _____

A. magnitude only

B. number only

C. direction only

D. both magnitude and direction

Answer: D

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2. The magnitude of a vector cannot be :

A. zero

B. negative

C. positive

D. unity

Answer: B

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3. Which of the following is a scalar?

A. Displacement

B. Kinetic energy

C. Couple

D. Momentum

Answer: B

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4. Which of the following is a scalar?

A. Torque

B. Linear momentum

C. Electric field

D. Electric potentrial

Answer: D

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5. Out of the following physical quantities which is NOT a scalar?

A. Angular velocity

B. Angular frequency

C. Number of moles

D. Total path length

Answer: A

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6. Which of the following is a vector quantity?

A. current

B. time

C. impulse

D. charge

Answer: C

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7. The vectors of the same quantity having same magnitude and same direction are called _____

A. parallel vectors

B. equal vectors

C. zero vectors

D. negative vectors

Answer: B

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8. A single vector which produces the same effect of two or more vectors is called _____

A. position vector

B. resultant vector

C. positive vector

D. equal vector

Answer: B

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9. Choose the INCORRECT statement.

A. Vectors having same direction can be added.

B. Vectors having same magnitude may be added.

C. Vectors having different physical quantities can be added.

D. Vectors representing same physical quanity can be added.

Answer: C

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10. Vectors subtraction is _____

A. non-commutative only

B. non-associative only

C. neither non-commutative nor non-associative

D. neither non-commutative nor non-associative

Answer: D

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11. The process of finding the resultant of two or more vectors is called _____

A. resolution of vectors

B. addition of vectors only

C. subtraction of vectors only

D. composition of vectors

Answer: D

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12. The resultant if two vectors will be maximum, if they are_____.

A. equal vectors

B. parallel vectors

C. coplanar vectors

D. orthogonal vectors

Answer: B

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13. The resultant of two vectors will be minimum, if they are

A. equal vectors

B. parallel vectors

C. coplanar vectors

D. perpendicular to each other.

Answer: D

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14. The process of finding the components of a given vector is called as _____

A. composition of vector

B. multiplication of vector

C. addition of vector

D. resolution of vector

Answer: D

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15. If the component of one vector in the direction of another vector is zero, then those two vectors are _____

A. parallel to each other

B. opposite to each other

C. coplanar vectors

D. perpendicular to each other.

Answer: D

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16. Under what condition $\left|\vec{A}+\vec{B}\right|=\left|\vec{A}\right|+\left|\vec{B}\right|$ holds good?

A. $\vec{A}$ and $\vec{B}$ act in the same direction.

B. $\vec{A}$ and $\vec{B}$ act in the opposite direction.

C. $\vec{A}$ and $\vec{B}$ are different physical quantities.

D. $\vec{A}$ and $\vec{B}$ have same magnitude.

Answer: A

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17. Law of polygon of vector is repeated use of

A. triangle law of vertor.

B. parallelogram law of vectors.

C. addition of vectot in one dimension.

D. multiplication law of vector.

Answer: A

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18. In parallelogram law of vector, the direction of resultant vector is given by

A. $\tan\alpha = \frac{Q\cos\theta}{P + Q\sin\theta}$

B. $\tan\alpha = \frac{Q\sin\theta}{P + Q\cos\theta}$

C. $\tan\alpha = \frac{P\sin\theta}{P + Q\cos\theta}$

D. $\tan\alpha = \frac{P\cos\theta}{P + Q\cos\theta}$

Answer: B

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19. The direction cosines of $\vec{A} = -\hat{i} + 2\hat{j} + 3j\hat{k}$ is

A. $\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$

B. $-\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$

C. $\frac{1}{\sqrt{14}}, \frac{-2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$

D. $\frac{-1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{-3}{\sqrt{14}}$

Answer: B

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20. In a cartesian coordinate system, the coordinates of two points P and Q are (2,3,-6) and (-2,-5,7) respectively, the vector $\overline{PQ}$ is represented by

A. $-4\hat{i}-8\hat{j}-13\hat{k}$

B. $-4\hat{i}+8\hat{j}-13\hat{k}$

C. $4\hat{i}-8\hat{j}-13\hat{k}$

D. $-4\hat{i}-8\hat{j}+13\hat{k}$

Answer: D

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21. Three coplanar vector in arbitary units are given $\overrightarrow{A}=4\hat{i}+2\hat{j}-3\hat{k}, \overrightarrow{B}=\hat{i}+\hat{j}+3\hat{k}$ and $\overrightarrow{C}=4\hat{i}+5\hat{j}+3\hat{k},$

the resultant is

A. $8\hat{i} + 3\hat{j} + 3\hat{k}$

B. $5\hat{i} + 3\hat{j} - 3\hat{k}$

C. $9\hat{i} + 3\hat{j} + 12\hat{k}$

D. $9\hat{i} + 8\hat{j} + 3\hat{k}$

Answer: D

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22. 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

A. $\frac{1}{7}\left(3\hat{i} + 6\hat{j} - 2\hat{k}\right)$

B. $\frac{1}{7}\left(3\hat{i} + 6\hat{j} + 2\hat{k}\right)$

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

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

Answer: A

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23. If $\overrightarrow{A}=3\hat{i}+2\hat{j}-4\hat{k}$ and $\overrightarrow{B}=5\hat{i}-7\hat{j}+2\hat{k}$, which vector when added to $\overrightarrow{A}+\overrightarrow{B}$ will given unit vector along X-axis?

A. $7\hat{i}+5\hat{j}+2\hat{k}$

B. $-7\hat{i}-5\hat{j}+2\hat{k}$

C. $-7\hat{i}+5\hat{j}+2\hat{k}$

D. $7\hat{i}+5\hat{j}-2\hat{k}$

Answer: C

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24. The magnitude of the resultant of two vectors $\overrightarrow{P}$ and $\overrightarrow{Q}$ is R. It is given by

A. $R = \sqrt{P^2 + Q^2 + 2PQ\sin\theta}$

B. $R = \sqrt{P^2 + Q^2 + 2PQ\cos\theta}$

C. $R = \sqrt{P^2 + Q^2 + PQ\sin\theta}$

D. $R = \sqrt{P^2 + Q^2 + PQ\cos\theta}$

Answer: B

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25. A body is acted upon by two forces of manitudes $F_1 = \sqrt{2}N$ and $F_2 = 3N$ which are inclined at 45° to each other. There magnitude of resultant force acting on the body is

A. 17 N

B. 11 N

C. $\sqrt{17}N$

D. $\sqrt{11}N$

Answer: C

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26. A body of mass 10kg is placed on a smooth inclined plane making an angle of 30° with the horizontal, the component of the force of gravity trying to move the body down the inclined plane is $\left[g = 9.8m/s^2\right]$

A. 98 N

B. 49 N

C. 10 N

D. 5 N

Answer: B

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27. Two vectors of different physical quantities can be _____ to obtain a scalar.

