PHYSICS

BOOKS - RESNICK AND HALLIDAY PHYSICS (HINGLISH)

VECTORS

Sample Problem

1. In an orienteering class, you have the goal of moving as far from base camp as possible by making three straight-line moves. You may use the following displacement in any order: (a) $\vec{a}$, 2.0 km due east (b) $\vec{b}$, 2.0 km 30° north of east (c) $\vec{c}$, 1.0 km due west. Alternatively, you may substitude either $-\vec{b}$ for $\vec{b}$ or $-\vec{c}$ for $\vec{.}$ What is the greatest distance you can be from base camp the the end of the third displacement

Watch Video Solution

2. A small airplane leaves an airport on an overcast day and is later sighted $215km$ away, in a direction making an angle of 22° east of due north. This means that the direction is not due north (directly toward the north) but is rotated 22° toward the east from due north. How far east and north is the airplane from the airport when sighted ?

Watch Video Solution

3. A head maze is a maze formed by tall rows of hedge. After entering, you search for the center point and then for the exit. Shows the entrance to such a maze and the first two choice we make at the junctions we encounter in moving from point I to point c. We undergo three displacements as indicated in the overhead view of

$d_1 = 6.00m\theta_1 = 40^\circ$

$d_2 = 8.00m\theta_2 = 30^\circ$

$d_3 = 5.00m\theta_3 = 0^\circ.$

where the last segment is parallel to the superimposed x axis. When we

reach point c, what are the magnitude and angle of our net displacement $\vec{d}_{\neq t}$ from point i?

View Text Solution

4. shows the following three vectors:

$\vec{a} = (4.2m)\hat{i} - (1.5m)\hat{j},$

$\vec{b} = (-1.6m)\hat{i} + (2.9m)\hat{j},$

and $\vec{c} = (-3.7m)\hat{j}.$

What is their vector sum $\vec{r}$ which is also shown ?

View Text Solution

5. For the vector $\vec{a} = (3.0m)\hat{i} + (4.0m)\hat{j}$ and $\vec{b} = (5.0m)\hat{i} + (-2.0m)\hat{j},$ give $\vec{a} + \vec{b}$ in (a) unite-vector notation, and as (b) a magnitude and (c) an angle (relation to $\hat{i}$). Now give $\vec{b} - \vec{a}$ in (d) unit vector notation, as (e) a magnitude and (f) an angle.

Watch Video Solution

6. Two beetles run across flat send, starting at the same point. Beetle 1 runs 0.50 m due east, the 0.80 m at 30° north of due east. Beetle 2 also makes two runs, the first is $1.6m$ at 40° east of due north. What must be (a) the magnitude and (b) the direction of its second run if it is to end up at the new location of beetle 1 ?

View Text Solution

7. a vector $\vec{a}$ with a magnitude of 17.0 m is directed at angle $\theta = 56.0^\circ$ countercloskwise from the +x axis. What are the components (a) a_x and $(b) a_y$ of the vector ? A second coordinate system is inclined by angle $\theta' = 18.0^\circ$ with respect to the first. What are the components (c) a and (d) $a_y$in this primed coordinate system ?

Watch Video Solution

8. What is the angle ϕ between $\vec{a} = 3.0\hat{i} - 4.0\hat{j}$ and $\vec{b} = -2.0\hat{i} + 3.0\hat{k}$?

Watch Video Solution

9. vector $\vec{a}$ lies in the xy plane, has a magnitude of 18 units, and points in a direction 250° from the positive direction of the x axis. Also, vector $\vec{b}$ has a magnitude of 12 units and points in the positive direction of the z axis. What is the vector product $\vec{c} = \vec{a} \times \vec{b}$?

Watch Video Solution

10. If $\vec{a} = 3\hat{i} - 4\hat{j}$ and $\vec{b} = -2\hat{i} + 3\hat{k}$, what is $\vec{c} = \vec{a} \times \vec{b}$?

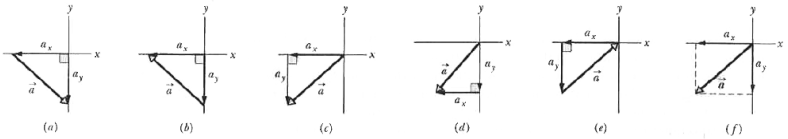
Watch Video Solution

Checkpoint

1. The magnitudes of displacemwent $\vec{a}$ and $\vec{b}$ are 3 m anad 4m, respectively, and $\vec{c} = \vec{a} + \vec{b}$. Considering various orientations of $\vec{a}$ and $\vec{b}$, what are (a) the maximum possible magnitude for $\vec{c}$ and (b) the minimum possible magnitude ?

