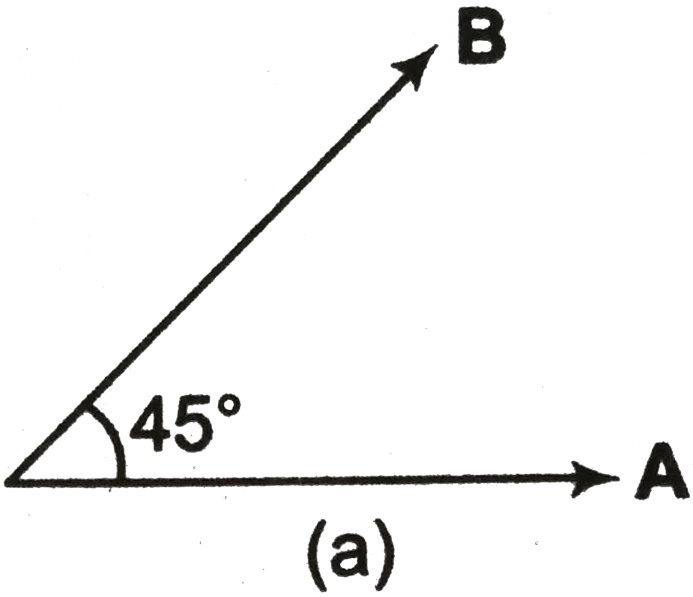
PHYSICS

BOOKS - DC PANDEY PHYSICS (HINGLISH)

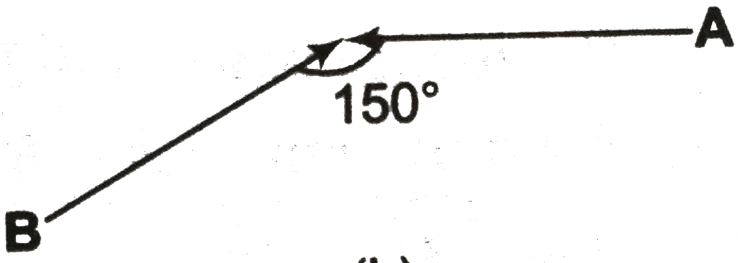
Vectors

Solved Examples

1. In the shown fig . 5.12 (a) , (b) and (c) , find the angle between A and B .

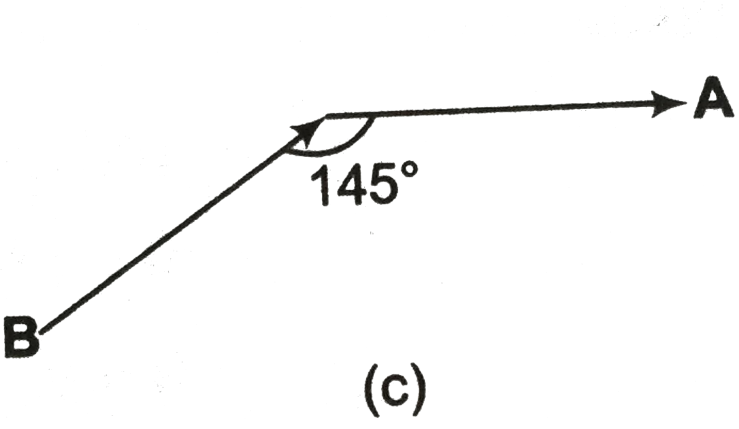


(a)



(b)

(b)



(c)

A. 45 ,150 ,35

B. 45 ,30 ,35

C. 45 ,150 ,135

D. 45 ,45, 35`

Answer: A

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2. What is the angle between a and $-\frac{3}{2}a$.

A. 180

B. 0

C. 120

D. 150

Answer: A

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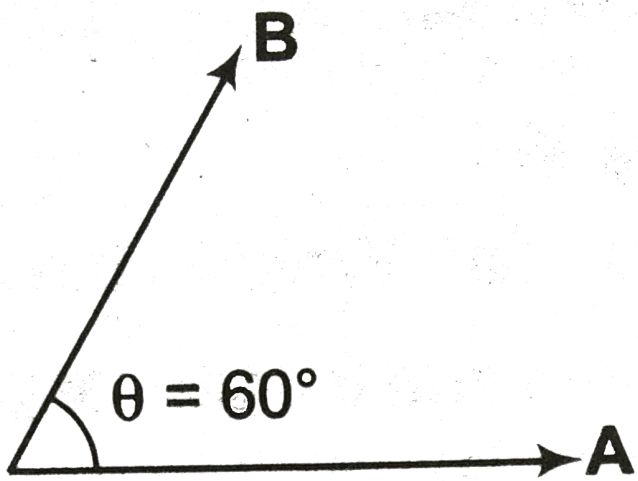
3. Find A+B and A-B in the diagram shown in figure. Given A=4 units and B=3 units.



A. √ 30,√ 22 units

B. √ 40,√ 28

C. √ 37,√ 15 units

D. √ 37,√ 13

Answer: D

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4. A force F has magnitude of $15N$. Direction of F is at 37° from nagative x-axis towards posititve y-axis. Represent F in terms of $\hat{i}$ and $\hat{J}$.

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5. Find magnitude and directon of a vector, $A = \left(6\hat{i} - 8\hat{j}\right)$.

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6. Resolve a weight of 10N in two directions which are parallel and perpendiular to a slope inclined at 30° to the horizontal.

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7. Resolve horizontally and vertically a force f =8 N which makes an angle of 45° with the horizontal.

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8. Obtain the magnitude of 2A - 3B if

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

A. $\sqrt{150}$

B. 90

C. $\sqrt{90}$

D. $\sqrt{80}$

Answer: C

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9. Work done by a force F on a body is W = F .s, where s is the displacement of body. Given that under a force $F = \left(2\hat{I} + 3\hat{j} + 4\hat{k}\right)N$ a body is displaced from position vector $r_1 = \left(2\hat{I} + 3\hat{j} + \hat{k}\right)m$ to the position

vector $r_2 = \left(\hat{i} + \hat{j} + \hat{k}\right)m$. Find the work done by this force.

A. $4J$

B. $10J$

C. $-16J$

D. $-8J$

Answer: D

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10. Find the angle between two vectors $A = 2\hat{j} + \hat{j} - \hat{k}$ and $B = \hat{j} - \hat{k}$ and $B = \hat{i} - \hat{k}$.

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11. Prove that the vectors $A = 2\hat{i} - 3\hat{j} + \hat{k}$ and $B = \hat{i} + \hat{j} + \hat{k}$ are mutually perpendicular.

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12. Show that the vector $A = \left(\hat{i}\right) - \left(\hat{j}\right) + 2\hat{k}$ is parallel to a vector $B = 3\hat{i} - 3\widehat{+}\,6\hat{k}$.

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13. Let a force F be acting on a body free to rotate about a point O and let r be the position vector of any point P on the line of action of the force. Then torque (τ) of this force about point O is defined as $\tau = r \times F$

Given,

$F = \left(2\hat{i} + 3\hat{j} - \hat{k}\right)N$ and $r = \left(\hat{i} - \hat{j} + 6\hat{k}\right)m$. Find the torque of this force.

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14. Find component of vector A +B along (i) x-axis, (ii) C.

Given $A = \hat{i} - 2\hat{j}, B = 2\hat{j} + 3\hat{k}$ and $C = \hat{i} + \hat{j}$.

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15. Find the angle that the vector $A = 2\hat{i} + 3\hat{j} - \hat{k}$ makes with y-axis.

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16. If a and b are the vectors AB and BC determined by the adjacent sides of a ragular hexagon. What are the vectors determined by the other sides taken is order?

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17. if $a \times b = b \times c \neq 0$ with a $\neq -c$ then show that a+c = kb, where k is scalar.

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18. if $A = 2\hat{i} - 3\hat{j} + 7\hat{k}, B = \hat{i} + 2\hat{j}$ and $C = \hat{j} - \hat{k}$.

Find $A(B \times C)$

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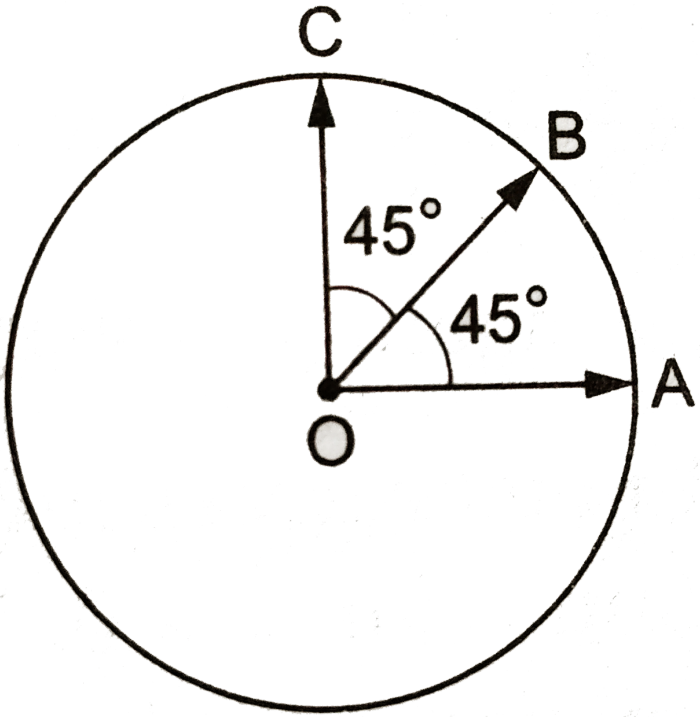
19. Find the resultant of the three vectors $\overrightarrow{OA}$, $\overrightarrow{OB}$ and $\overrightarrow{OC}$ shown in figure. Radius of the circle is R.



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20. Prove that $\left|a \times b^2 = a^2 b^2 - (a.\, b)^2\right.$

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21. Show that the vectors $a = 3\hat{i} - 2\hat{j} + \hat{k}, b = \hat{i} - 3\hat{j} + 5\hat{k}$ and $c = 2\hat{j} + \hat{j} - 4\hat{k}$ form a right angled triangle.

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22. Let A,B and C be the unit vectors . Suppose that A.B=A.C =0 and the angle between B and C is $\frac{\pi}{6}$ then prove that $A = \pm 2(B \times C)$

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23. A particle moves on a given straight line with a constant speed v. At a certain time it is at a point P on its straight lline path.O is a fixed point. Show than $\overrightarrow{OP} \times \overrightarrow{v}$ is independent of the position P.?

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24. Prove that the mid-point of the hypotenuse of right angled triangle is equidistant from its vertices.

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Exercise 5 1

1. What is the angle between 2a and 4a?

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2. What is the angle between 3a and -5a? What is the ratio of magnitude of two vectors?

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3. Two vectors have magnitudes 6 and 8 units, respectively. Find the magnitude of the resultant vector if the angle between vectors is (a) 60° (b) 90° and (c) 120°.

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4. Two vectors A and B have magnitudes 6 units and 8 units respectively. Find |A-B|, if the angle between two vectors is .(a) 0° (b) 180° (c) 120° .

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5. For what angle between $\vec{a}$ and $\vec{b}$, $\left|\vec{a}+\vec{b}\right| = \left|\vec{a}-\vec{b}\right|$.

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Exercise 5 2

1. Find magnitude and direction cosines of the vector, $A = \left(3\hat{i} - 4\hat{j} + 5\hat{k}\right)$.

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2. Resolve a force F = 10N along x and y-axes. Where this force vector in making an angle of 60° from negative x-axis towards nagetive y-axis?

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3. Find magnitude of A-2B+3C, where, $A = 2\hat{i} + 3\hat{j}, B = \hat{i} + \hat{j}$ and $c = \hat{k}$.

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4. Find angle between A and B where, (a) $A = 2\hat{i}$ and $B = -6\hat{i}$ (b) $A = 6\hat{j}$ and $B = -2\hat{k}$ (c) $A = \left(2\hat{i} = 3\hat{j}\right)$ and $B = 4\hat{k}$ (d) $A = 4\hat{i}$ and $B = \left(-3\hat{i} + 3\hat{j}\right)$.

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Exercise 5 3

1. Cross product of two paralle or antiparallel vectors is a null vector. Is this statement true or false?

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2. Find the values of . (a) $\left(4\hat{j}\right) \times \left(-6\hat{k}\right)$ (b) $\left(3\hat{j}\right).\left(-4\hat{j}\right)$ (c) $\left(2\hat{i}\right) - \left(-4\hat{k}\right)$.

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3. Two vectors A and B have magnitudes 2 units and 4 units respectively. Find A. B is angle between these two vectors is (a) 0° (b) 60° (c) 90° (d) 120° .

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4. Find $(2A) \times (-3B)$, if $A = 2\hat{i} - \hat{j}$ and $B = \left(\hat{j} + \hat{k}\right)$

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Single Correct

1. which one of the following is a scalar quantity?

A. Dipole moment

B. Electric field

C. Acceleration

D. work

Answer: D

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2. Which one of the following is not the vector quantity?