A. added

B. subracted

C. multiplied

D. divided

Answer: C

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28. Choose the WRONG statement.

A. Scalar product of two vectors is a scalar quantity.

B. Dot product of two vector obeys the distributive law of multiplication.

C. Dot product of a vector with itself is zero.

D. Scalar product of vector with itself is equal to square of its magnitude.

Answer: C

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29. The scalar product of electric field intensity and area vector through which the line of force emerges is _____

A. electric potential

B. electric current

C. electric charge density

D. electric flux

Answer: D

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30. The example of dot product is _____

A. angular momentum

B. moment of force

C. linear velocity in terms of angular velocity

D. magnectic flux linked with the surface os magnetic induction

Answer: D

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31. Two vectors $\overrightarrow{P}$ and $\overrightarrow{Q}$ are given $\overrightarrow{P} = 5\hat{i} + 7\hat{j} - 3\hat{k}$ and $\overrightarrow{Q} = 2\hat{i} + 2\hat{j} - a\hat{k}$. If they are mutually perpendicular then value of 'a' is

A. 8

B. 5

C. 3

D. -8

Answer: D

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32. A force of $\left(5\hat{i}+6\hat{j}\right)$ N makes a body to move on a rough surface with a velocity of $\left(4\hat{j}-2\hat{k}\right)$ m/s. What is the power?

A. 8 unit

B. 13 unit

C. 14 unit

D. 24 unit

Answer: D

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33. A constant force of $\left(2\hat{i}+3\hat{j}+5\hat{k}\right)$ N produces a displacement of $\left(3\hat{i}+2\hat{j}+2\hat{k}\right)$ m. Then work done is

A. 5 j

B. 15 j

C. 22 j

D. 50 j

Answer: C

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34. The angle between the following pair of vectors $\vec{A} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{B} = -\hat{i} - \hat{j} + 2\hat{k}$ is

A. 150°

B. 120°

C. 90°

D. 30°

Answer: C

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35. What is the dot product of two vectors of magnitude 3 and 5, if the angle between them is 60°?

A. 15

B. 8

C. 7.5

D. 5.3

Answer: C

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36. The vector product of two vector is a vector whose direction is given is given by

A. Left hand thumb rule.

B. Right hand screw rule.

C. Fleming's left hand rule.

D. Biot-Savart's rule.

Answer: B

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37. The magnitude of self cross product is

A. zero

B. magnitude of vector.

C. square of the magnitude of vector.

D. half the magnitude of vector.

Answer: A

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38. The vector product of two non-zero vector is zero

A. only when they are in the same direction

B. only when they are making angle 60°

C. only when they are perpendicular.

D. whey they are parallel or antiparallel.

Answer: D

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39. The example of cross product is _____

A. power

B. torque

C. work

D. electric flux

Answer: B

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40. If $\vec{A} = -2\hat{i} + 3\hat{j} - 4\hat{k}$ and $\vec{B} = 3\hat{i} - 4\hat{j} + 5\hat{k}$ then $\vec{A} \times \vec{B}$ is

A. $\hat{i} - 2\hat{j} - \hat{k}$

B. $-\hat{i} + 2\hat{j} - \hat{k}$

C. $-\hat{i} - 2\hat{j} + \hat{k}$

D. $-\hat{i} - 2\hat{j} - \hat{k}$

Answer: D

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41. Determine a vector product of $\vec{A} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{B} = -3\hat{i} + \hat{j} + \hat{k}$

A. $-4\hat{i}-\hat{j}+4\hat{k}$

B. $-3\hat{i}+\hat{j}+4\hat{k}$

C. $3\hat{i}+\hat{j}-4\hat{k}$

D. $-4\hat{j}+4\hat{k}$

Answer: D

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42. If $\vec{P}=\hat{i}+2\hat{j}+\hat{k}$ and $\vec{Q}=3\hat{i}+\hat{j}-\hat{k}$ then $\vec{P}\times\vec{Q}$ is

A. $-3\hat{i}+4\hat{j}-5\hat{k}$

B. $3\hat{i}-4\hat{j}+5\hat{k}$

C. $3\hat{i}+4\hat{j}-5\hat{k}$

D. $3\hat{i} + 4\hat{j} - 5\hat{k}$

Answer: A

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43. Linear momentum $\overrightarrow{P} = 2\hat{i} + 4\hat{j} + 5\hat{k}$ and position vector is $\overrightarrow{r} = 3\hat{i} - \hat{j} + 2\hat{k}$, the angular momentum is given by

A. $3\hat{i} - 19\hat{j} + 14\hat{k}$

B. $13\hat{i} + 19\hat{j} + 14\hat{k}$

C. $-3\hat{i} - 19\hat{j} + 14\hat{k}$

D. $-13\hat{i} - 11\hat{j} + 14\hat{k}$

Answer: D

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44. The area of a triangle formed by the sides of vector $\vec{A}$ and $\vec{B}$ is

A. $\left|\vec{A} \times \vec{B}\right|$

B. $\left|\vec{A} \cdot \vec{B}\right|$

C. $\frac{1}{2}\left|\vec{A} \cdot \vec{B}\right|$

D. $\frac{1}{2}\left|\vec{A} \times \vec{B}\right|$

Answer: D

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45. The area of the triangle having two sides $\vec{A} = \hat{i} - 2\hat{j} - 2\hat{k}$ and $\vec{B} = 2\hat{i} + 2\hat{j} + 3\hat{k}$ is s

A. $\sqrt{45} sq.\ unit$

B. $\sqrt{22.5} sq.\ unit$

C. $4.717 sq.\ unit$

D. $9.43 sq.\ unit$

Answer: C

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46. Area of parallelogram whose adjacent sides are $\left(\hat{i} + 2\hat{j} + 3\hat{k}\right)m$ and $\left(\hat{i} - 3\hat{j} + \hat{k}\right)$m is

A. $\sqrt{50}m^2$

B. $\sqrt{150}m^2$

C. $\sqrt{25}m^2$

D. $\sqrt{75}m^2$

Answer: B

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47. If $\vec{P} = \hat{i} + 2\hat{j} - 4\hat{k}$ and $\vec{Q} = \hat{i} + 2\hat{j} - \hat{k}$ then $\left(\vec{P} + \vec{Q}\right) \cdot \left(\vec{P} - \vec{Q}\right)$ is

A. 5

B. 15

C. 25

D. 115

Answer: B

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48. If $\vec{A} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ and $\vec{B} = \hat{i} + 2\hat{j} + 3\hat{k}$. The value of $\left(2\vec{A} - \vec{B}\right) \cdot \left(\vec{A} + 2\vec{B}\right)$ is

A. 30

B. 40

C. 55

D. 90

Answer: D

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49. A particle moves form position $\overrightarrow{s_1} = \left(3\hat{i} + 2\hat{j} - 6\hat{k}\right)$m to position of $\overrightarrow{s_2} = \left(14\hat{i} + 13\hat{j} - 9\hat{k}\right)$m, under the action of a force $\overrightarrow{F} = \left(14\hat{i} + 13\hat{j} - 9\hat{k}\right)$ N, The work done by the force is