Watch Video Solution

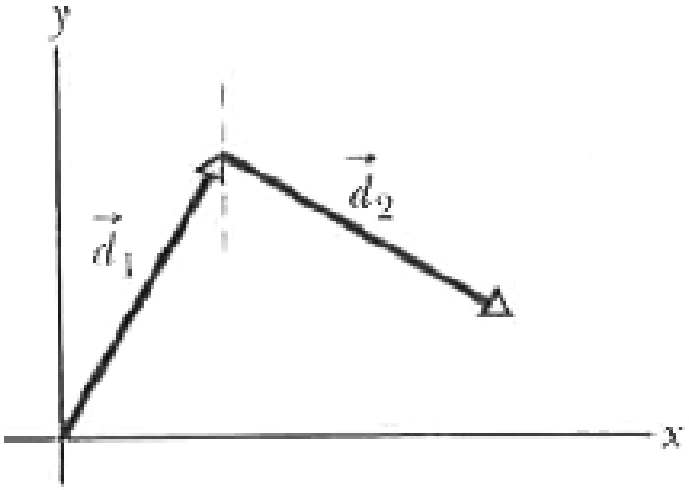
2. In the figure , which of the indicated methods for combining the x and y components of vercor $\vec{a}$ are proper to determine that vector ?



Watch Video Solution

3. (a) In the figure here, what are the signs of the x components of $\vec{d}_1$ and $\vec{d}_2$? (b) What are the signs of the y components of $\vec{d}_1$ and $\vec{d}_2$? (c) What are the signs of the x and y components of

$\vec{d}_1 + \vec{d}_2$?



Watch Video Solution

4. Vectors $\vec{C}$ and $\vec{D}$ have magnitudes of 3 units and 4 units, respectively. What is the angle between the directions of $\vec{C}$ and $\vec{D}$ if $\vec{C} \cdot \vec{D}$ equals (a) zero, (b) 12 units , and (c) -12 units ?

Watch Video Solution

5. Vectors $\vec{C}$ and $\vec{D}$ have magnitudes of 3 units and 4 units, respectively. What is the angle between the directions of $\vec{C}$ and $\vec{D}$ if $\vec{C} . \vec{D}$ equals (a) zero, (b) 12 units , and (c) -12 units ?

Watch Video Solution

Problems

1. If the x component of a vector $\vec{a}$, in the xy plane, is half as large as the magnitude of the vector, find the tangent of the angle between the vector and the x axis.

Watch Video Solution

2. A displacement vector $\vec{r}$ in the xy plane is 12 m long and directed at angle $\theta = 30^{\circ}$ in Fig. $3-25$. Determine (a) the x vomponent and (b) the

y component of the vector.

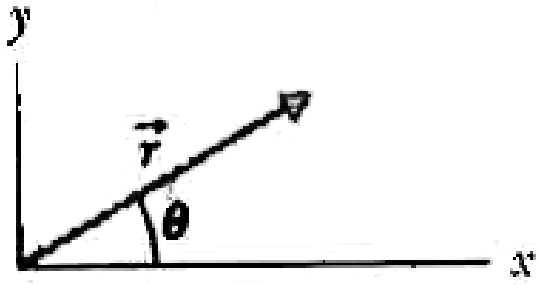


Figure 3-25 Problem 2.

Watch Video Solution

3. A vector has a component of 15 m in the + x direction, a component of 15 m in the + y direction, and a component of 1- m in the + z direction. What is the magnitude of this vector ?

Watch Video Solution

4. A golf takes three putts to get the ball into the hole. The first putt displaces the ball 3.66 m north, the second 1.83 m southeast, and the

thirs 0.91 m southwest. What are (a) the magnitude and (b) the direction of the displacement needed to get the ball into the hole on the first putt ?

Watch Video Solution

5. There are two displacement vectors„ one of magnitude 3 metres and the other of 4 metres. How would the two vectors be added so that the magnitude of the resultant vector be (a) 7 metres (b) 1 metre and (c) 5 metres.

Watch Video Solution

6. Consider two vectors $\vec{a} = (5.0)\hat{i} - (4.0)\hat{j} + (2.0)\hat{k}$ and $\vec{b} = (-2.0m)\hat{i} + (2.0)m\hat{j} + (5.0m)$ where m is a scalar. Find

(a) $\vec{a} + \vec{b}$, $(b)\vec{a} - \vec{b}$, and (c) a thirs vector $\vec{c}$ such that $\vec{a} - \vec{b} + \vec{c} = 0.$

Watch Video Solution

7. Find the (a) x, (b) y, and (c) z components of the sum $\vec{r}$ of the displacement $\vec{c}$ and $\vec{d}$ whose components in meters are $c_x = 7.4, c_y = -3.8, c_z = -6.1, d_x = 4.4 d_y = -2.0, d_z = 3.3.$

Watch Video Solution

8. (a) In unit -vector notation, what is the sum $\vec{a} + \vec{b}$ if $\vec{a} = (4.0cm)\hat{i} + (3.0)\hat{j}$ and $\vec{b} = (-13.0m)\hat{i} + (7.0m)\hat{j}$? What are the (b) magnitude and (c) direction of $\vec{a} + \vec{b}$?