A. Torque

B. Displacement

C. Velocity

D. Speed

Answer: D

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3. Which one is a vector quantity?

A. Time

B. Temperature

C. Magnetic flux

D. Magnetic field intensity

Answer: D

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4. Minimum numbar of vectors of unequal magnitudes which can give zore resultant are

A. two

B. three

C. four

D. more than four

Answer: B

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5. which one of the following statement is false ?

A. A vector cannot be displaced from one point to another point

B. Distance is a scalar quantity but displacement is a vector quantity

C. Momentum force and torque are vector quantites

D. Mass, speed and energy are scalar quantities

Answer: A

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6. what is the dot product of two vectors of magnitudes 3 and 5,if angle between them is 60°?

A. 5.2

B. 7.5

C. 8.4

D. 8.6

Answer: B

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

A. non coplanar non concurrent forces

B. non coplanar concurrent forces

C. coplanar concurrent forces

D. coplanar non-concurrent forces

Answer: B

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

A. along west

B. along east

C. zero

D. vertically downward

Answer: A

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9. The magnitude of the vectors product of two vectors $\left|\overrightarrow{A}\right|$ and $\left|\overrightarrow{B}\right|$ may be

A. greater than AB

B. equal to AB

C. less than AB

D. equal to zero

Answer: B::C::D

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10. A force $\left(3\hat{i}+4\hat{j}\right)$ newton acts on a boby and displaces it by $\left(3\hat{i}+4\hat{j}\right)$ metre. The work done by the force is

A. 5 J

B. 25 J

C. 10 J

D. 30 J

Answer: B

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11. The torque of force $F = \left(2\hat{i} - 3\hat{j} + 4\hat{k}\right)$ newton acting at the point $r = \left(3\hat{i} + 2\hat{j} + 3\hat{k}\right)$ metre about origin is (in N-m)

A. $6\hat{i} - 6\hat{j} + 12\hat{k}$

B. $17\hat{i} - 6\hat{j} - 13\hat{k}$

C. $-6\hat{i} + 6\hat{j} - 12\hat{k}$

D. $-17\hat{i} + 6\hat{j} + 13\hat{k}$

Answer: B

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

A. 1

B. $\sqrt{0.11}$

C. $\sqrt{0.01}$

D. 0.39

Answer: B

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13. Two vectors of equal magnitudes have a resultant equle to either of them, than the angel between them will be

A. 30°

B. 120°

C. 60°

D. 150°

Answer: B

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

A. -1

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

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

D. 1

Answer: B

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15. The angle between the two vectors $A = 3\hat{i} + 4\hat{j} + 5\hat{k}$ and $B = 3\hat{i} + \hat{j} - 5\hat{k}$ is

A. 60°

B. 45°

C. 90°

D. 30°

Answer: C

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16. Maximum and minimum values of the resultant of two forces acting at a point are 7 N and 3 N respectively . The smaller force will be equal to

A. 5 N

B. 4 N

C. 2 N

D. 1 N

Answer: C

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17. if the vectors $P = \alpha\hat{i} + \alpha j + 3\hat{k}$ and $Q = \alpha\hat{i} - 2\hat{j} - \hat{k}$ are perpendicular to each other, then the positive value of α is

A. 0 (zero)

B. 1

C. 2

D. 3

Answer: D

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18. The (x,y,z) co -ordinates of two points A and B are give respectively as (0,3,- 1) and (-2,6,4) The displacement vector from A to B is given by

A. $-2\hat{i}+6\hat{j}+4\hat{k}$

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

C. $-2\hat{i}+3\hat{j}+5\hat{k}$

D. $2\hat{i}-3\hat{j}-5\hat{k}$

Answer: C

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19. A vector is not changed if

A. it is rotated through an arbitrary angle

B. it is multiplied by an arbitrary scalar

C. it is cross multiplied by a unit vector

D. it is displaced paralled to itself

Answer: D

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20. Which of the sets given below may represent the magnitudes of three vectors adding to zero?

A. 2,4,8

B. 4,8,16

C. 1,2,1

D. 0.5, 1.2

Answer: C

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

A. α is always less then β

B. $\alpha < \beta$ if $A < B$

C. $\alpha < \beta$ if $A > B$

D. $\alpha < \beta$ if $A = B$

Answer: C

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22. The angles which the vector $A = 3\hat{i} + 6\hat{j} + 2\hat{k}$ makes with the co-ordinate axes are

A. $\cos^{-1}.\frac{3}{7}, \cos^{-1}, \frac{6}{7}$ and $\cos^{-1}, \frac{2}{7}$

B. $\cos^{-1}.\frac{4}{7}, \cos^{-1}, \frac{5}{7}$ and $\cos^{-1}, \frac{3}{7}$

C. $\cos^{-1}.\frac{3}{7}, \cos^{-1}, \frac{4}{7}$ and $\cos^{-1}, \frac{1}{7}$

D. None of these

Answer: A

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23. Unit vector parallel to the resultant of vectors $A = 4\hat{j} - 3\hat{j}$ and $B = 8\hat{j} + 8\hat{j}$ will be

A. $\frac{24\hat{i} + 5\hat{j}}{13}$

B. $\frac{12\hat{i} + 5\hat{j}}{13}$

C. $\frac{6\hat{i} + 5\hat{j}}{13}$

D. None of these

Answer: B

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24. The component of vector $A = 2\hat{i} + 3\hat{j}$ along the vector $\hat{i} + \hat{j}$ is

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

B. $10\sqrt{2}$

C. $5\sqrt{2}$

D. 5

Answer: A

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25. Two vectors A and B are such that $A + B = C$ and $A^2 + B^2 = C^2$. If θ is the angle between positive direction of A and B, then the correct statement is

A. $\theta = \pi$

B. $\theta = \frac{2\pi}{3}$

C. $\theta = 0$

D. $\theta = \frac{\pi}{2}$

Answer: D

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

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

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

C. $(A + B)$

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

Answer: A

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27. If the angle between the vectors A and B is θ, the value of the product(BxA)). A is equal to

A. $BA^2 \cos\theta$

B. $BA^2 \sin\theta$

C. $BA^2 \sin\theta \cos\theta$

D. zero

Answer: D

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28. Given that P 12, Q = 5 and R = 13 also P+Q=R, then the angle between P and Q will be

A. π

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

C. zero

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

Answer: B

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29. Given that P+Q+R= 0. Two out of the three vectors are equal in magnitude. The magnitude fo the third vector is s $\sqrt{2}$ times that of the other two. Which of the following can be the angles between these vectors?

A. 90°

B. $45^\circ, 45^\circ, 90^\circ$

C. $30^\circ, 60^\circ, 90^\circ$

D. $45^\circ, 90^\circ, 135^\circ$

Answer: A

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30. The angles between P+Q and P-Q will be

A. 90°

B. between 0° and 180°

C. 180° only

D. None of these

Answer: B

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31. The value of n so that vectors $2\hat{i}+3\hat{j}-2\hat{k}, 5\hat{i}+n\hat{j}+\hat{k}$ and $-\hat{i}+2\hat{j}+3\hat{k}$ may be complanar.will be

A. 18

B. 28

C. 9

D. 36

Answer: A

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32. If a and b are two vectors.then the value of $(a+b)\times(a-b)$ is

A. $2(b\times a)$

B. $-2(b\times a)$

C. $b\times a$

D. $a\times b$

Answer: A

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33. 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. 30°

D. 135°

Answer: B

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34. 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. 120°

B. 60°

C. 90°

D. 150°

Answer: A

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35. Three vectors satisfy the relation A.B =0 and A.C=0 then A is parallel to

A. C

B. B

C. $B \times C$

D. B.C

Answer: C

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36. The sum of two forces at a point is 16N. if their resultant is normal to the smaller force and has a magnitude of 8N, then two forces are

A. 6N, 10N

B. 8N, 8N

C. 4N, 12N

D. 2N, 14N

Answer: A

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37. The sum of two vectors A and B is at right angles to their difference. Then

A. A=B

B. A=2B

C. B=2A

D. A and B have the same direction

Answer: A

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38. Let $\vec{C} = \vec{A} + \vec{B}$ then

A. |C| is always grater than |A|

B. it is possibal to have |C| lt|A| and |C| lt |B|

C. C is always equal to A+B

D. C is never equla to A+B

Answer: B

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39. Let the angle between two nonzero vector $\vec{A}$ and $\vec{B}$ is 120° and its resultant be $\vec{C}$.

A. C must be equal to |A-B|

B. C must be less than |A_B|

C. C must be greater than |A-B|

D. C may be equal to |A-B|

Answer: C

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Subjective

1. If $a = 2\hat{i} + 3\hat{j} + 4\hat{k}$ and $b = 4\hat{i} + 3\hat{j} + 2\hat{k}$,find the angel between a and b.

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2. The vectors $\vec{A}$ has a magnitude of 5 unit $\vec{B}$ has a magnitude of 6 unit and the cross product of $\vec{A}$ and $\vec{B}$ has a magnitude of 15 unit. Find the angle between $\vec{A}$ and $\vec{B}$.

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3. Suppose $\vec{a}$ is a vector of magnitude 4.5 unit due north. What is the vector (a) $3\vec{a}$ (b) $-4\vec{a}$?

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4. Two vectors have magnitudes 3 unit and 4 unit respectively. What should be the angel between them if the magnitude of the resultant is (a). 1 unit (b). 5 unit and (c). 7 unit.

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5. The work done by a force $\vec{F}$ during a displacement $\vec{r}$ is given by $\vec{F} . \vec{r}$. Suppose a force of 12 N acts on a particle in vertically upward directionand the particle is displaced through 2.0 m in vertically downward direction. Find the work done by the force during this displacement.

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6. If $\vec{A}, \vec{B}, \vec{C}$ are mutually perpendicular show that $\vec{C} \times \left(\vec{A} \times \vec{B}\right) = 0$. Is the converse true?

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7. Prove that $\vec{A} . \left(\vec{A} \times \vec{B}\right) = 0$

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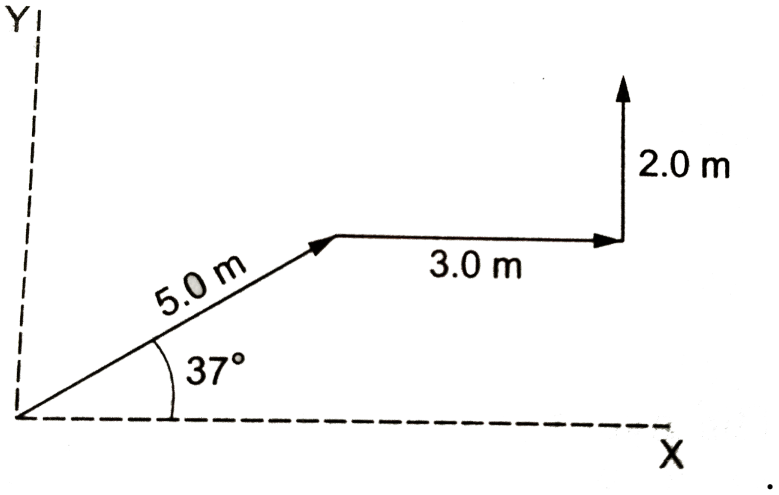
8. Find the resultant of the three vectors shown in figure (2W1).



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9. Given an example for which $\vec{A} . \vec{B} = \vec{C} . \vec{B}$ but $\vec{A} \neq \vec{C}$.

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10. Obtain the angle between A+B and A-B if $A = 2\hat{i} + 3\hat{j}$ and $B = \hat{i} - 2\hat{j}$.

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11. Deduce the condition for the vectors $2\hat{i} + 3\hat{j} - 4\hat{k}$ and $3\hat{i} - \alpha\hat{j} + b\hat{k}$ to be parallel.

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12. Find the area of the parallelogram whose sides are represented by $2\hat{i} + 4\hat{j} - 6\hat{k}$ and $\hat{i} + 2\hat{k}$.

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13. If vectors A and B be respectively equal to $3\hat{i} - 4\hat{j} + 5\hat{k}$ and $2\hat{i} + 3\hat{j} - 4\hat{k}$. Find the unit vector parallel t A + B

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14. if $A = 2\hat{i} - 3\hat{j} + 7\hat{k}, B = \hat{i} + 2\hat{j}$ and $C = \hat{j} - \hat{k}$. Find $A(B \times C)$

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15. The x and y-components of vector A are 4 m and 6 m respectively. The x and y-components of vector A + B are 10 m and 9 m respectively. Calculate for the vector B the following:

(a) its x and y-components

(b) its length

(c) the angle it makes with x-axis.

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16. Three vectors which are coplanar with respect to a certain rectangular co-ordinate system are given by $a = 4\hat{i} - \hat{j}, b = -3\hat{i} + 2\hat{j}$ and $c = -3\hat{j}$

Find

(a) $a + b + c$

(b) $a + b \pm c$

(c) Find the angle between $a + b + c$ and $a + b - c$

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17. Let $\vec{A}$ and $\vec{B}$ be the two vectors of magnitude 10 unit each. If they are inclined to the X-axis at angles 30° and 60° respectively, find the resultant.