A. 200 j

B. 100 j

C. 75 j

D. 50 j

Answer: B

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Critical Thinking

1. Scalars are physical quantities which are completely specified by _____

A. number and unit

B. number only

C. unit only

D. neither number nor unit

Answer: A

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2. A vector is not changed if

A. it is divided by a scalar

B. it is multiplied by a scalar

C. it slides parallel to itself

D. all of these

Answer: C

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3. The velocity vector of a stationary particle is _____

A. zero vector

B. vector with magnitude of velocity vector

C. scalar

D. scalar with magnitude of velocity vector

Answer: A

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4. If the angle between two collinear vector is π radians, vector are said to be _____

A. antiparallel vector

B. parallel vectors

C. similar vector

D. identical vector

Answer: A

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5. If the angular displacement is large, it is a scalar quantity because

A. its magnitude for large values cannot be calculate.

B. it is not coplanar for large values.

C. it will not obey the commutative law of vector addition.

D. it will not obey principal of homogeneity.

Answer: C

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6. Angular momentum is

A. a scalar

B. a polar vector

C. an axial vector

D. None of these

Answer: C

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7. The component of a vector may be

A. double its magnitude.

B. equal to its magnitude.

C. greater than its magnitude.

D. either greater or equal to its magnitude.

Answer: A

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8. Which of the following is NOT essential for three forces to produce zero resultant?

A. They should be in same plane.

B. It should be possible to represent them by the three sides of a triangle taken in the same order.

C. They should act along the sides of parallelogram.

D. The resultant of any two forces should be equal and opposite to the third force.

Answer: C

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9. Following sets of three forces act on a body. Whose resultant can not be zero.

A. 10,10,10

B. 10,10,20

C. 10,20,23

D. 10,20,40

Answer: D

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10. If more than one forces are acting on a heavy rigid body such that the body is in balanced state, then all the forces are

A. collinear.

B. coplanar.

C. acting in random direction.

D. represented by the sides of a polygon of vectors.

Answer: D

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11. The vector projection of a vector $3\hat{i} + 4\hat{k}$ on y-axis is

A. five

B. four

C. three

D. zero

Answer: D

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12. A vector is represented by $3\hat{i} + \hat{j} + 2\hat{k}$ Its length in XY plane is

A. 2

B. $\sqrt{14}$

C. $\sqrt{10}$

D. $\sqrt{5}$

Answer: C

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13. A particle is simultaneously acted by two forces equal to $4N$ and $3N$. The net force on the particle is

A. 7 N

B. 5 N

C. 1 N

D. Between 1 N and 7 N

Answer: D

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14. The resultant of two vectors at right angles is 5 N. If the angle between them is 120° then the resultant is $\sqrt{13}$ then the vector are

A. 3 N,4 N`

B. $\sqrt{2}N, \sqrt{5}N$

C. $\sqrt{3}N, \sqrt{4}N$

D. $\sqrt{7}N, \sqrt{3}N$

Answer: A

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15. $\overrightarrow{A}$ is a vector with magnitude A, then the unit vector $\hat{A}$ in the direction $\overrightarrow{A}$ is

A. $A\overrightarrow{A}$

B. $\overrightarrow{A}\,\overrightarrow{A}$

C. $\overrightarrow{A} \times \overrightarrow{A}$

D. $\dfrac{\overrightarrow{A}}{A}$

Answer: D

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16. 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. $\sqrt{0.01}$

B. $\sqrt{0.11}$

C. 1

D. $\sqrt{0.39}$

Answer: B

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17. A Unit vector in the direction of the negative of the vector $\left(-\hat{i}+\hat{j}-\hat{k}\right)$ is

A. $\frac{-1}{\sqrt{3}}\left(-\hat{i}+\hat{j}-\hat{k}\right)$

B. $\sqrt{3}\left(\hat{i}+\hat{j}-\hat{k}\right)$

C. $\frac{-1}{\sqrt{2}}\left(\hat{i}+\hat{j}-\hat{k}\right)$

D. $\frac{-1}{\sqrt{3}}\left(\hat{i}+\hat{j}-\hat{k}\right)$

Answer: A

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18. If $\overrightarrow{A}=2\hat{i}+6\hat{j}$ and $\overrightarrow{B}=4\hat{i}+3\hat{j}$, the vector having the same magnitude as $\overrightarrow{B}$ and parallel to $\overrightarrow{A}$ is

A. $\frac{5}{2}\left(2\hat{i}-6\hat{j}\right)$

B. $\frac{\sqrt{10}}{4}\left(\hat{i}-3\hat{j}\right)$

C. $\frac{\sqrt{10}}{4}\left(4\hat{i}+3\hat{j}\right)$

D. $\frac{\sqrt{10}}{2}\left(\hat{i}+3\hat{j}\right)$

Answer: D

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19. If the sum of two unit vectors is a unit vector, then magnitude of difference is-

A. $\sqrt{3}$

B. $\sqrt{2}$

C. $\frac{1}{\sqrt{2}}$

D. $\sqrt{5}$

Answer: B

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20. A vector of magnitude b is rotated through angle θ. What is the change in magnitude of the vector?

A. $2b\sin\theta/2$

B. $2b\cos\theta/2$

C. $2b\sin\theta/2$

D. $2b\cos\theta$

Answer: A

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21. The resultant of two vectors $\vec{P}$ and $\vec{Q}$ is $\vec{R}$. If the magnitude of $\vec{Q}$ is doubled, the new resultant vector

becomes perpendicular to $\overrightarrow{P}$. Then, the magnitude of $\overrightarrow{R}$ is equal to

A. P+Q

B. Q

C. P

D. $\frac{P+Q}{2}$

Answer: B

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22. Choose the correct options

A force vector applied on a mass is represented as $\overrightarrow{F} = \left(6\hat{i} - 8\hat{j} + 10\hat{k}\right)$ N and accelerates with 1 ms^{-2} What will be the mass of the body?

A. $10\sqrt{2}$

B. 20

C. $2\sqrt{10}$

D. 10

Answer: A

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23. Vector $\vec{A} = 2\hat{i} - 3\hat{j} + a\hat{k}$ and $\vec{B} = 12\hat{i} - b\hat{j} + 6\hat{k}$ are parallel to each other, then values of 'a' and 'b' are

A. 1,18

B. 1,-18

C. $-1, 18$

D. $-1, \ -18$

Answer: A

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24. If a $4\hat{i}+3\hat{j}+8\hat{k}$ is perpendicular to the vector $4\hat{j}-4\hat{i}+m\hat{k}$, then the value of m is

A. $\frac{1}{2}$

B. $-\frac{1}{2}$

C. 1

D. -1

Answer: A

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25. A force $\vec{F} = 3\hat{i} + c\hat{j} + 2\hat{k}$ acting on a particle causes a displacement $\vec{d} = -4\hat{i} + 2\hat{j} + 3\hat{k}$. If the work done is $6j$. Find the value of 'c' ?