Watch Video Solution

9. A car is drive east for a distance of 40 km, then north for 30 km, and then in a direction 30° east of north for 25 km Sketch the vector diagram and determine (a) the magnitude and (b) the angle of the car's total displacement from its starting point.

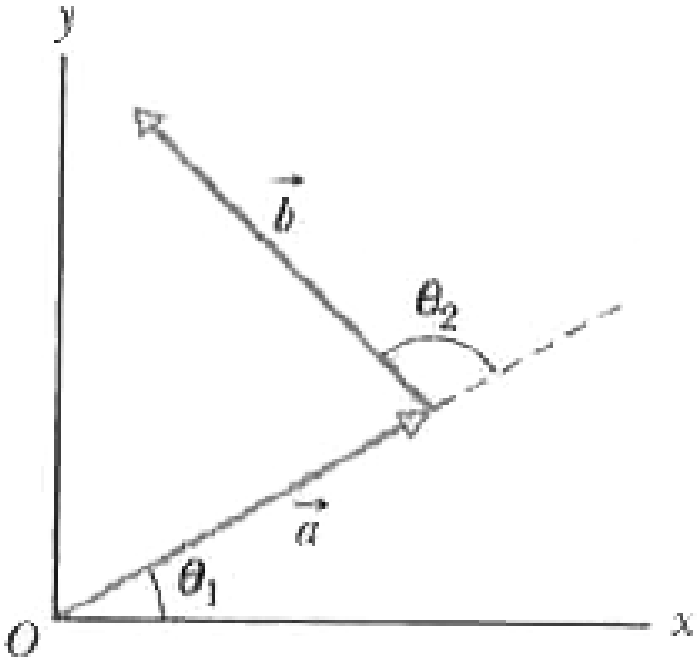
Watch Video Solution

10. An object moves 1.00 m in a straight -line displacement $\vec{a}$, changes direction, moves another 1.00 m in straight-line displacement $\vec{b}$, and then ends up $1.0m$ from the starting point. (a) Through what angle did it turn ? (b) What is the magnitude of $\vec{a} + \vec{b}$?

Watch Video Solution

11. The two vectors $\vec{a}$ and $\vec{b}$ have equal magnitudes of 10.0 m and the angles are $\theta_1 = 30^\circ$ and $\theta_2 = 105^\circ$. Find the (a) x and (b) y components of their vector sum $\vec{r}$, (c) the magnitude oof $\vec{r}$ makes with

the positive direction of the x axis.



Watch Video Solution

12. For the displacement vector $\vec{a} = (3.0m)\hat{i} + (4.0m)\hat{j}$ and $\vec{b} = (5.0m)\hat{i} + (-2.0m)\hat{j}$, give $\vec{a} + \vec{b}$ in (a) unit-vector notation, and as (b) a magnitude and (c) angle (relative to $\hat{i}$). Now give $\vec{a} - \vec{b}$ in (d) unit-vector natation, and as (e) a magnitude and (f) an angle.

View Text Solution

13. There vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ each have a magnitude of 50 m and lie in an xy plane. Their directions relative to the positive direction of the x axis are $30^\circ, 195^\circ, \text{ and } 315^\circ,$ respectively. What are (a) the magnitude and (b) the angle of the vector $\vec{a} + \vec{b} + \vec{c},$ and (c) the magnitude and (d) the angle of $\vec{a} - \vec{b} - \vec{c}$? What are the (e) magnitude and (f) angle of a fourth vector $\vec{d}$ such that $\left(\vec{a} + \vec{b}\right) - \left(\vec{c} + \vec{d}\right) = 0$?

View Text Solution

14. In the sum $\vec{A} + \vec{b} + cecC.$ vector $\vec{A}$ has a magnitude of 12.0 m and is angled 40.0° counterclockwise from the +x direction, and vector $\vec{C}$ has a magnitude of 16.0 m and is angled 20.0° counterclockwise from the -x direction. What are (a) the magnitude and (b) the angle (relative to +x) of $\vec{B}$?

View Text Solution

15. In a game of lawn chess, where pieces are moved between the centers of squares that are each 1.00 m on edge, a knight is moved in the following way: (1) two squares forward, one square rightward, (2) two squares leftward, one square forward, (3) two squares forward, one square leftward. What are (a) the magnitude and (b) the angle (relative to "forward") of the knight's overall displacement for the series of three moves ?