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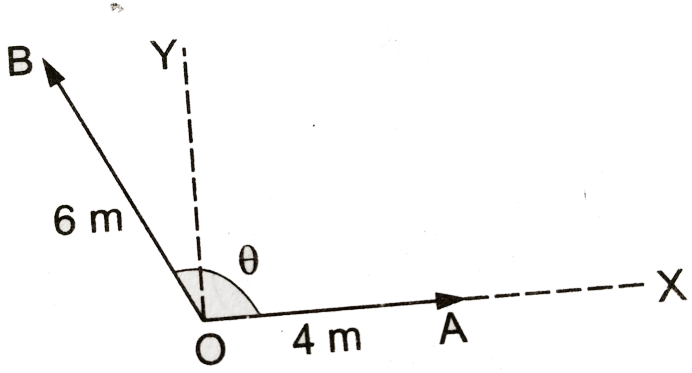
18. The resultant of vectors $\overrightarrow{OA}$ and $\overrightarrow{OB}$ is peerpendicular to $\overrightarrow{OA}$. Find the angle AOB.



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19. Find the components of a vector $A = 2\hat{i} + 3\hat{j}$ along the directions of $\hat{i} + \hat{j}$ and $\hat{i} - \hat{j}$.

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20. If two vectors are $A = 2\hat{i} + \hat{j} - \hat{k}$ and $B = \hat{j} - 4\hat{k}$. By calculation,

prove AxxB isperpendicular to both A and B.

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21. The resultant of two vector A and B is at right angles to A and its magnitude is half of B. Find the angle between A and B.

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22. Four forces of magnitude P, 2P, 3P and 4P act along the four sides of a square ABCD in cyclic order. Use the vector method to find the magnitude of resultant force.

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23. If P + Q = R and P - Q = S, prove that $R^2 + S^2 = 2(P^2 + Q^2)$

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24. In an ΔABC as showin in Fig. 2 . (2) .71 (a) prove that $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{C}{\sin C}$.

Watch Video Solution

Example

1. check Wether the vector $\left(\frac{\hat{i}}{\sqrt{2}}+\frac{\hat{j}}{\sqrt{2}}\right)$ is a unit vector or not .

A. YES

B. NO

C. Cannot be determined

D. None of the above

Answer: A

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2. Find the unit vector of $4\hat{i}-3\hat{j}+\hat{k}$.

A. $\frac{\hat{4}-3\hat{j}+\hat{k}}{\sqrt{2}}$

B. $\frac{\hat{4}-3\hat{j}+\hat{k}}{\sqrt{26}}$

C. $\frac{\hat{4}-4\hat{j}+\hat{k}}{\sqrt{2}}$

D. $\frac{\hat{2}-3\hat{j}+\hat{k}}{\sqrt{2}}$

Answer: B

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3. If vector $\hat{i}-3\hat{j}+5\hat{k}$ and $\hat{i}-3\hat{j}-a\hat{k}$ are equal vector then find the volue of a.

A. $a=5$

B. $a=-15$

C. $a = 15$

D. $a = -5$

Answer: D

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4. If $\vec{A} = 3\hat{i} + 4\hat{j}$ and $\vec{B} = 7\hat{I} + 24\hat{j}$, find a vector having the same magnitude as $\vec{B}$ and parallel to $\vec{A}$.

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5. Two forces whose magnitudes are in the ratio $3:5$ give a resultant of 28N. If the angle of their inclination

is 60°, find the magnitude of each force.

A. $1N\ 2N$

B. $12N\ 20N$

C. $12N\ 12N$

D. $22N\ 20N$

Answer: B

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6. Aboy Walks 4m east and then 3m south .Find the displacement of the boy.

A. 7

B. 1

C. 5

D. 12

Answer: C

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7. If A=B+C have scalar magnitudes o 5,4,3 units respectively , then find the between A and C.

A. $\cos^{-1}\left(\frac{2}{5}\right)$

B. $\cos^{-1}\left(\frac{1}{5}\right)$

C. $\cos^{-1}\left(\frac{3}{5}\right)$

D. $\sin^{-1}\left(\frac{3}{5}\right)$

Answer: C

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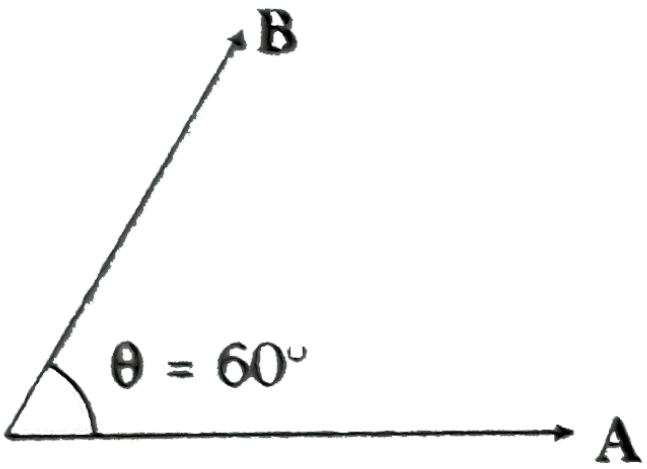
8. Find the sum of vector A and B as shown in the figure ,also find the direction of sum vector. Given $A = 4\text{unit}$

and $B = 3\text{unit}$.



A. $\sqrt{35}\text{unit}\,, \alpha = \tan^{-1}(0.472) = 25.3^\circ$

B. $\sqrt{25}\text{unit}\,, \alpha = \tan^{-1}(0.472) = 25.3^\circ$

C. $\sqrt{37}\text{unit}\,, \alpha = \tan^{-1}(0.472) = 25.3^\circ$

D. $\sqrt{37}\text{unit}\,, \alpha = \tan^{-1}(1) = 45^\circ$

Answer: C

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9. Two equal vector have a resultant equal to either of them, then the angle between them will be:

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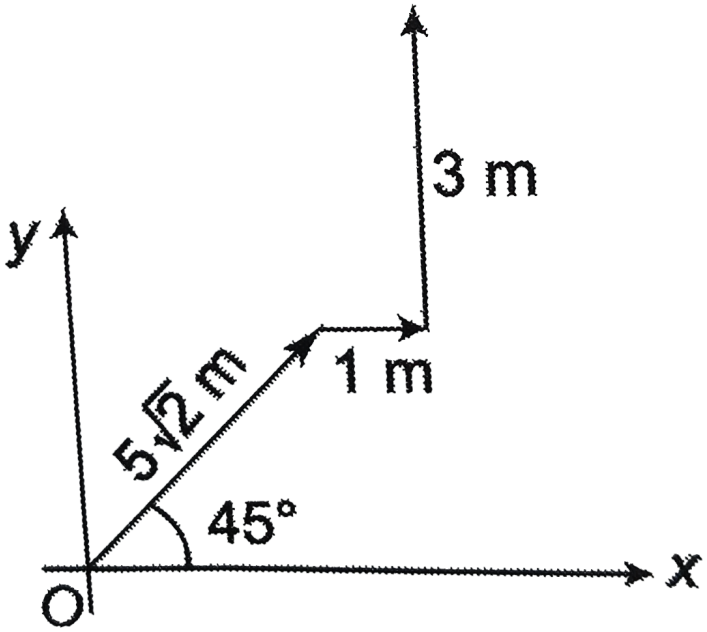
10. Find the resultant of three vectors shown in the figure.



A. $10m \tan^{-1}\left(\frac{3}{4}\right)$

B. $100m \tan^{-1}\left(\frac{4}{3}\right)$

C. $110m \tan^{-1}\left(\frac{4}{3}\right)$

D. $10m \tan^{-1}\left(\frac{4}{3}\right)$

Answer: D

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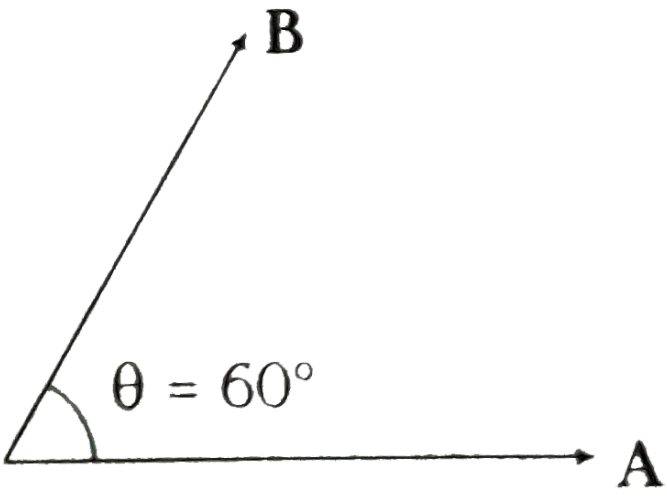
11. Find the subraction of vector A and B as shown in the figure , also find the direction of subtraction vector ,Given A=4 unit and b=3 unit .



A. $= \sqrt{19} unit\ 60$

B. $= \sqrt{24} unit\ 45^\circ$

C. $= \sqrt{17} unit\ 46.1^\circ$

D. $= \sqrt{13} unit\ 46.1^{\circ}$

Answer: D

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12. Obtain the magnitude of 2A - 3B if

$A = \hat{i} + \hat{J} - 2\hat{k}$ and $b = 2\hat{I} - \hat{j} + \hat{k}$.

A. $\sqrt{90}$

B. 90

C. $3\sqrt{10}$

D. both option A and option C correct

Answer: D

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13. If a and b are the vectors AB and BC determined by the adjacent sides of a regular hexagon. What are the vectors determined by the other sides taken is order?

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14. the initial and final and posdition vector for a particle are(-3) $\hat{i} + (2m)\hat{j} + (8m)\hat{k}$and $(9m)\hat{i} + (2m)\hat{j} + (- 8m)\hat{k}$ respectively ,find the displacement of the particle.

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15. If $\left|\vec{P}+\vec{Q}\right|=\left|\vec{P}-\vec{Q}\right|$, find the angle between $\vec{P}$ and $\vec{Q}$.

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16. A vector is given by $\vec{A}=3\hat{i}+4\hat{j}+5\hat{k}$. Find the magnitude of $\vec{A}$, unit vector along $\vec{A}$ and angles made by $\vec{A}$ with coordinate axes.

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17. Resolve a weight of 10N in two directions which are parallel and perpendiular to a slope inclined at 30° to the horizontal.

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18. Resolve horizontally and vertically a force $F = 8N$ which makes an angle of 45° with the horizontal.

A. 5 √ 2 N

B. √ 2 N

C. 5 √ 2 N

D. 4 √ 2 N

Answer: D

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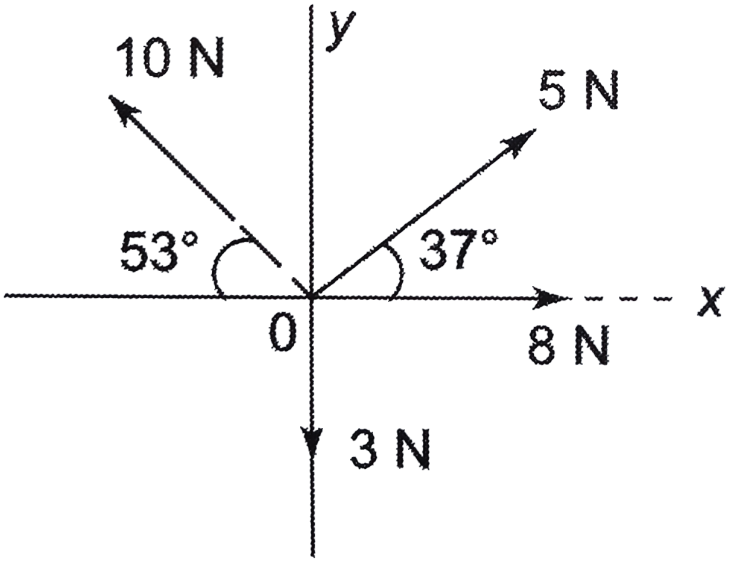
19. Find the resultant of the following forces.

$$\left[\sin 37^\circ = \frac{3}{5}, \cos 37^\circ = \frac{4}{5}, \sin 53^\circ = \frac{4}{5}, \cos 53^\circ = \frac{3}{5}\right]$$



A. The resultant of these is 10N at 53° with the positive X-axis.

B. The resultant of these is 10N at 43° with the positive X-axis.

C. The resultant of these is 100N at 53° with the positive X-axis.

D. The resultant of these is 120N at 53° with the positive X-axis.

Answer: A

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20. Find the angle that the vector $A = 2\hat{i} + 3\hat{j} - \hat{k}$ makes with y-axis.