A. 0

B. 1

C. -6

D. 12

Answer: C

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26. Work done when a force of $\left(7\hat{i}-4\hat{j}-4\hat{k}\right)$ N moves a body through a distance of 10 metre in its own direction is

A. 160 j

B. 120 j

C. 90 j

D. 10 j

Answer: C

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27. If $\vec{P}=\hat{i}-2\hat{j}-3\hat{k}$ and $\vec{Q}=4\hat{i}-2\hat{j}+6\hat{k}$, the angle made by $\vec{P}+\vec{Q}$ with X-axis is

A. 30°

B. 45°

C. 60°

D. 90°

Answer: B

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28. Choose the CORRECT statement.

A. The vector product does not obey commutative law but obeys distributive law of multiplication.

B. The vector product obeys commutative law of multiplication but does not obey distributive law of

multiplication.

C. The vector product does not obey both commutative and distributive law of multiplication.

D. The vector product obeys both commutative and distributive law of multiplication.

Answer: A

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29. The sine of the angle between $3\hat{i}+\hat{j}+2\hat{k}$ and $2\hat{i}-2\hat{j}+4\hat{k}$ is

A. 1

B. 0.91

C. 0.76

D. 0.67

Answer: C

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30. If $\vec{A} . \vec{B} = 0$ and $\vec{A} \times \vec{B} = 0,$ then which of the following conditions is necessary?

A. A=1,B=0

B. A=0 and B=0

C. A=0 or B=0

D. A=0,B=1

Answer: C

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31. If the ratio of the dot product of two vectors and cross product of same two vectors is $\sqrt{3}$, the two vectors make angle

A. 30°

B. 45°

C. 90°

D. 120°

Answer: A

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32. Select the WRONG one.

A. $\overrightarrow{P} \times \overrightarrow{Q} \neq \overrightarrow{Q} \times \overrightarrow{P}$

B. $\overrightarrow{P} \times \left(\overrightarrow{Q} \times \overrightarrow{R}\right) = \left(\overrightarrow{P} \times \overrightarrow{Q}\right) \times \overrightarrow{R}$

C. $\overrightarrow{P} \cdot \overrightarrow{Q} = \overrightarrow{Q} \cdot \overrightarrow{P}$

D. $\overrightarrow{P} \times \left(\overrightarrow{Q} + \overrightarrow{R}\right) = \overrightarrow{P} \times \overrightarrow{Q} + \overrightarrow{P} \times \overrightarrow{R}$

Answer: B

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33. If $\overrightarrow{a}$ and $\overrightarrow{b}$ are two vectors then the value of $\left(\overrightarrow{a} + \overrightarrow{b}\right) \times \left(\overrightarrow{a} - \overrightarrow{b}\right)$ is

A. $2\left(\vec{B} \times \vec{A}\right)$

B. $\left(\vec{B} \times \vec{A}\right)$

C. $2\left(\vec{B} + \vec{A}\right)$

D. $2\left(\vec{B} - \vec{A}\right)$

Answer: A

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34. Given $\vec{p} \cdot \left(\vec{P} + \vec{Q}\right) = P^2$ then the angle between $\vec{P}$ and $\vec{Q}$ is

A. 0°

B. 30°

C. 45°

D. 90°

Answer: D

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35. Assertion : If dot product and cross product of $\vec{A}$ and $\vec{B}$ are zero, it implies that one of the vector $\vec{A}$ and $\vec{B}$ must be a null vector.

Reason: Null vector is a vector with zero mangnitude.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion

C. Assertion is True, Reason is False

D. Assertion is False, Reason is False.

Answer: B

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36. Assertion : $\vec{A} \times \vec{B}$ is perpendicular to both $\vec{A} + \vec{B}$ as well as $\vec{A} - \vec{B}$.

Reason: $\vec{A} + \vec{B}$ as well as $\vec{A} - \vec{B}$ lie in the plane containing $\vec{A}$ and $\vec{B}$, but $\vec{A} \times \vec{B}$ lies perpendicular to the plane containing A and B.

A. Assertion is True, Reason is True, Reason is a correct explantion for Assertion

B. Assertion is True, Reason is True, Reason is not a correct explanaition for Assertion

C. Assertion is True, Reason is False

D. Assertion is False, Reason is False.

Answer: A

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37. A small ball is hung by a string fixed to a wall. The ball is pushed away from the wall. The forces action on the ball are shown in the diagram. Which of the following statements is wrong? 

A. $P = W \tan\theta$

B. $\vec{T} + \vec{P} + \vec{W} = 0$

C. $T^2 = P^2 + W^2$

D. $T = P + W$

Answer: D

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Competitive Thinking

1. Which of the following is a scalar quantity?

A. Displacement

B. Electric field

C. Accerleration

D. Work

Answer: D

Watch Video Solution

2. Can the resultant of two vectors be zero ?

A. Yes, when the 2 vectors are same in magnitude and direction.

B. No

C. Yes, when the 2 vectors are same in magnitude but opposite in sense.

D. Yes, when the 2 vectors are same in magnitude making an angle of $\frac{2\pi}{3}$ with each other.

Answer: C

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3. Two vectors $\vec{A}$ and $\vec{B}$ are acting in the same plane and the vector $\vec{C}$ is perpendicular to the plane. The resultant of these vectors.

A. may be zero.

B. can not be zero.

C. lies between $\vec{A}$ and $\vec{B}$

D. lies between $\vec{A}$ and $-\vec{B}$.

Answer: B

Watch Video Solution

4. If $\left|\vec{A}+\vec{B}\right|=\left|\vec{A}\right|+\left|\vec{B}\right|$, then angle between $\vec{A}$ and $\vec{B}$ will be

A. 90°

B. 120°

C. 0°

D. 60°

Answer: C

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5. A bird flies from (-3 m,4 m,-3 m) to (7 m, -2 m, -3 m) in XYZ co-ordinates. The bird's displacement in unit vectors is given

by

A. $\left(4\hat{i}+\hat{j}-6\hat{k}\right)$

B. $\left(10\hat{i}+6\hat{j}\right)$

C. $\left(10\hat{i}-6\hat{j}\right)$

D. $\left(10\hat{i}+6\hat{j}-6\hat{k}\right)$

Answer: C

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6. The magnitudes of vectors $\overrightarrow{A}, \overrightarrow{B}$ and $\overrightarrow{C}$ are 3,4 and 5 unit respectively. If $\overrightarrow{A}+\overrightarrow{B}=\overrightarrow{C}$, the angle between $\overrightarrow{A}$ and $\overrightarrow{B}$ is

A. $\frac{\pi}{2}$

B. $\cos^{-1}(0.6)$

C. $\tan^{-1}\left(\frac{7}{5}\right)$

D. $\frac{\pi}{4}$

Answer: A

Watch Video Solution

7. A person goes 10 km north and 20 km east. What will be the displacement from initial point?

A. 22.36 km

B. 2 km

C. 5 km

D. 20 km

Answer: A

Watch Video Solution

8. The resultant of the three vectors shown in figure and the angle made by the resultant with X-axis is 

A. 10 m ahd 37°

B. 8.6 m and 35.5°

C. $\left(5+\sqrt{3}\right)m$ and 37°

D. None of these

Answer: B

Watch Video Solution

9. A ship A is moving westwards with a speed of $10kmh^{-1}$ and a ship B 100 km south of A, is moving northwards with a speed of $10kmh^{-1}$ The time after which the distance between them becomes shortest, is

A. 0 h

B. 5 h

C. $5\sqrt{2}h$

D. $10\sqrt{2}h$

Answer: B

Watch Video Solution

10. Particle A moves along X-axis with a uniform velocity of magnitude 10 m/s. Particle B moves with uniform velocity 20 m/s. along a direction making an angle of 60° with the positive direction of X-axis as shwon in the figure. The relative velocity of B with respect to that of A is 

A. 10 m/s along X-axis.

B. $10\sqrt{3}\frac{m}{s}$ along Y-axis (perpendicular to X-axis).

C. $10S\sqrt{5}$ along the bisection of the velocities of A and B.

D. 30 m/s along negative X-axis.

Answer: B

Watch Video Solution

11. A particle has displacement of 12 m towards east and 5 m towards north then 6 m vertically upwards. The sum of these displacements is

A. 12 m

B. 10.04 m

C. 14.31 m

D. None of these

Answer: C

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12. Two equal forces are acting at a point with an angle of 60° between them. If the resultant force is equal to $40\sqrt{3}$ N,

the magnitude of each force is

A. 40 N

B. 20 N

C. 80 N

D. 30 N

Answer: A

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13. The resultant force of 5 N and 10 N cannot be

A. 12 N

B. 8 N

C. 4 N

D. 5 N

Answer: C

Watch Video Solution

14. The maximum and minimum magnitude of the resultant of two given vectors are 17 units and 7 units respectively. If these two vectors are at right angles to each other, the magnitude of their resultant is

A. 18

B. 16

C. 14

D. 13

Answer: D

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15. If $\vec{a} = 4\hat{i} - \hat{j}$, $\vec{b} = -3\hat{i} + 2\hat{j}$ and $\vec{c} = -\hat{k}$. Then the unit vector $\hat{r}$ along the direction of sum of these vectors will be

A. $\hat{r} = \frac{1}{\sqrt{3}}\left(\hat{i} + \hat{j} - \hat{k}\right)a$

B. $\hat{r} = \frac{1}{\sqrt{2}}\left(\hat{i} + \hat{j} - \hat{k}\right)$

C. $\hat{r} = \frac{1}{3}\left(\hat{i} - \hat{j} + \hat{k}\right)$

D. $\hat{r} = \frac{1}{\sqrt{2}}\left(\hat{i} + \hat{j} + \hat{k}\right)$

Answer: A

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16. If $A = 3\hat{i} - 2\hat{j} + \hat{k}, B = \hat{i} - 3\hat{j} + 5\hat{k}$ and $C = 2\hat{i} + \hat{j} - 4\hat{k}$ form a right angled triangle, then out of the following which one is satisfed ?

A. $\overrightarrow{A} = \overrightarrow{B} + \overrightarrow{C}$ and $A^2 = B^2 + c^2$

B. $\overrightarrow{A} = \overrightarrow{B} + \overrightarrow{C}$ and $B^2 = A^2 + c^2$

C. $\overrightarrow{B} = \overrightarrow{A} + \overrightarrow{C}$ and $B^2 = A^2 + C^2$

D. $\overrightarrow{B} = \overrightarrow{A} + \overrightarrow{C}$ and $A^2 = B^2 + C^2$

Answer: B

Watch Video Solution

17. The resultant of two forces , one double the other in magnitude is perpendicular to the smaller of the two forces. The angle between the two forces is _____?

A. 60°

B. 120°

C. 150°

D. 90°

Answer: B

Watch Video Solution

18. Two forces are such that the sum of their magnitudes is 18N and their resultant is 12 N which is perpendicular to the

smaller force. Then the magnitude of the forces are

A. 12 N, 8 N

B. 13 N, 5 N

C. 10 N, 8 N

D. 16 N, 2 N

Answer: B

Watch Video Solution

19. Two forces with equal magnitudes F act on body and the magnitude of the resultant forces is $\frac{F}{3}$. The angle between the two forces is

A. $\cos^{-1}\left(-\frac{17}{18}\right)$

B. $\cos^{-1}\left(-\frac{1}{3}\right)$

C. $\cos^{-1}\left(-\frac{2}{3}\right)$

D. $\cos^{-1}\left(-\frac{8}{9}\right)$

Answer: A

Watch Video Solution

20. Two forces of equal magnitude F are at a point. If θ is the angle between two forces then magnitude of the resultant forces will be

A. $2F\cos\frac{\theta}{2}$

B. $F\cos\frac{\theta}{2}$

C. $2F\cos\theta$

D. $\frac{F}{2}\cos\frac{\theta}{2}$

Answer: C

Watch Video Solution

21. Two equal vectors have a resultant equal to either of them. The angle between them is

A. 60°

B. 90°

C. 100°

D. 120°

Answer: D

Watch Video Solution

Watch Video Solution

22. The resultant of two forces 3P and 2P is R. If the first force is doubled then resultant is also doubled.The angle between the two forces is

A. 60°

B. 120°

C. 70°

D. 180°

Answer: B

Watch Video Solution

23. 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

A. 45°

B. 180°

C. 0°

D. 90°

Answer: D

Watch Video Solution

24. If $\left|\vec{V}_1 + \vec{V}_2\right| = \left|\vec{V}_1 - \vec{V}_2\right|$ and V_2 is finite, then

A. V_1 is parallel to V_2

B. $\vec{V}_1 = \vec{V}_2$

C. V_1 and V_2 are mutually perpendicular

D. $\left|\vec{V}_1\right| = \left|\vec{V}_2\right|$

Answer: C

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25. Two vector $\vec{A}$ and $\vec{B}$ have equal magnitudes. If magnitude of $\vec{A} + \vec{B}$ is equal to n time the magnitude of $\vec{A} - \vec{B}$, then angle to between $\vec{A}$ and $\vec{B}$ is

A. $\cos^{-1}\left(\frac{n-1}{n+1}\right)$

B. $\cos^{-1}\left(\frac{n^2-1}{n^2+1}\right)$

C. $\sin^{-1}\left(\frac{n-1}{n+1}\right)$

D. $\sin^{-1}\left(\frac{n^2-1}{n^2+1}\right)$

Answer: B

Watch Video Solution

26. A unit vector is represented as $\left(0.8\hat{i}+b\hat{j}+0.4\hat{k}\right)$. Hence the value of 'b' must be

A. 0.4

B. $\sqrt{0.6}$

C. 0.2

D. $\sqrt{0.2}$

Answer: D

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27. The angle between two vector A and B is θ. Vector R is the resultant of the two vectors. If R makes an angle $\frac{\theta}{2}$ with A, then