A. $\theta = \cos^1\left(\frac{3}{\sqrt{14}}\right)$

B. $\theta = \cos^{-1}\left(\frac{3}{\sqrt{4}}\right)$

C. $\theta = \cos^{-1}\left(\frac{3}{\sqrt{14}}\right)$

D. $\theta = \cos^{-1}\left(\frac{3}{\sqrt{12}}\right)$

Answer: C

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21. If a particle moves from the point $A(1, 2, 3)$ to the point $B(4, 6, 9)$, its displacement vector be

A. $3\vec{i} + 4\vec{j}$

B. $3\vec{i} + 6\vec{k}$

C. $3\vec{i} + 5\vec{j} + 6\vec{k}$

D. $3\vec{i} + 4\vec{j} + 6\vec{k}$

Answer: D

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22. Prove that the quadrilateral formed by joining the mid-points of the pairs of consecutive sides of a quadrilateral is a parallelogram.

Watch Video Solution

23. Find component of vector A +B along (i) x-axis, (ii) C. Given $A = \hat{i} - 2\hat{j}, B = 2\hat{i} + 3\hat{k}$ and $C = \hat{i} + \hat{j}$.

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24. Work done by a force F on a body is W = F .s, where s is the displacement of body. Given that under a force

$F = \left(2\hat{I} + 3\hat{j} + 4\hat{k}\right)$ N a body is displaced from position vector $r_1 = \left(2\hat{I} + 3\hat{j} + \hat{k}\right)$ m to the position vector $r_2 = \left(\hat{i} + \hat{j} + \hat{k}\right)$ m. Find the work done by this force.

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25. Find the angle between two vector $A = 2\hat{i} + \hat{j} - \hat{k}$ and $B = \hat{i} - \hat{k}$.

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26. prove that the vectors $A = 2\hat{i} - 3\hat{j} + \hat{k}$ and $B = \hat{i} + \hat{j} + \hat{k}$ are mutually

perpendicular .

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27. Find the (i) Scalar component and (ii)vector component of $A = 3\hat{i} + 4\hat{j} + 5\hat{k} on B = \hat{i} + \hat{j} + \hat{k}$.

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28. Show that the vectors $a = 3\hat{i} - 2\hat{j} + \hat{k}, b = \hat{i} - 3\hat{j} + 5\hat{k}$ and $c = 2\hat{j} + \hat{j} - 4\hat{k}$ form a right angled triangle.

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29. Prove that the mid-point of the hypotenuse of right angled triangle is equidistant from its vertices.

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30. Find the projection of $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + \hat{k}$.

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31. Let a force F be acting on a body free to rotate about a point O and let r the position vector of ant point P on the line of aciton of the force. Then torque

(τ) of this force abot point O is defined as $\tau = r \times F$

Given,

$F = \left(2\hat{i} + 3\hat{j} - \hat{k}\right)N$ and $r = \left(\hat{i} - \hat{j} + 6\hat{k}\right)m$ Find the torque of this force.

A. $\left(-16\hat{i} + 13\hat{j} + 7\hat{k}\right)N - m$

B. $\left(-17\hat{i} - 13\hat{j} - 5\hat{k}\right)N - m$

C. $\left(-17\hat{i} + 13\hat{j} + 5\hat{k}\right)N - m$

D. $\left(-16\hat{i} + 11\hat{j} + 15\hat{k}\right)N - m$

Answer: C

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32. Is the vector $A = \left(\hat{i}\right) - \left(\hat{j}\right) + 2\hat{k}$ parallel to a vector $B = 3\hat{i} - 3\hat{j} + 6\hat{k}$.

A. No

B. Yes

C. May be

D. Incomplete Info

Answer: B

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33. Prove that $|a \times b|^2 = a^2b^2 - (a.\, b)^2$

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34. A particle moves on a given straight line with a constant speed v. At a certain time it is at a point P on its straight lline path.O is a fixed point. Show than $\overrightarrow{OP} \times \overrightarrow{v}$ is independent of the position P.?

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35. if $a \times b = b \times c \neq 0$ with a $\neq -c$ then show that a+c = kb, where k is scalar.

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36. Let A,B and C be the unit vectors . Suppose that A.B=A.C =0 and the angle between B and C is $\frac{\pi}{6}$ then prove that $A = \pm 2(B \times C)$

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37. The diagonals of a parallelogram are $2\hat{i}$ and $2\hat{j}$. What is the area of the parallelogram

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38. If $a = 3\hat{i} + \hat{j} - 4\hat{k}, b = 6\hat{i} + 5\hat{j} - 2\hat{k},$ then find the area of a triangle whose adjacent sides are

determined by a and b.

A. 12.5sq unit

B. 11.5sq unit

C. 135sq unit

D. 13.5sq unit

Answer: D

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39. The adjacent sides of a paralellelogram is given by two vector A and B where

$A = 5\hat{i} - 4\hat{j} + 3\hat{k}$ and $B = 3\hat{i} - 2\hat{j} + \hat{k}$ Calulate the aera of parallelogram .

A. $10\sqrt{30}$sq units

B. $100\sqrt{3}$sq units

C. $10\sqrt{3}$sq units

D. $10\sqrt{2}$sq units

Answer: C

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Check Point 2 1

1. Which is not a vector quantity?

A. Current

B. Displacement

C. Velocity

D. Acceleration

Answer: A

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2. Pressure is

A. Scalar

B. vector

C. both (a) and (b)

D. none of these

Answer: A

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3. Which one of the following is not the vector quantity?

A. Torque

B. Displacement

C. Dipole moment

D. Electric flux

Answer: D

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4. Which of the following is a vector?

A. Pressure

B. Displacement

C. Moment of inertia

D. none of these

Answer: D

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5. Suface area is

A. Scalar

B. vector

C. Neither scalar nor vector

D. both (a)and(b)

Answer: A

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6. Which is a vector quantity?

A. Angular momentum

B. Work

C. Potential energy

D. Electirc current

Answer: A

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7. Which one is a vector quantity?

A. Work

B. momentum

C. time

D. Speed

Answer: B

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8. Which is a vector quantity?

A. Work

B. power

C. Torque

D. Gravitational constant

Answer: C

Watch Video Solution

9. Find the vector that must be added to the vector $\hat{i} - 3\hat{j} + 2\hat{k}$ and $3\hat{i} + 6\hat{j} - 7\hat{k}$ so that the resultant vector is a unit vector along the y-axis.

A. $-4\hat{i} - 2\hat{j} + 5\hat{k}$

B. $-4\hat{i} + 2\hat{j} + 5\hat{k}$

C. $4\hat{i} - 2\hat{j} + 5\hat{k}$

D. $-4\hat{i} - 2\hat{j} - 5\hat{k}$

Answer: A

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10. A vector multiplied by the number 0, results into

A. 0

B. A

C. O

D. $\hat{A}$

Answer: C

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11. Which of the following represents a unit vector ?

A. $\frac{|A|}{A}$

B. $\frac{A}{|A|}$

C. $\frac{A}{A}$

D. $\frac{|A|}{|A|}$

Answer: B

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12. Unit vector does not have any

A. direction

B. magnitude

C. unit

D. All of these

Answer: C

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13. If $\hat{i}$ and $\hat{j}$ are unit vectors along X-and Y-axis respective, then what is the magnitude and direction of $\hat{i}+\hat{j}$ and $\hat{i}-\hat{j}$?

A. 2

B. 0

C. $\sqrt{2}$

D. 4

Answer: C

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

A. $\hat{k}$

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

C. $\frac{\hat{i} + \hat{j}}{\sqrt{2}}$

D. $\frac{\hat{i} + \hat{j}}{2}$

Answer: C

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15. What happens, when we multiply a vector by (-2)

A. direction reverses and unit charges

B. direction reverses and megnitude is doubled

C. direction remains unchanged and unit chanes

D. none of the above

Answer: B

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Check Point 2 2

1. $\overrightarrow{A} + \overrightarrow{B}$ can also be written as

A. A-B

B. B-A

C. B+A

D. B-A

Answer: C

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2. If $P + Q = 0$. Then which of the following is necessarily ture?

A. P=0

B. P=-Q

C. Q=0

D. P=Q

Answer: B

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3. Two vector having magnitude 8 and 10 can maximum and minium value of magnitude of their resultant as

A. 12,6

B. 10,3

C. 18,2

D. none of these

Answer: C

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4. $\overrightarrow{P}+\overrightarrow{Q}$ is a unit vector along x-axis. If $\overrightarrow{P}=\hat{i}-\hat{j}+\hat{k}$, then what is $\overrightarrow{Q}$?

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

B. $\hat{j}-\hat{k}$

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

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

Answer: B

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5. For the resultant of two vectors to be maximum , what must be the angle between them ?

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6. What are the minimum number of froces (all mumerically equal) whose vector sun can be zero ?

A. Two

B. Three

C. Four

D. Any

Answer: B

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7. Given that $P + Q + R = 0$. Which of the following statement is true?

A. $|P| + |Q| = |R|$

B. $|P + Q| = |R|$

C. $|P| - |Q| = |R|$

D. $|P - Q| = |R|$

Answer: B

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8. $\vec{A} = 2\hat{i} + \hat{j}, B = 3\hat{j} - \hat{k}$ and $\vec{C} = 6\hat{i} - 2\hat{k}$.

value of $\vec{A} - 2\vec{B} + 3\vec{C}$ would be

A. $20\hat{i} + 5\hat{j} + 4\hat{k}$

B. $20\hat{i} - 5\hat{j} - 4\hat{k}$

C. $4\hat{i} + 5\hat{j} + 20\hat{k}$

D. $5\hat{i} + 4\hat{j} + 10\hat{k}$

Answer: B

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9. If $\vec{A} = 4\hat{i} - 3\hat{j}$ and $\vec{B} = 6\hat{i} + 8\hat{j}$ then magnitude and direction of $\vec{A} + \vec{B}$ will be

A. $5, \tan^{-1}(3/4)$

B. $5\sqrt{5}, \tan^{-1}(1/2)$

C. $10, \tan^{-1}(5)$

D. $25, \tan^{-1}(3/4)$

Answer: B

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10. A truck travelling due to north at $20ms^{-1}$ turns west and travels at the same speed. Find the change in its velocity.

A. $40ms^{-1}N - W$

B. $20\sqrt{2}ms^{-1}N - W$

C. $40ms^{-1}S - W$

D. $20\sqrt{2}ms^{-1}S - W$

Answer: D

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11. Resultant of two vetors A and B is given by $|R| = \{|A| - |B|\}$. angle between A and B will be

A. 90°

B. 180°

C. 0°

D. none of these

Answer: B

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12. If $|A|=2$ and $|B|=4$ and angle between then is 60° then $|A-B|$

A. $\sqrt{13}$

B. $3\sqrt{3}$

C. $\sqrt{3}$

D. $2\sqrt{3}$

Answer: D

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13. If A and B are two vectors such that |A+B|=2|A-B|. The angle between vectors A and B is

A. 45°

B. 60°

C. 30°

D. data insuffcient

Answer: D

Watch Video Solution

14. if $P + Q = P - Q$,then

A. P=0

B. Q=0

C. P=1

D. |Q|=1

Answer: B

Watch Video Solution

15. Position of a particle in a rectangular -co-ordinate $(3, 2, 5)$. Then its position vector will be

A. $3\hat{i} + 5\hat{j} + 2\hat{k}$

B. $3\hat{i} + 2\hat{j} + 5\hat{k}$

C. $5\hat{i} + 3\hat{j} + 2\hat{k}$

D. none of these

Answer: B

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16. If a particle moves from point $P(2, 3, 5)$ to point $Q(3, 4, 5)$. Its displacement vector be

A. $\hat{i} + \hat{j} + 10\hat{k}$

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

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

D. $2\hat{i} + 4\hat{j} + 6\hat{k}$

Answer: C

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17. At what angle should the two force vector 2F and $\sqrt{2}F$ act so that the resultant force is $\sqrt{10}F$?