A. A=2B

B. $A = \frac{B}{2}$

C. A = B

D. AB = 1

Answer: C

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28. The magnitude of the component of the vector $2\hat{i} + 3\hat{j} + \hat{k}$ along $3\hat{i} + 4\hat{k}$ is

A. $\frac{1}{2}$

B. $\frac{14}{5}$

C. 2

D. $\frac{6}{5}$

Answer: C

Watch Video Solution

29. $\overrightarrow{A}$ and $\overrightarrow{B}$ are two vectors given by $\overrightarrow{A} = 2\hat{i} + 3\hat{j}$ and $\overrightarrow{B} = \hat{i} + \hat{j}$. The magnitude of the

component of $\overrightarrow{A}$ along $\overrightarrow{B}$ is

A. $\frac{5}{\sqrt{2}}$

B. $\frac{3}{\sqrt{2}}$

C. $\frac{7}{\sqrt{2}}$

D. $\frac{1}{\sqrt{2}}$

Answer: A

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30. 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

A. $-\frac{1}{2}$

B. $\frac{1}{2}$

C. 1

D. -1

Answer: A

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

A. 3

B. 4

C. 9

D. 13

Answer: A

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32. 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

A. t = 0

B. $t = \frac{\pi}{4\omega}$

C. $t = \frac{\pi}{2\omega}$

D. $t = \frac{\pi}{\omega}$

Answer: D

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33. Consider two vector $\overrightarrow{F_1} = 2\hat{j} + 5\hat{k}$ and $\overrightarrow{F_2} = 3\hat{j} + 4\hat{k}$.

The magnitude of the scalar product of these vector is

A. 20

B. 23

C. $5\sqrt{33}$

D. 26

Answer: D

Watch Video Solution

34. A particle moves from (1,0,3) to the point (-3,4,5), when a force $\overrightarrow{F} = \left(\hat{i} + 5\hat{k}\right)$ acts on it. Amount of work done in

joule is

A. 14

B. 10

C. 6

D. 15

Answer: C

Watch Video Solution

35. A force $\left(4\hat{i}+\hat{j}-2\hat{k}\right)'Nwithvelocityat$ (2(i)+2hat(j)+3hat(k))' ms^(-1)` The power exerted is

A. 4 W

B. 5 W

C. 2 W

D. 8 W

Answer: A

Watch Video Solution

36. A body of mass 1 kg begins to move under the action of a time dependent force $F = \left(2t\hat{i} + 3t^2\hat{j}\right)N$, where $\hat{i}$ and $\hat{j}$ are unit vector along x and y axis. What power will be developed by the force at the time?

A. $\left(2t^3 + 3t^4\right)W$

B. $\left(2t^3 + 3t^5\right)W$

C. $\left(2t^2 + 3t^2\right)W$

D. $\left(2t^2 + 3t^4\right)W$

Answer: B

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37. When $\vec{A} \cdot \vec{B} = -\left|\vec{A}\right|\left|\vec{B}\right|$, then

A. $\vec{A}$ and $\vec{B}$ are perpendicular to each other.

B. $\vec{A}$ and $\vec{B}$ act in the same direction.

C. $\vec{A}$ and $\vec{B}$ act in the opposite direction.

D. $\vec{A}$ and $\vec{B}$ can act in any direction.

Answer: C

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38. The angle between the two vectors, $\left(\vec{A} = 3\hat{i} + 4\hat{j} + 5\hat{k}\right)$ and $\left(\vec{B} = 3\hat{i} + 4\hat{j} - 5\hat{k}\right)$ will be

A. zero

B. 45°

C. 90°

D. 180°

Answer: C

Watch Video Solution

39. The angle θ between the vector $\vec{p} = \hat{i} + \hat{j} + \hat{k}$ and unit vector along X-axis is

A. $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

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

C. $\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$

D. $\cos^{-1}\left(\frac{1}{2}\right)$

Answer: A

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40. Angle between the vectors $\left(\hat{i}+\hat{j}\right)$ and $\left(\hat{j}-\hat{k}\right)$ is

A. 30°

B. 45°

C. 60°

D. 90°

Answer: C

Watch Video Solution

41. A particle moves in the x-y plane under the action of a force $\vec{F}$ such that the value of its linear momentum $\vec{P}$ at any time t is $P_x = 2\cos t$ and $p_y = 2\sin t$. What is the angle θ between $\vec{F}$ and P at a given time t?

A. $\theta = 0^\circ$

B. $\theta = 30^\circ$

C. $\theta = 90^\circ$

D. $\theta = 180^\circ$

Answer: C

Watch Video Solution

42. In a triangle ABC, the sides AB and AC represented by the vector $3\hat{i}+\hat{j}+\hat{k}$ and $\hat{i}+2\hat{j}+\hat{k}$ respectively. Calcutate the angle $\angle ABC$.

A. $\cos^{-1}\left(\sqrt{\frac{5}{11}}\right)$

B. $\cos^{-1}\left(\sqrt{\frac{6}{11}}\right)$

C. $90^\circ - \cos^{-1}\left(\sqrt{\frac{5}{11}}\right)$

D. $180^\circ - \cos^{-1}\left(\sqrt{\frac{5}{11}}\right)$

Answer: A

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43. In a clockwise system :-

A. $\hat{j} * \hat{k} = \hat{i}$

B. $\hat{i} \cdot \hat{i} = 0$

C. $\hat{j} \times \hat{k} = \hat{i}$

D. $\hat{k} \cdot \hat{j} = 1$

Answer: A

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44. For vectors $\overrightarrow{A}$ and $\overrightarrow{B}$ making an angle θ which one of the following relation is correct?

A. $\vec{A} \times \vec{B} = \vec{B} \times \vec{A}$

B. $\vec{A} \times \vec{B} = -AB\sin\theta$

C. $\vec{A} \times \vec{B} = AB\cos\theta$

D. $\vec{A} \times \vec{B} = -\vec{B} \times \vec{A}$

Answer: D

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

A. zero

B. along west

C. along east

D. vertically downward

Answer: B

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46. Which of the following relation is not correct?

A. $\overrightarrow{v} = \overrightarrow{\omega} \times \overrightarrow{r}$

B. $\overrightarrow{v} = \overrightarrow{r} \times \overrightarrow{\omega}$

C. $\overrightarrow{\delta s} = \overrightarrow{\delta\theta} \times \overrightarrow{r}$

D. $v = r\omega$

Answer: A

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47. What is the value of linear velocity if $\vec{\omega} = 3\hat{i} - 4\hat{j} + \hat{k}$ and $\vec{r} = 5\hat{i} - 6\hat{k} + 6\hat{k}$?

A. $6\hat{i} - 2\hat{j} + 3\hat{k}$

B. $6\hat{i} - 2\hat{j} + 8\hat{k}$

C. $6\hat{i} - 13\hat{j} + 6\hat{k}$

D. $-18\hat{i} - 13\hat{j} - 2\hat{k}$

Answer: D

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48. If $\vec{A} \times \vec{B} = \vec{B} \times \vec{A}$, then the angle between $\vec{A}$ and $\vec{B}$ is-

A. π

B. $\pi/3$

C. $\pi/2$

D. $\pi/4$

Answer: A

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49. The moment of the force, $\vec{F} = 4\hat{i} + 5\hat{j} - 6\hat{k}$ at (2,0,-3), about the point (2,-2,-2) is given by

A. $-8\hat{i} - 4\hat{j} - 7\hat{k}$

B. $-4\hat{i} - \hat{j} - 8\hat{k}$

C. $-7\hat{i} - 8\hat{j} - 4\hat{k}$

D. $-7\hat{i}-4\hat{j}-8\hat{k}$

Answer: D

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50. A force $\overrightarrow{F}=\propto \hat{i}+3\hat{j}+6\hat{k}$ is acting at a point $\overrightarrow{r}=2\hat{i}-6\hat{j}-12\hat{k}$. The value of $\propto$ for which angular momentum about origin is conserved is.

A. 1

B. -1

C. 2

D. zero

Answer: B

Watch Video Solution

51. Two particles A and B are moving as shown in the figure.

Their total angular momentum about the point O is 

A. $9.8kgm^2/s$

B. zero

C. $52.7kgm^2/s$

D. $37.9kgm^2/s$

Answer: A

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52. The velocity of a particle of mass m is $\overrightarrow{v} = 5\hat{i} + 4\hat{j} + 6\hat{k}$ when at $\overrightarrow{r} = -2\hat{i} + 4\hat{j} + 6\hat{k}$.

The angular momentum of the particle about the origin is

A. 42 m

B. $\left(42\hat{j} - 28\hat{k}\right)$

C. $m\left(42\hat{i} - 28\hat{j}\right)$

D. $m\left(42\hat{k} - 28\hat{i}\right)$

Answer: B

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53. Two adjacent sides of a parallelogram are respectively by the two vectors $\hat{i} + 2\hat{j} + 3\hat{k}$ and $3\hat{i} - 2\hat{j} + \hat{k}$. What is the

area of parallelogram?

A. 8

B. $8\sqrt{3}$

C. $3\sqrt{8}$

D. 192

Answer: B

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54. Three vector $\vec{A}, \vec{B}, \vec{C}$ satisfy the relation $\vec{A} \cdot \vec{B} = 0$and $\vec{A} . \vec{C} = 0$. The vector $\vec{A}$ is parallel to

A. $\vec{B} \times \vec{C}$

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

C. $\overrightarrow{C}$

D. $\overrightarrow{B}$

Answer: A

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55. The component of a vector r along X-axis will have maximum value if

A. $\overrightarrow{r}$ is along $+$ ve x - axis.

B. $\overrightarrow{r}$ is along $+$ ve y - axis

C. $\overrightarrow{r}$ is along $-$ ve y - axis

D. $\overrightarrow{r}$ make as angle of 45° with the x-axis.

Answer: A

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

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

B. A + B

C. $\left(A^2 + B^2 + 2AB\right)^{1/2}$

D. $\left(A^2 + B^2 + AB\right)^{1/2}$

Answer: D

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57. Sum of magitude of two fores is 25 N. The resultant of these forces is normal to the smaller force and has a magnitude of 10 N. Then the two forces are

A. $14.5N, 10.5N$

B. 16 N, 9 N

C. 13 N, 12 N

D. 20 N , 5 N

Answer: A

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58. Consider a particle on which constant forces $\overrightarrow{F} = \hat{i} + 2\hat{j} + 3\hat{k}$ N and $\overrightarrow{F_2} = 4\hat{i} - 5\hat{j} - 2\hat{k}$ N act

together resulting in a displacement from position $\overrightarrow{r_1} = 20\hat{i} + 15\hat{j}$ cm to $\overrightarrow{r_2} = 7\hat{k}$ cm. The total work done on the particle is

A. $-0.48j$

B. $+0.48j$

C. $-4.8j$

D. `+ 4.8 j

Answer: A

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59. A particle moves from a point $\left(-2\hat{i} + 5\hat{j}\right)$ to $\left(4\hat{j} + 3\hat{k}\right)$ when a force of $\left(4\hat{i} + 3\hat{j}\right)$ N How much work has been done by this force?

A. 2 j

B. 8 j

C. 11 j

D. 5 j

Answer: D

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60. A force $\overrightarrow{(F)} = -K\left(y\hat{i} + x\hat{j}\right)$ (where K is a positive constant) acts on a particle moving in the X-Y plane. Starting from the origin, the particle is taken along the positive X-axis to the point (a, 0) and then parallel to the Y-axis to the point (a,a). The total work done by the force $\overrightarrow{F}$. of the particle is

A. $-2Ka^2$

B. $2Ka^2$

C. $-Ka^2$

D. Ka^2

Answer: C

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

A. are not equal other in magnitude.

B. cannot be predicted.

C. are equal to each other.

D. are equal to each other is magnitude.

Answer: D

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62. If $\vec{A}$ and $\vec{B}$ are two vectors then $\left(\vec{A}+\vec{B}\right)\times\left(\vec{A}-\vec{B}\right)$ is

A. $2\left(\vec{b}\times\vec{a}\right)$

B. $-2\left(\vec{b}\times\vec{a}\right)$

C. $\left(\vec{b}\times\vec{a}\right)$

D. $\vec{a}\times\vec{b}$

Answer: A

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63. The angle between the vector $\vec{A}$ and $\vec{B}$ is θ. Find the value of triple product $\vec{A} . \left(\vec{B} \times \vec{A} \right)$.

A. $A^2 B$

B. Zero

C. $A^2 B \sin \theta$

D. $A^2 B \cos \theta$

Answer: B

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64. If the position vector of a body performing rectilinear motion is given by $\overrightarrow{r} = 3t^2\hat{i} + 4t^2\hat{j}$ m. Find the velocity and acceleration of the particle at t= 1sec.

A. $\sqrt{265}m/s$

B. $\sqrt{276}m/s$

C. $\sqrt{246}m/s$

D. $\sqrt{255}m/s$

Answer: A

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Evaluation Test

1. A force $\vec{F} = 4\hat{i} + 3\hat{j} - 2\hat{k}$ is passing through the origin.

Its moment about point (1,1,0) is

A. $-\hat{i} + \hat{j} + \hat{k}$

B. zero

C. $2\hat{i} + 3\hat{j}$

D. $-2\hat{i} + 2\hat{j} - \hat{k}$

Answer: D

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2. Assertion: If $\vec{a} = \hat{i} + 2\hat{j} - 2\hat{k}$, $\vec{b} = 2\hat{i} + \hat{j} - \hat{k}$, $then \quad \left|\vec{a}\right| \neq \left|\vec{b}\right|$.