A. 45°

B. 60°

C. 90°

D. 120°

Answer: A

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18. What vector must be added to the two 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 x- axis

A. $5\hat{i} + \hat{k}$

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

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

D. $-3\hat{i} + 2\hat{k}$

Answer: B

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19. Three vector each of magnitude A are acting at a point such that angle between any two consecuitve vectors in same plane is 60° The magniude of their resultant is

A. 2A

B. $\sqrt{2}A$

C. $\sqrt{3}A$

D. $\sqrt{6}A$

Answer: A

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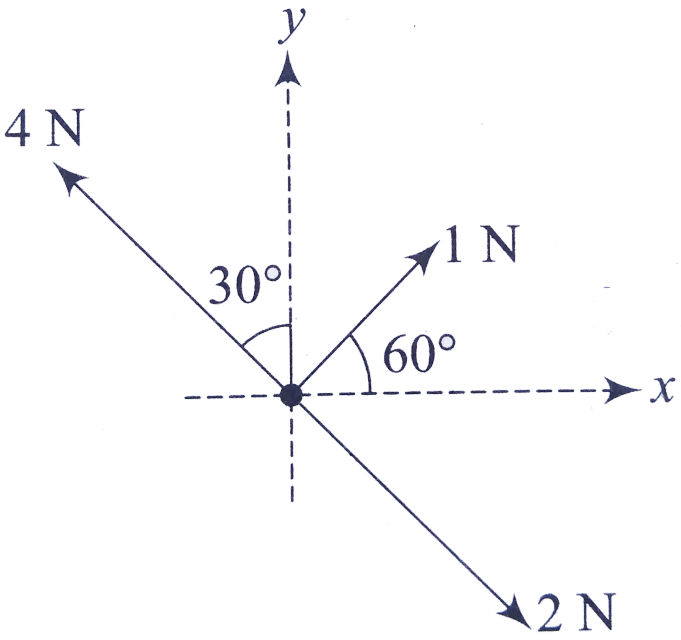
20. Three forces acting on a body are shown in figure. To have the resultant force only along the y-directon, the magnitude of the minimum additional force needed si



A. $\frac{\sqrt{3}}{4}N$

B. $\sqrt{3}N$

C. $0.5N$

D. $1.5N$

Answer: C

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Check Point 2 3

1. The work done by a force $F = \left(\hat{i} + 2\hat{j} + 3\hat{k}\right)$ N ,to displace a body from position A to position B is [The position vector of A is $r_1 = \left(2\hat{i} + 2\hat{j} + 3\hat{k}\right)m$]

A. 5 J

B. 3 J

C. 2 J

D. 10 J

Answer: A

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2. The condition $(a.\ b)^2 = a^2b^2$ is satisfied when

A. a is parallel to b

B. $a \neq b$

C. $a.\ b = 1$

D. $a \perp b$

Answer: A

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3. The modulus of the vector product of two vector is $\frac{1}{\sqrt{3}}$ times their scalar product . The angle between vectors is

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

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

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

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

Answer: A

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4. Three vectors satisfy the relation A.B =0 and A.C=0 then A is parallel to

A. B

B. C

C. B.C

D. $B \times C$

Answer: D

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5. what is the dot product of two vectors of magnitudes 3 and 5,if angle between them is 60°?

A. 5.2

B. 7.5

C. 8.4

D. 8.6

Answer: B

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6. When $A.\ B = -|A||B|,$ then

A. A and B are perpendicular to each other

B. A and B act in the same direction

C. A and B act in the opposite sirection

D. A and B can act in any in any direction

Answer: C

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

A. 5

B. 4

C. 3

D. Zero

Answer: D

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8. In a clockwise system :-

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

B. $\hat{k}.\ \hat{i} = 1$

C. $\hat{i}.\ \hat{i} = 0$

D. $\hat{j} \times \hat{j} = 1$

Answer: A

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

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

B. A+B

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

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

Answer: D

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10. If $|A| = 2, |B| = 5$ and $|A \times B| = 8.$ Angle between A and B is acute, then $(A.\ B)$ is

A. 6

B. 3

C. 4

D. 7

Answer: A

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11. Find the torque of a force $\vec{F} = -3\hat{i} + 2\hat{j} + \hat{k}$ acting at the point $\vec{r} = 8\hat{i} + 2\hat{j} + 3\hat{k}$ about origin

A. $14\hat{i} - -38\hat{j} + 16\hat{k}$

B. $4\hat{i} + 4\hat{j} + 6\hat{k}$

C. $-14\hat{i} + 38\hat{j} - 16\hat{k}$

D. $-4\hat{i} + 17\hat{j} - 22\hat{k}$

Answer: D

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12. What is the unit vector perpendicular to the following vectors $2\hat{i} + 2\hat{j} - \hat{k}$ and $6\hat{i} - 3\hat{j} + 2\hat{k}$

A. $\dfrac{\hat{i} + 10\hat{j} - 18\hat{k}}{5\sqrt{17}}$

B. $\dfrac{\hat{i} - 10\hat{j} + 18\hat{k}}{5\sqrt{17}}$

C. $\dfrac{\hat{i} - 10\hat{j} - 18\hat{k}}{5\sqrt{17}}$

D. $\dfrac{\hat{i} + 10\hat{j} + 18\hat{k}}{5\sqrt{17}}$

Answer: C

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13. The angle between vectors $(A \times B)$ and $(B \times A)$ is

A. Zero

B. π

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

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

Answer: B

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

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15. Find the area of the parallelogram determined $A = 2\hat{i} + \hat{j} - 3\hat{k}$ and $B = 12\hat{j} - 2\hat{k}$

A. 43

B. 56

C. 38

D. 74

Answer: A

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Chapter Exercises

1. The vector quantily among the following is

A. mass

B. time

C. distance

D. displacement

Answer: D

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2. A vetor is added to an equal and oppsite vector of similar nature,forms a

A. unit vector

B. postion vector

C. null vector

D. dislacement vector

Answer: C

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3. Out og the following quantities,which is scalar?

A. Displacement

B. momentum

C. Potential energy

D. Torque

Answer: C

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4. Which of the followingis a unit vector ?

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

B. $\cos\theta\hat{i} - \sin\theta\hat{j}$

C. $\sin\theta\hat{i} + 2\cos\theta\hat{j}$

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

Answer: B

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5. The component of a vector is

A. always less than its magnitude

B. always greater than its magnitude

C. always equal to its magnitude

D. none of the above

Answer: A

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6. The expression $\left(\frac{1}{\sqrt{2}}\hat{i}+\frac{1}{\sqrt{2}}\hat{j}\right)$ is a

A. unit vector

B. unll vector

C. vector of magnitude $\sqrt{2}$

D. Scalar

Answer: A

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7. Theposition vector of a moving particle at time t is $r = 3\hat{i} + 4t\hat{j} - t\hat{k}$ Its displacement during the time interval $t = 1$ s to t=3` s is

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

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

C. $9\hat{i} + 36\hat{j} - 27\hat{k}$

D. None of the above

Answer: D

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8. Vector $P = 6\hat{i} + 4\sqrt{2}\hat{j} + 4\sqrt{2}\hat{k}$ makes angle from Z-axas equal to

A. $\cos^{-1}\left(\frac{\sqrt{2}}{5}\right)$

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

C. $\cos^{-1}\frac{2\sqrt{2}}{5}$

D. None of these

Answer: C

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9. Given :

$\vec{A} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{B} = -\hat{i} - \hat{j} - \hat{k}$ What is the angle between $\left(\vec{A} - \vec{B}\right)$ and $\vec{A}$?

A. 0°

B. 180°

C. 90°

D. 60°

Answer: A

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10. Which of the following Statement is true?

A. When the coordiante axes are translated the component of a vector in a plane changes.

B. When the coording axces are rotated though some angle components of the vector change but vector 's magnitude remain constant.

C. Sum of a and b is R If the magnitude of a alone is increased angle between b and R decreases.

D. The cross product of $3\hat{i}$ and $4\hat{j}$is 12.

Answer: B

View Text Solution

11. The component of vector $A = 2\hat{i} + 3\hat{j}$ along the vector $\hat{i} + \hat{j}$ is

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

B. $4\sqrt{2}$

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

D. None of these

Answer: A

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12. A vector $P = 3\hat{i} - 2\hat{j} + a\hat{k}$ is perpendicular to the vector $Q = 2\hat{i} + \hat{j} - \hat{k},$ The value of a is

A. 2

B. 1

C. 4

D. 3

Answer: C

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13. If three vector along coordinate axis represent the adjacent sides of a cube of length b, then the unit vector along its diaonal passing thourth the origin will be

A. $\frac{\hat{i}+\hat{j}+\hat{k}}{\sqrt{2}}$

B. $\frac{\hat{i}+\hat{j}+\hat{k}}{\sqrt{36}}$

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

D. $\frac{\hat{i}+\hat{j}+\hat{k}}{\sqrt{3}}$

Answer: D

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14. The angle between two vectors $-2\hat{i}+3\hat{j}+k$ and $\hat{i}+2\hat{j}-4\hat{k}$ is

A. 45°

B. 90°

C. 30°

D. 60°

Answer: B

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15. The angle between the vector $2\hat{i}+\hat{j}+\hat{k}$ and $\hat{j}$?

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

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

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

D. None of these

Answer: B

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

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

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

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

D. none of these

Answer: D

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17. Which of the following is the unit vector perpendicular to $\vec{A}$ and $\vec{B}$?

A. $\frac{\hat{A} \times \hat{B}}{AB \sin \theta}$

B. $\frac{\hat{A} \times \hat{B}}{AB \cos \theta}$

C. $\frac{A \times B}{AB \sin \theta}$

D. $\frac{A \times B}{AB \cos \theta}$

Answer: C

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18. If $\frac{|a+b|}{|a-b|} = 1$, then the angle between a and b is

A. 0°

B. 45°

C. 90°

D. 60°

Answer: C

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19. A man walk 20 m at an angle60° north of east . How far towards east has he he travellled ?

A. 10 m

B. 20 m

C. $20\sqrt{3}$ m

D. $10\sqrt{3}$m

Answer: A

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20. If A=B , then which of the following is not correct ?

A. $\widehat{A} = \widehat{B}$

B. $|A| = |B|$

C. $A\widehat{B} = B\widehat{A}$

D. $A + B = \widehat{A} + \widehat{B}$

Answer: D

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21. The area of the parallelogram represented by the vectors $\overrightarrow{A} = 2\hat{i} + 3\hat{j}$ and $\overrightarrow{B} = \hat{i} + 4\hat{j}$ is

A. 14 unit

B. 7.5 units

C. 10 unit

D. 5 units

Answer: D

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

A. non- copanar non-concurrent fores

B. non - copanar concurrent forces

C. coplanar concurrent forces

D. coplanar non- concurrernt forces

Answer: B

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23. If the angle between two vectors A and B is 120°, then its resultant C will be

A. $C = |A - B|$

B. $C < |A - B|$

C. $C > |A - B|$

D. $C = |A + B|$

Answer: C

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24. The condition under which the vector (a+b) and (a-b) are parallel is

A. $a \perp b$

B. $|a| = |b|$

C. $a \neq b$

D. $C = |A + B|$

Answer: D

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25. A body, under the action of a force $\vec{F} = 6\hat{i} - 8\hat{j} + 10\hat{k}$, acquires an acceleration of $1ms^{-2}$. The mass of this body must be.

A. 200 kg

B. 20kg

C. $10\sqrt{2}kg$

D. 6sqrt(2) kg`

Answer: C

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26. The vector sum of two forces is perpendicular to their vector differences. In that case, the forces

A. are not equal to each other in magnitude

B. are parallel

C. are perpendicular

D. are rqual to each other in magnitude

Answer: D

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27. The resultant of $\overrightarrow{a}$ and $\overrightarrow{b}$ makes α with $\overrightarrow{a}$ and β with $\overrightarrow{b}$, then (a,b represent magnitudes of respective vectors) :

A. $apha < \beta$

B. $\alpha > \beta \text{if} A < B$

C. $\alpha < \beta \text{if} A = B$

D. $\alpha < \beta \text{if} A < B$

Answer: B

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28. Two equal vector have a resultant equal to either of them, then the angle between them will be:

A. 60°

B. $120^\circ 0$

C. 90°

D. 0°

Answer: B

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29. If A and B are Two non -zero vector having equal magnitude , the angle between the vector A and A-B is

A. 0°

B. 90°

C. 180°

D. dependent on the orientation o fA and B

Answer: D

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30. The angle between $\vec{A} = \hat{i} + \hat{j}$ and $\vec{B} = \hat{i} - \hat{j}$ is

A. 45°

B. 90°

C. -45°

D. 180°

Answer: B

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31. Five equal forces of $10N$ each are applied at one point and all are lying one plane. If the angles between them are equal, the resultant force will be

A. zero

B. 10N

C. 20N

D. $10\sqrt{2}N$

Answer: A

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32. Two vectors $\vec{A}$ and $\vec{B}$ inclined at an angle θ have a resultant $\vec{R}$ which makes an angle α with $\vec{A}$. If the directions of $\vec{A}$ and $\vec{B}$ are interchanged, the resultant will have the same

A. magnitude the same

B. direction reverses and megnitude is doubled

C. magnitude as well as direction

D. Neither

Answer: A

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33. What is correct ?

A. $|a-b| = |a| - |b|$

B. $|a-b| \leq |a| - |b|$

C. $|a-b| \geq |a| - |b|$

D. $|a-b| > |a| - |b|$

Answer: C

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34. Resultant of which of a following may be equal to zero?

A. $10N, 10N, 10N$

B. $10N, 10N, 25N$

C. $10N, 10N, 35N$

D. None of these

Answer: A

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35. A man first moves 3 m due east , them 6 m due north and finally 7 m due west , then the magnitude of the resultant displacement is (in metre)

A. $\sqrt{16}$

B. $\sqrt{24}$

C. $\sqrt{52}$

D. $\sqrt{94}$

Answer: C

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36. 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. 90°

D. 180°

Answer: B

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37. Two forces 8 N and 12 act ay 120° The third force required to keep the body in equilbrium is

A. 4 N

B. $4\sqrt{7}N$

C. 20 N

D. none of these

Answer: B

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38. If A.B =0 and $A \times B = 1$, then A and B are

A. perpendicular unit vectors

B. paraellel unit vector

C. parallel

D. anti - parallel

Answer: A

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39. If

$P + Q = R$ and $|P| = |Q| = \sqrt{3}$ and $|R| = = 3,$

then the angle between P and Q is

A. $\pi / 4$

B. $\pi/6$

C. $\pi/3$

D. $\pi/2$

Answer: C

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

A. e is along positive Y-axis

B. r is along postiveY-asis

C. x makes an angle of 45° with the X-axis

D. r is along nehnitive Y-axis

Answer: B

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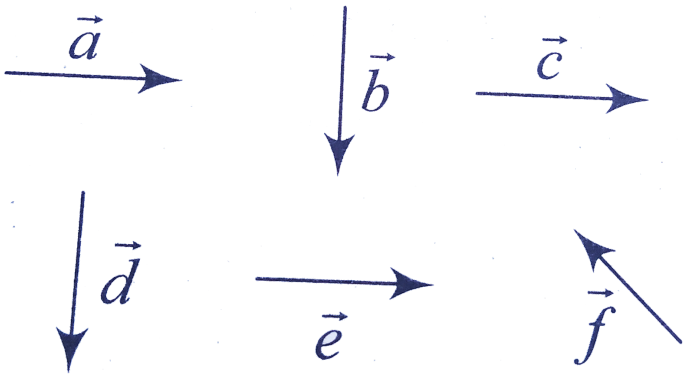
41. Six vector $\overrightarrow{a}$ through $\overrightarrow{f}$ have the magnitudes and direction indicated in the figure. Which of the following statements is true?



A. $b + e = f$

B. $b + c = f$

C. $d + c = f$

D. $d + e = f$

Answer: D

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42. A paricle starting from the origin (0,0) moves in a straight line in (x, y) plane. Its coordinates at a later time are $\left(\sqrt{3}, 3\right)$. The path of the particle makes with the x-axis an angle of

A. 30°

B. 45°

C. 60°

D. 0°

Answer: C

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43. Consider a vector $\vec{F} = 4\hat{i} - 3\hat{j}$. Another vector that is perpendicular to $\vec{F}$ is

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

B. $6\hat{i}$

C. $7\hat{k}$

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

Answer: C

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44. The angle between vectors $(A \times B)$ and $(B \times A)$ is

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45. The angle between vectors $(A \times B)$ and $(B \times A)$ is

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46. Unit vector perpnicular to vector $A = -3\hat{i} - 2\hat{j} - 3\hat{k}$ and $2\hat{i} + 4\hat{j} + 6\hat{k}$ oth is

A. $\frac{3\hat{i} - 2\hat{k}}{\sqrt{13}}$

B. $\frac{3\hat{k} - 2\hat{j}}{\sqrt{13}}$

C.

D.

Answer: A

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47. Unit vector parallel to the resultant of vector $8\hat{i}$ and $8\hat{j}$ will be

A. $\left(24\hat{i}+5\hat{j}\right)/13$

B. $\left(12\hat{i}+5\hat{j}\right)/13$

C. $\left(6\hat{i}+5\hat{j}\right)/13$

D. None of therse

Answer: D

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48. A force of $5N$ acts on a particle along a direction making an angle of 60° with verticle. Its verticel

components is

A. 10N

B. 3 N

C. 4 N

D. 2.5 N

Answer: D

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49. If $\vec{A} = 3\hat{i} + 4\hat{j}$ and $\vec{B} = 7\hat{i} + 24\hat{j}$, find a vector having the same magnitude as $\vec{B}$ and parallel and same direction as $\vec{A}$.

A. $5\hat{i} + 20\hat{j}$

B. $15\hat{i} + 10\hat{j}$

C. $20\hat{i} + 15\hat{j}$

D. $15\hat{i} + 20\hat{j}$

Answer: D

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50. The vector that must be added to the vector $\hat{i} - 3\hat{j} + 2\hat{k}$ and $3\hat{i} + 6\hat{j} + 7\hat{k}$ so that the resultant vector is a unit vector along the y-axis is

A. $4\hat{i} + 2\hat{j} + 5\hat{k}$

B. $-4\hat{i}+2\hat{j}+5\hat{k}$

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

D. Null vector

Answer: B

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

A. $\hat{i}B\cos\theta - \hat{j}B\sin\theta$

B. $\hat{i}B\sin\theta - \hat{j}B\cos\theta$

C. $\hat{i}B\sin\theta + \hat{j}B\cos\theta$

D. $\hat{i}B\sin\theta + \hat{j}B\cos\theta$

Answer: B

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53. If two vectors $2\hat{i} + 3\hat{j} - \hat{k}$ and $-4\hat{i} - 6\hat{j} - \lambda\hat{k}$ are parallel to each other then value of λ be

A. 0

B. 2

C. 3

D. 4

Answer: B

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54. What is the angle between $\left(\overrightarrow{P}+\overrightarrow{Q}\right)$ and $\left(\overrightarrow{P}\times\overrightarrow{Q}\right)$?

A. Zero

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

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

D. π

Answer: B

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

A. 1

B. $\sqrt{0.11}$

C. $\sqrt{0.01}$

D. $\sqrt{0.39}$

Answer: B

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56. If $A = a_1\hat{i} + b_1\hat{j}$ and $B = a_2\hat{i} + b_2\hat{j}$ the condition that they are perpendicula to each other is

A. $\frac{a_1}{b_1} = -\frac{b_2}{a_2}$

B. $a_1 b_1 = a_2 b_2$

C. $\frac{a_1}{b_1} = -\frac{b_1}{b_2}$

D. None of these

Answer: A

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57. For what value of x , will the two vector $A = 2\hat{i} + 2\hat{j} - x\hat{k}$ and $B = 2\hat{i} - \hat{j} - 3\hat{k}$ are perpendicular to each other ?

A. $x = -2/3$

B. $x = -3/2$

C. $x = -4/3$

D. $x = -2/3$

Answer: A

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58. A and B are two vector given by $A = 2\hat{i} + 3\hat{j}$ and $B = 2\hat{i} + 4\hat{j}$ The magnitude to the component of A along B is

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

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

C. $\frac{8}{\sqrt{5}}$

D. $\frac{5}{\sqrt{13}}$

Answer: C

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59. The value of x and y for which vector $A = \left(6\hat{i} + x\hat{j} - 2\hat{k}\right)$ and $B = \left(5\hat{i} + 6\hat{j} - y\hat{k}\right)$ may be parallel are

A. $x = 0, y = \frac{2}{3}$

B. $x = \frac{36}{5}, y = \frac{5}{3}$

C. $x = \frac{15}{3}, y = \frac{23}{3}$

D. $x = \frac{36}{5}, y = \frac{15}{4}$

Answer: B

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60. The angles which the vector $A = 3\hat{i} + 6\hat{j} + 2\hat{k}$ makes with the co-ordinate axes are

A. $\cos^{-1}\frac{3}{7}\cos^{-1}\frac{6}{7}$ and $\cos^{-1}\frac{2}{7}$

B. $\cos^{-1}\frac{4}{7}\cos^{-1}\frac{5}{7}$ and $\cos^{-1}\frac{3}{7}$

C. $\cos^{-1}\frac{3}{7}\cos^{-1}\frac{4}{7}$ and $\cos^{-1}\frac{1}{7}$

D. None of the above

Answer: A

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61. A particle is moving on a circular path with constant speed v then the change in its velocity after it has desceibed an angle of 60° will be

A. $v\sqrt{2}$

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

C. $v\sqrt{3}$

D. v

Answer: D

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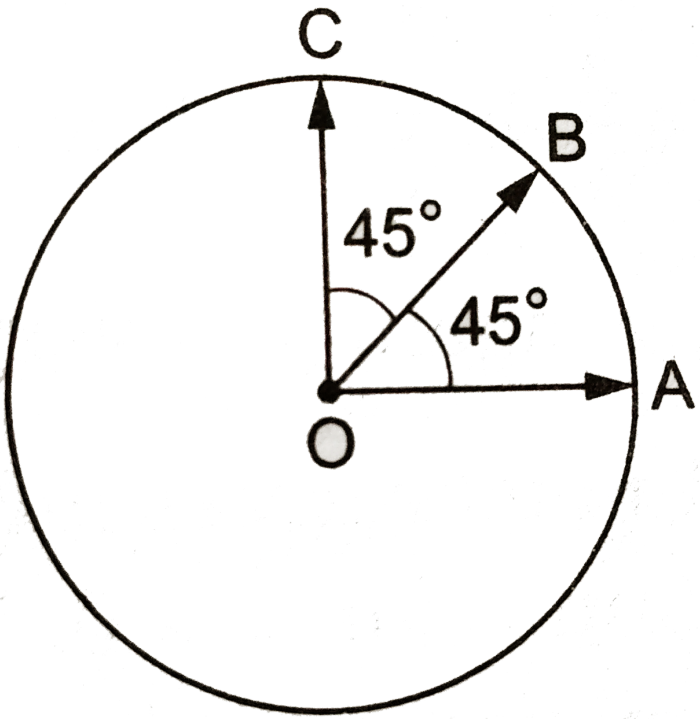
62. Find the resultant of the three vectors $\overrightarrow{OA}, \overrightarrow{OB}$ and $\overrightarrow{OC}$ shown in figure. Radius of the circle is R.



A. 2R

B. $R\left(1+\sqrt{2}\right)$

C. $R\sqrt{2}$

D. $R(\sqrt{2}-1)$

Answer: B

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63. Resultant of two vector of equal magnitude A is

A. $\sqrt{3}Aat60^\circ$

B. $\sqrt{2}Aat90^\circ$

C. $2Aat120^\circ$

D. $Aat180^\circ$

Answer: A,B

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64. If $a\hat{i} + b\hat{j}$ is a unit vector and it iws perpendicular to $\hat{i} + \hat{j}$, then value of a and b is

A. 1,0

B. $-2, 0$

C. $0.5, \ -0.5$

D. None of these

Answer: D

Watch Video Solution

65. If $a+b+c=0$, then $a \times b$ is equal to

A. $b \times c$

B. $c \times b$

C. $a \times c$

D. None of these

Answer: A

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66. Consider a force vector $F=\hat{i}+\hat{j}+\hat{k}$ Anorther vectoer perpendicular of F is

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

B. $6\hat{i}$

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

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

Answer: C

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67. A vector perpendicular to both the vector $2\hat{i} - 3\hat{j}$ and $3\hat{i} - 2\hat{j}$ is

A. $\hat{j} + 5\hat{k}$

B. $\hat{j} - 5\hat{k}$

C. $6\hat{k}$

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

Answer: C

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68. If $\vec{A}=4\hat{i}-3\hat{j}$ and $\vec{B}=6\hat{i}+8\hat{j}$ then magnitude and direction of $\vec{A}+\vec{B}$ will be

A. $5, \tan^{-1}(3/4)$

B. $5\sqrt{5}, \tan^{-1}(1/2)$

C. $10, \tan^{-1}(5)$

D. $25, \tan^{-1}(3/4)$

Answer: B

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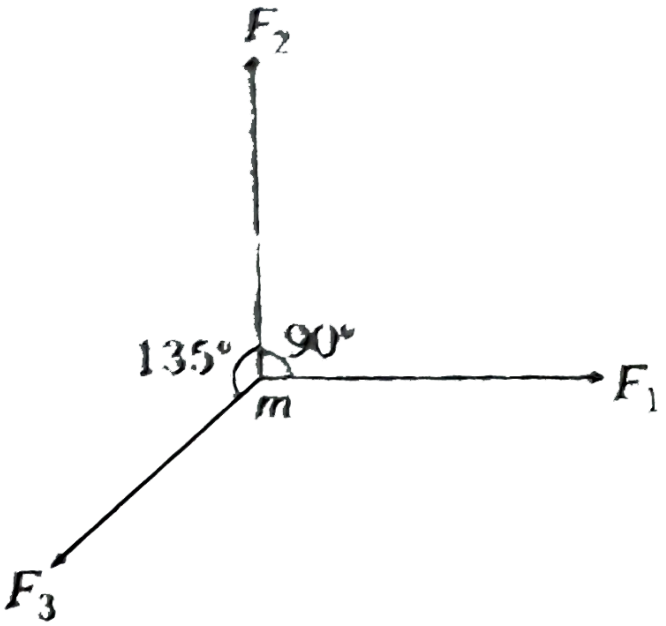
69. When a force F acs on a body of mass m the acceleration product in the body is a . If htree equal forces $F_1 = F_2 = F_3 = F$ act on the same body as

shown in figure the accleration produced is



A. $\left(\sqrt{2}-1\right)a$

B. $\left(\sqrt{2}+1\right)a$

C. $\sqrt{2}a$

D. a

Answer: A

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70. Obtain the magnitude and direction cosines of vector $(A-B)$, if $A=2\hat{i}+3\hat{j}+\hat{k}, B=2\hat{i}+2\hat{j}+3\hat{k}$

A. $0, \frac{1}{\sqrt{5}}, \frac{-2}{\sqrt{5}}$

B. $0, \frac{2}{\sqrt{5}}, \frac{1}{\sqrt{5}}$

C. $0, 0, \frac{1}{\sqrt{5}}$

D. None of these

Answer: A

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71. Two vectors having equal magnitudes A make an angle θ with eahc other. Find the magnitude and direction of the resultant.