Reason: Two unequal vectors can never have same magnitude.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion.

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion.

C. Assertion is True, Reason is False.

D. Assertion is False, Reason is True.

Answer: C

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3. Two forces of magnitudes 3 N and 5 N act at the same point on an object. Which one of the following equations will satisfy the magnitude of the resultant force R in newtons?

A. $2 \leq R \leq 5$

B. $2 \leq R \leq 8$

C. $3 \leq R \leq 5$

D. $2 \leq R \leq 3$

Answer: B

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4. If $\vec{A}$ is a vector of magnitude 3 units due east. What is the magnitude and direction of a vector $-4\vec{A}$?

A. 3 units due east

B. 4 units due east

C. 12 units due east

D. 12 units due west

Answer: D

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5. A body constrained to move in Y direction, is subjected to a force given by $\vec{F} = \left(-2\hat{i} + 15\hat{j} + 6\hat{k} \right) N$. What is the work done by this force is moving the body through a distance of 1 m along Y axis?

A. 190 j

B. 60 j

C. 150 j

D. 20 j

Answer: B

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6. Choose the incorrect option.

The two vectors $\vec{P}$ and (Q) are drawn from a common point and $\vec{R} = (P) + (Q)$, then angle between (P) and (Q) is

A. 90° if $R^2 = P^2 + Q^2$

B. less than 90° if $R^2 > P^2 + Q^2$

C. greater than 90° if $R^2 < P^2 + Q^2$

D. greater than 90° if $R^2 > P^2 + Q^2$

Answer: D

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7. When vector $\hat{n} = a\hat{i} + b\hat{j}$ is perpendicular to $\left(2\hat{i} + \hat{j}\right)$, then a and b are

A. $\frac{1}{\sqrt{5}}, \frac{-2}{\sqrt{5}}$

B. $-2, 0$

C. 0,-2

D. $\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}$

Answer: C

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8. A force of $-F\hat{k}$ acts on O, the origin of the coordinate system. The torque about the point (1, -1) is

A. $-4F\left(\hat{i}-\hat{j}\right)$

B. $4F\left(\hat{i}-\hat{j}\right)$

C. $-4F\left(\hat{i}+\hat{j}\right)$

D. $4F\left(\hat{i}+\hat{j}\right)$

Answer: D

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9. If $\hat{i}, \hat{j}$ and $\hat{k}$ are unit vectors along x,y and z-axis respectively, the angle θ between the vector $\hat{i}+\hat{j}+\hat{k}$ and vector $\hat{j}$ is given by

A. $\theta = \cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

B. $\theta = \sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$

C. $\theta = \cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$

D. $\theta = \sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$

Answer: A

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10. $\vec{A}$ and $\vec{B}$ are the two vectors such that ratio their dot product to magnitude of their cross product is $\frac{1}{\sqrt{3}}$. Then the angle between $\vec{A}$ and $\vec{B}$ is

A. $\frac{\pi}{2}$

B. $\frac{\pi}{3}$

C. 0

D. $\frac{\pi}{6}$

Answer: B

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11. Two vectors $\vec{A}$ and $\vec{B}$ lie in plane, another vector $\vec{C}$ lies outside this plane, then the resultant of these three vectors

i.e., $\vec{A} + \vec{B} + \vec{C}$

A. can be zero

B. must be zero

C. lies in the same plane as $\vec{A}$ or $\vec{B}$

D. lies in the plane different from any of the three vectors.

Answer: D

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12. A particle acted upon by constant forces $5\hat{i} + \hat{j} - 2\hat{k}$ and $2\hat{i} + \hat{j} - 2\hat{k}$ is displaced from the point

$2\hat{i}+2\hat{j}-4\hat{k}$ to point $6\hat{i}+4\hat{j}-2\hat{k}$. The total work done by the forces in SI unit is

A. $20\sqrt{2}$

B. 47

C. 24

D. 33

Answer: C

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13. The x and y components of vectors $\vec{A}$ are 4 m and 6 m respectively. The x and y components of vector $\left(\vec{A}+\vec{B}\right)$ are 12 m and 10 m respectively. Then what are the x and y component . of vector $\vec{B}$?

A. 8 m, 4m

B. 3 m,6m

C. 4 m, 8m

D. 4 m, 6m

Answer: A

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14. The angel subtended by the vector $A = 6\hat{i} + 3\hat{j} + 4\hat{k}$ with the y-axis is

A. $\sin^{-1}\left(\frac{3}{61}\right)$

B. $\sin^{-1}\left(\frac{3}{\sqrt{61}}\right)$

C. $\cos^{-1}\left(\frac{3}{\sqrt{61}}\right)$

D. $\cos^{-1}\left(\frac{4}{\sqrt{61}}\right)$

Answer: B

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15. A particle moves in the x-y plane under the action of a force $\vec{F}$ such that the components of its linear momentum $\vec{P}$ at any time t are $p_x = \cos t$ and $p_y = 3\sin t$. What is the magnitude of the vector $\vec{F}$?

A. $2\sqrt{2}$

B. 5

C. 3

D. 4

Answer: C

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16. $\vec{A}$ and $\vec{B}$ are two vectors given by $\vec{A} = 2\hat{i} + 3\hat{j}$ and $\vec{B} = \hat{i} + \hat{j}$. The magnitude of the component of $\vec{A}$ along $\vec{B}$ is

A. $\frac{1}{\sqrt{2}}$

B. $\frac{3}{\sqrt{2}}$

C. $\frac{5}{\sqrt{2}}$

D. $\frac{7}{\sqrt{2}}$

Answer: C

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17. A vector $\overrightarrow{A}$ is along the positive x-axis and its vector product with another vector $\overrightarrow{B}$ is zero, then vector $\overrightarrow{B}$ could be

A. $\hat{i} + \hat{j}$

B. $4\hat{i}$

C. $\hat{j} + \hat{k}$

D. $-7\hat{k}$

Answer: B

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18. What is the area of the triangle formed by sides $\vec{A} = 2\hat{i} - 3\hat{j} + 4\hat{k}$ and $\vec{B} = \hat{i} - 2\hat{k}$?

A. $\sqrt{13.5}$units

B. 13.5units

C. $\sqrt{109}$units

D. 5.22units

Answer: D

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19. The component of vector $\vec{A} = a_x\hat{i} + a_y\hat{j} + a_z\hat{k}$ along the direction of $\hat{j} - \hat{k}$ is

A. $a_x - a_y + a_z$

B. $a_z - a_y$

C. $\left(a_x - a_y\right) / \sqrt{2}$

D. $\frac{a_y - a_z}{\sqrt{2}}$

Answer: D

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