A. $2A\cos\frac{\theta}{2}$, along bisector

B. $A\cos\frac{\theta}{2}$, $\mathrm{At} 45^\circ$ from on e vector

C. $2A\cos\frac{\theta}{2}$, along bisector

D. $A\cos\frac{\theta}{2}$, along bisector

Answer: A

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72. 12 coplanar non collinear forces (all of equal magnitude) maintain a body in equilibrium, then angle between any two adjacent forces is

A. 15°

B. 30°

C. 45°

D. 60°

Answer: B

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73. Given that $\vec{A} + \vec{B} + \vec{C} = 0$, out of three vectors two are equal in magnitude and the magnitude of third vector is $\sqrt{2}$ times that of either of two having equal magnitude. Then angle between vectors are given by

A. $30^\circ, 60^\circ, 90^\circ$

B. $45^\circ, 45^\circ, 90^\circ$

C. $90^\circ, 135^\circ, 45^\circ$

D. $90^\circ, 135^\circ, 135^\circ$

Answer: D

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74. Two vectors A and B are such that $A + B = C$ and $A^2 + B^2 = C^2$. If θ is the angle between positive direction of A and B, then the correct statement is

A. $\theta = \pi$

B. $\theta = \frac{2\pi}{3}$

C. $\theta = 0$

D. $\theta = \frac{\pi}{2}$

Answer: D

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75. Given $A = 3\hat{i} + 4\hat{j}$ and $B = 6\hat{i} + 8\hat{j}$ which of the following statement is correct ?

A. $A \times B = 0$

B. $\frac{|A|}{|B|} = \frac{1}{2}$

C. $|A| = 15$

D. $A. |B| = 48$

Answer: A,B

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76. If a vector $\vec{A}$ make angles α, β and γ, respectively , with the X, Y and Z axes , then $\sin^2\alpha + \sin^2\beta + \sin^2\gamma =$

A. 0

B. 1

C. 2

D. 3

Answer: C

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77. If vector A and B have an angle θ between them, then value of $\left|\hat{A} - \hat{B}\right|$ will be ,

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

B. $2\tan\frac{\theta}{2}$

C. $2\sin\frac{\theta}{2}$

D. None of these

Answer: C

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78. A particle undergoes three successive displacements given by $s_1 = \sqrt{2}$ m morth - east , $s_1 = 2$ m due south and $s_3 = 4m, 30^\circ$ north of west , then mngnitude of net displecement is

A. $\sqrt{14 + 4\sqrt{3}}$

B. $\sqrt{14 - 4\sqrt{3}}$

C. $\sqrt{4}$

D. None of these

Answer: B

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79. The resultant of A and B is R_1 On reversing the vector B , the resulatnt R_2 what is the value of $R_1^2 + R_2^2$?

A. $A^2 + B^2$

B. $A^2 - B^2$

C. $2\left(A^2 + B^2\right)$

D. $2\left(A^2 - B^2\right)$

Answer: C

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

A. $\sqrt{2}$

B. $sqr(3)$

C. $1/\sqrt{2}$

D. $\sqrt{5}$

Answer: B

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81. The sum of two vectors A and B is at right angles to their difference. Then

A. A=B

B. A=2B

C. B=2A

D. None of these

Answer: A

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82. A vector having magnitude 30 unit makes equal angles with each of X,Y, and Z -axes The components of vector along each of X,Y,and Z -axes are

A. $10\sqrt{3}$ unit

B. $20\sqrt{3}$ unit

C. $15\sqrt{3}$ unit

D. 10 unit

Answer: A

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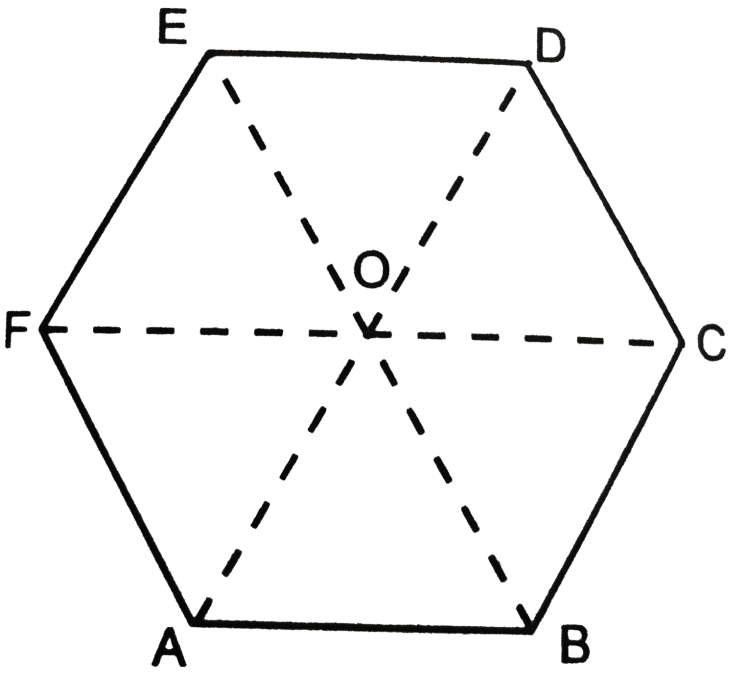
83. $ABCDEF$ is a regular hexagon, Fig. 2 (c) .65. What is the value of

$$\left(\overrightarrow{AB} + \overrightarrow{AC} + \overrightarrow{AD} + \overrightarrow{AE} + \overrightarrow{AF}?\right.$$



A. AO

B. 2AO

C. 4AO

D. 6AO

Answer: D

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84. If A is a unit vector in a given direction then the value of $\widehat{A}.\ \frac{d\widehat{A}}{dt}$ is

A. 0

B. 1

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

D. 2

Answer: A

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85. If F_1 and F_2 aare two vectors of equal magniudes F such that $|F_1.F_2| = |F_1 \times F_2|$, then $|F_1 + F_2|$ equals to

A. $\sqrt{(2+\sqrt{2})}F$

B. $2F$

C. $F\sqrt{2}$

D. None of these

Answer: A

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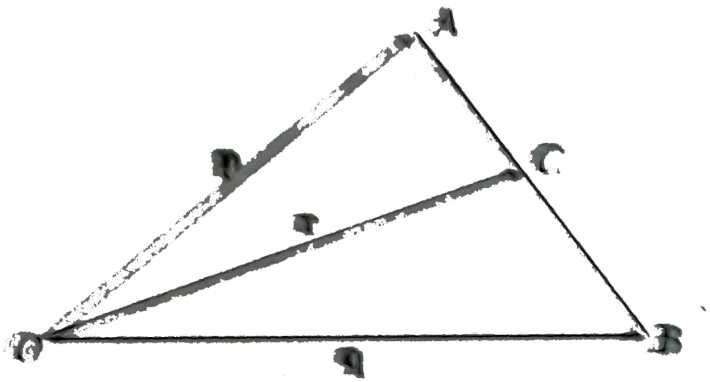
86. Figure showns three vectors p,q and r where C is the mid - point of AB Then which of the following reation is correct ?



A. $p + q = 2r$

B. $p + q = r$

C. $p - q = 2r$

D. $p - q = r$

Answer: A

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87. What is the angle between P and the cross product of $(P + Q)$ and $(P - Q)$?

A. 90°

B. $\tan^{-1}(p/Q)$

C. $\tan^{-1}(Q/p)$

D. 0°

Answer: A

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88. The resultant of two vectors $\vec{P}$ and $\vec{Q}$ is $\vec{R}$. If $\vec{Q}$ is doubled then the new resultant vector is perpendicular to $\vec{P}$. Then magnitude of $\vec{R}$ is :-

A. P

B. $(P+Q)$

C. Q

D. $(P-Q)$

Answer: C

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89. 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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90. The sum of the magnitudes of two forces acting at a point is 18 and the magnitude of their resultant is 12. If the resultant is at 90° with the force of smaller magnitude, What are the magnitudes of forces?

A. 12,6

B. 14,4

C. 5,13

D. 10,8

Answer: C

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91. A vector $\vec{a}$ is turned without a change in its length through a small angle $d\theta$. Find the value of $\left|\Delta \vec{a}\right|$ and Δa.

A. $0, adth\eta$

B. $a.\ d\theta, 0$

C. $0, 0$

D. None of these

Answer: B

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92. A force $F = -K\left(y\hat{i} + x\hat{j}\right)$ (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 F on the particle is

A. $-2Ka^2$

B. $2Ka^2$

C. $-Ka^2$

D. Ka^2

Answer: C

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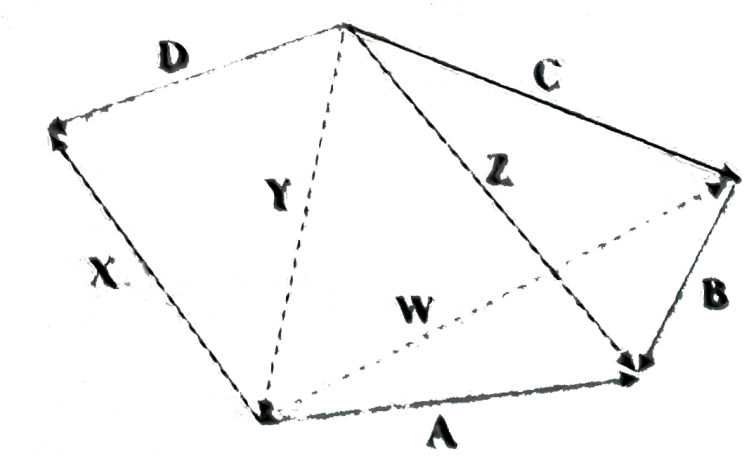
93. In the digram shown in figure



A. $X = A + B - C + D$

B. $Y = B + C - A$

C. $Z = B + C$

D. $W = A + B$

Answer: B,C

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94. If a and b are two vectors.then the value of $(a+b)\times(a-b)$ is

A. $2(b\times a)$

B. $-2(b\times a)$

C. $b\times a$

D. $b\times a$

Answer: A

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95. Given that $\vec{A} + \vec{B} = \vec{C}$ and that $\vec{C}$ is perpendicular to $\vec{A}$ Further if $\left|\vec{A}\right| = \left|\vec{C}\right|$, then what is the angle between $\vec{A}$ and $\vec{B}$

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

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

C. $\frac{3\pi}{4}$

D. π

Answer: C

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96. 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. 120°

B. 135°

C. 90°

D. 150°

Answer: A

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97. If $A + B = C, |A| = 2|B|$ and $B.C = 0,$ then

A. $|A + B| = |A + B|$

B. $|A + C| = B$

C. $A.B < 0$

D. A.C may be zero

Answer: C

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98. Two unit vector when added give a unit vector .

Then choose the correct statement.

A. magnitude the their difference is $\sqrt{3}$

B. Mignitude of their difference is 1

C. Angle between the vectors is 90°

D. Angle between the sum and the difference of the two vectors is 90°

Answer: D,A

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99. Which one of the following statement is true?

A. A scalar quantity is the one that is conserved In a process

B. A sclar quantity is the onr that can never take nagative values

C. Ascalar quantity is the onr thaat does not vary from one point to another in space

D. A sclar quantity has the same value for observers with different orientaion of the axes.

Answer: D

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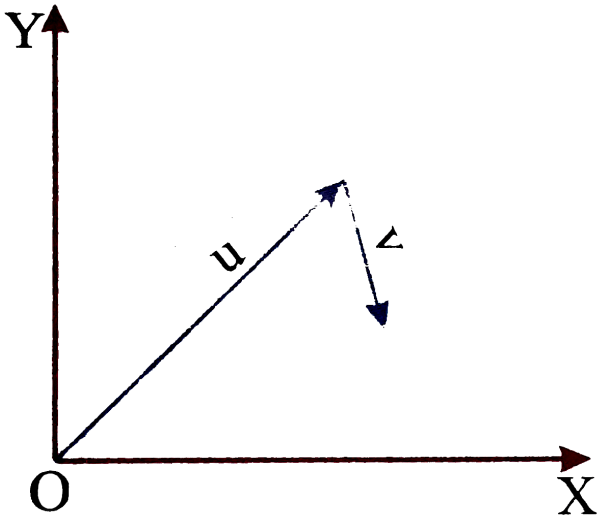
100. Figure shows the orientation of two vectors u and v in the XY plane.

if $\overrightarrow{u} = a\hat{i} + b\hat{j}$ and $\overrightarrow{v} = p\hat{i} + q\hat{j}$

which of the following is correct?



A. a and p are positivewhile b andq are negative

B. a,p and b are positive while q is negative

C. a,q and b are positve while p is negative

D. a,b,p and q are all positive

Answer: B

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101. The velocity of a particle is $v = 6\hat{i} + 2\hat{j} - 2\hat{k}$ The component of the velocity parallel to vector $a = \hat{i} + \hat{j} + 2\hat{k}$ invector from is

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

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

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

D. $6\hat{i} + 2\hat{j} + 2\hat{k}$

Answer: B

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102. The resultant R of vector P andQ is perpendicular to P and R=P both , then angle betwwen $|P|$ and $|Q|$is

A. 45°

B. 135°

C. 120°

D. All of these

Answer: B

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103. The value of $\hat{i} \times \left(\hat{i} \times a\right) + \hat{j} \times \left(\hat{j} \times a\right) + \hat{k} \times \left(\hat{k} \times a\right)$ is

A. a

B. $a \times \hat{k}$

C. $-2a$

D. $-a$

Answer: C

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104. What is the angle between $\overrightarrow{P}$ and the resultant of $\left(\overrightarrow{P} + \overrightarrow{Q}\right)$ and $\left(\overrightarrow{P} - \overrightarrow{Q}\right)$?

A. zero

B. $\tan^{-1}(p/Q)$

C. $\tan^{-1}(Q/p)$

D. $\tan^{-1}(P-Q)/(P+Q)$

Answer: A

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105. If a_1 and a_2 aare two non- collineaar unit vectors and if $|a_1+a_2|=\sqrt{3},$,then value of $(a_1-a_2).(2a_1-a_2)$ is

A. 2

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

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

D. 1

Answer: B

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106. Three are N coplancar vectors each of magnitude V

Each vector is inclined to the preceding vector atangle $\frac{2\pi}{N}$ What is the magnitude of their resultant ?

A. $\frac{V}{N}$

B. V

C. zero

D. $\frac{N}{V}$

Answer: C

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107. Three equal masses of 1 kg each are placed at the vertices of an equilateral triangle which is at a distance of $sqr(2)$ m from each of the vertices of the triangle .The force . In newton , acting on the mass of 2 kg is

A. 2

B. 1

C. 1

D. Zero

Answer: D

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108. At what angle must the two forces (x+y) and (x-y) act so that the resultant may be $\sqrt{x^2+y^2}$?

A. $\cos^{-1}\left[-\frac{x^2+y^2}{2(x^2-y^2)}\right]$

B. $\cos^{-1}\left[-\frac{-2x^2-y^2}{(x^2+y^2)}\right]$

C. $\cos^{-1}\left[-\frac{x^2+y^2}{(x^2-y^2)}\right]$

D. $\cos^{-1}\left[-\frac{x^2-y^2}{(x^2+y^2)}\right]$

Answer: A

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Assertion And Reason

1. Assertion - Finite angular disacement is not a vector quantiy.

Reason It does not obey vector laws.

A. If both Assetion and Reason are correct but Reason is the correct explanation of Assertion.

B. If both Assetion and Reason are correct but Reason is not the correct explanation of

Assertion.

C. If Asserion is true but Reason is false

D. If Asserion is false but Reason is true

Answer: A

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2. Assertion - small displacement is a vector quantity. Reason Pressure and surface tension are also vector quanities.

A. If both Assetion and Reason are correct but Reason is the correct explanation of Assertion.

B. If both Assetion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Asserion is true but Reason is false

D. If Asserion is false but Reason is true

Answer: C

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3. Assertion - Vector addition of two vector is always greater then their vector subtraction.

Reason At $\theta = 90^\circ$, addition and subreaction of two vector are equal .

A. If both Assetion and Reason are correct but Reason is the correct explanation of Assertion.

B. If both Assetion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Asserion is true but Reason is false

D. If Asserion is false but Reason is true

Answer: D

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4. Assertion - Vector product of two vectors may be greater then , equal to or less than the scaler product .

Reason At $\theta = 45^\circ$ two are equal .

A. If both Assetion and Reason are correct but Reason is the correct explanation of Assertion.

B. If both Assetion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Asserion is true but Reason is false

D. If Asserion is false but Reason is true

Answer: B

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5. Assertion: Angle between $\hat{i}+\hat{j}$ and $\hat{i}$ is 45°.

Reason: $\hat{i}+\hat{j}$ is equally inclined to both $\hat{i}$ and $\hat{j}$ and the angle between $\hat{i}$ and $\hat{j}$ is 90°.

A. If both Assetion and Reason are correct but Reason is the correct explanation of Assertion.

B. If both Assetion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Asserion is true but Reason is false

D. If Asserion is false but Reason is true

Answer: B

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6. Assertion - Component of A along B is equal to component of b along A.

Reason Compoent of A along B is A $\cos\theta$, Where $\theta$is the angle between two vector .

A. If both Assetion and Reason are correct but Reason is the correct explanation of Assertion.

B. If both Assetion and Reason are correct but Reason is not the correct explanation of

Assertion.

C. If Asserion is true but Reason is false

D. If Asserion is false but Reason is true

Answer: D

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7. Assertion - Component of A along B is equal to component of B along A.

Reason value of component is always less then the magnitude of vector .

A. If both Assetion and Reason are correct but Reason is the correct explanation of Assertion.

B. If both Assetion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Asserion is true but Reason is false

D. If Asserion is false but Reason is true

Answer: D

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8. Assertion (A+B).(A-B) is always positve.

Reason this is positive If $|A| > |B|$

A. If both Assetion and Reason are correct but Reason is the correct explanation of Assertion.

B. If both Assetion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Asserion is true but Reason is false

D. If Asserion is false but Reason is true

Answer: D

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9. Assertion: $\overrightarrow{A} \times \overrightarrow{B}$ is perpendicualr to both $\overrightarrow{A} - \overrightarrow{B}$ as well as $\overrightarrow{A} + \overrightarrow{B}$

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

A. If both Assetion and Reason are correct but Reason is the correct explanation of Assertion.

B. If both Assetion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Asserion is true but Reason is false

D. If Asserion is false but Reason is true

Answer: A

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10. Assertion If angle between a and b is 30° . Then angle between 2a and $-\frac{b}{2}$ will be 150°

Reason Sign of dot product of two vectors tells you whether angle between two vectors is acute or obtuse .

A. If both Assetion and Reason are correct but Reason is the correct explanation of Assertion.

B. If both Assetion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Asserion is true but Reason is false

D. If Asserion is false but Reason is true

Answer: B

View Text Solution

11. Assertion - If $|A| = |B|$, then $(A + B), (A - B)$ and $(A \times B)$ aaraea three mutually perpendicular vectors .

Reason - Dot Produt od a null vector with any other vector is always zero .

A. If both Assetion and Reason are correct but Reason is the correct explanation of Assertion.

B. If both Assetion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Asserion is true but Reason is false

D. If Asserion is false but Reason is true

Answer: B

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12. Assertion - $(A \times B).(B \times A)\text{is} - a^2B^2\sin^2\theta$ Here $there$ is the between A and B.

Reason `(AxxB) and (BxxA) are two anti - paralle3l vectors provided A and B are neither parallel nor anti - parallel .

A. If both Assetion and Reason are correct but Reason is the correct explanation of Assertion.

B. If both Assetion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Asserion is true but Reason is false

D. If Asserion is false but Reason is true

Answer: B

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13. Assertion - We can find angle between two vectors by using the relation ,

$\theta = \sin^{-1}\left(\frac{|A \times B|}{AB}\right)$

Reason $\frac{|A \times B|}{Ab}$ si always positive .

A. If both Assetion and Reason are correct but Reason is the correct explanation of Assertion.

B. If both Assetion and Reason are correct but Reason is not the correct explanation of

Assertion.

C. If Asserion is true but Reason is false

D. If Asserion is false but Reason is true

Answer: C

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14. Assertion - If θ be the angle between A and B then $\tan therta \frac{A \times B}{AB}$

Reason - $A \times B$ is perpendicular to AB.

A. If both Assetion and Reason are correct but Reason is the correct explanation of Assertion.

B. If both Assetion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Asserion is true but Reason is false

D. If both Assertion and Reason are false.

Answer: D

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Match The Columns

1. For component of a vector $A = \left(3\hat{i} + 4\hat{j} - 5\hat{k}\right)$, match the following co0lumns.

	Column I		Column II
(A)	X-axis	(P)	5unit
(B)	Along another vector $\left(2\hat{i} + \hat{j} + 2\hat{k}\right)$	(Q)	3Unit
(C)	Along $\left(6\hat{i} + 8\hat{j} - 10\hat{k}\right)$	(r)	*Zero*
(D)	Along another vector $\left(-3\hat{i} - 4\hat{j} + 5\hat{k}\right)$	(s)	None

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2. Two vector A and B have rqual magnitude x .Angle between tjem is 60° Then match the following two

columns.

	Column I		Column II
(A)	$\|\mathrm{A}+\mathrm{B}\|$	(P)	$\frac{\sqrt{3}}{2}x^2$
(B)	$\|A-B\|$	(Q)	x
(C)	$A.B$	(r)	$\sqrt{3}x$
(D)	$\|A \times B\|$	(s)	None

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3. Vector A is pointing eastwards and vector B northwards .If $|A| = |B|$ then match the following two columns.

	Column I		Column II
(A)	$(A+B)$	(P)	north -east
(B)	$(A-B)$	(Q)	Vertically upwards
(C)	$(A \times B)$	(r)	Vertically downwads
(D)	$(A \times B) \times (A \times B)$	(s)	None

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4. A vector has a magnitude x . If it is rotated by an angle θ then magnitude of change in vector is nx. Match the following two columns.

	Column I		Column II
(A)	$\theta = 60^\circ$	(P)	$n = \sqrt{3}$
(B)	$\theta = 90^\circ$	(Q)	$n = 1$
(C)	$\theta = 120^\circ$	(r)	$n = \sqrt{2}$
(D)	$\theta = 180^\circ$	(s)	$n = 2$

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5. If θ is the angle between two vectors A and B , then match the following two columns.

	Column I		Column II
(A)	$A.B = \|A \times B\|$	(P)	$\theta = 90^\circ$
(B)	$A.B = B^2$	(Q)	$\theta = 0^\circ$ or 180°
(C)	$\|A + B\| = \|A - C\|$	(r)	$A = B$
(D)	$\|A \times B\| = AB$	(s)	None

A. $A \to s, B \to q, r, C \to p, D \to p$

B. $A \to p, B \to q, r, C \to p, D \to s$

C. $A \to s, B \to q, r, C \to s, D \to p$

D. $A \to s, B \to q, C \to r, D \to p$

Answer: A

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1. If the magnitude of sum of two vectors is equal to the magnitude of difference of the two vector, the angle between these Vector is

A. 90°

B. 45°

C. 180°

D. 0°

Answer: A

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

A. $1/2$

B. -1

C. $-1/2$

D. 1

Answer: C

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3. The angle θ between the vector $p = \hat{i} + \hat{j} + \hat{k}$ 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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4. Consider three vectors $A = \hat{i} + \hat{j} - 2\hat{k}$, $B = \hat{i} + \hat{j} + 2\hat{k}$ and $2\hat{i} - 3\hat{j} + 4\hat{k}$ A vector X of the from $\alpha A + \beta B(\alpha \text{ and } \beta \text{are numbers})$ is perpendicular to C .The ratio of α and β is

A. $1:1$

B. $2:1$

C. $-1:1$

D. $3:1$

Answer: A

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5. Two equal vector have a resultant equal to either of them, then the angle between them will be:

A. 90°

B. 60°

C. 120°

D. 0°

Answer: C

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6. Which of the following is not a cloning vector ?

A. Weight

B. Nuclear spin

C. Momentum

D. Potential enerrgy

Answer: D

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7. The scalar product of two vectors $A = 2\hat{i} + 2\hat{j} - \hat{k}$ and $B = -\hat{j} + \hat{k}$,is given by

A. A.B=3

B. A.B=4

C. A.B=-4

D. A.B=-3

Answer: D

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8. If $A.\ B = A \times B$, then angle between A and B is

A. 45°

B. 30°

C. 60°

D. 90°

Answer: A

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9. A vector $\vec{B}$ which has a magnitude 8.0 is added to a vector $\vec{A}$ which lies along the x-axis. The sum of these two vector is a third vector which lies along the y-axis and has a magnitude that is twice the magnitude of $\vec{A}$. Find the magnitude of $\vec{A}$

A. $\frac{6}{\sqrt{5}}$

B. $\frac{12}{\sqrt{5}}$

C. $\frac{16}{\sqrt{5}}$

D. $\frac{8}{\sqrt{5}}$

Answer: D

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