View Text Solution

16. An explorer is caught in a whiteout (in which the snowfall is so thick that the ground cannot be distinguished from the sky) while returning to base camp. He was supposed to trave due north for $4.8km,$ but when the snow clears, he discovers that he actually traveled 7.8 km at 50° north of due east. (a) How far and (b) in what direction must he now travel to reach base camp ?

View Text Solution

17. An ant, crazed by the Sun on a hot Texas afternoon, darts over an xy plane scratched in the dirt. The x and y components of four consecutive darts are the following, all in centimeters: $(30, 0, 40.0), (b_x, -70.0), (-20.0, c_y), (-80.0, -70.0)$. The overall displacement of the four darts has the xy components $(-140, -20.0)$. WHat are (a) b_x and $(b)c_y$? What are the (c) magnitude and (d) angle (relative to the positive direction of the x axis) of the overall displacement ?

View Text Solution

18. If $\vec{b} = (3.0)\hat{i} + (4.0)\hat{j}$ and $\vec{a} = \hat{i} + \hat{j}$, what is the vector having the same magnitude as that of $\vec{b}$ and parallel to $\vec{a}$?

Watch Video Solution

19. Vector $\vec{A}$, which is directed along an x axis, is to be added to vector $\vec{B}$, which has a magnitude of 6.0 m. The sum is a third vector that is

directed along the y axis, with a magnitude of $\vec{A}$ Find the magnitude of $\vec{A}$?

Watch Video Solution

20. Starting from an oasis, a camel walks 25 km in a direction 30° south of west and then walks 30 km toward the north to a second oasis. What is the direction from the first oasis to the second oasis ?

Watch Video Solution

21.

$\vec{B}: 4.00m, at + 65.0^\circ$

$\vec{C} = (-4.00m)\hat{i} + (-6.00m)\hat{i}$

$\vec{D}: 5.00m, at - 235^\circ$

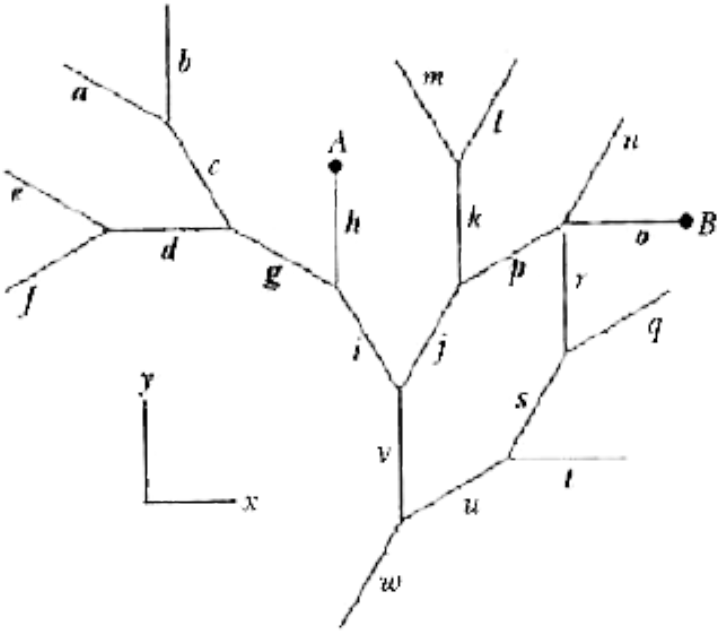
View Text Solution

22. If $\vec{d}_1 + \vec{d}_2 = 5\vec{d}_3, d_1 - d_2 = 3d_3,$ and $\vec{d}_3 = 2\hat{i} + 4\hat{j},$ then what are , in unit-vector notation,(a) $\vec{d}_1$ and $(b)\vec{d}_2$?

Watch Video Solution

23. Tpical backyard ants often create a network of chemical trails for guidance. Extending out ward from the nest, a trail branches (bifurcates) repeatedly, with 60° between the branches. If a roaming an chances upon a trail, it can tell the way to the nest at any branch point: If it is moving away from the nest, it has two choice of path requiring a small turn in its travel direction, either 30° leftward or 30° rightward. If it is moving toward the nest, it has only one such choice. shows a typical ant trail, with lettered straight sections of $2.0cm$ length and symmetric bifurcation of 60°. Path v is parallel to the y axis. What are the (a) magnitude and (b) angle (relative to the positive direction of the superimposed x axis) of an ant's displacement from the nest (find it in the figure) if the ant enters the trail at point A ? What are the (c) magnitude and (d) angle if it enters

at point B ?



View Text Solution

24. Here are two vectors:

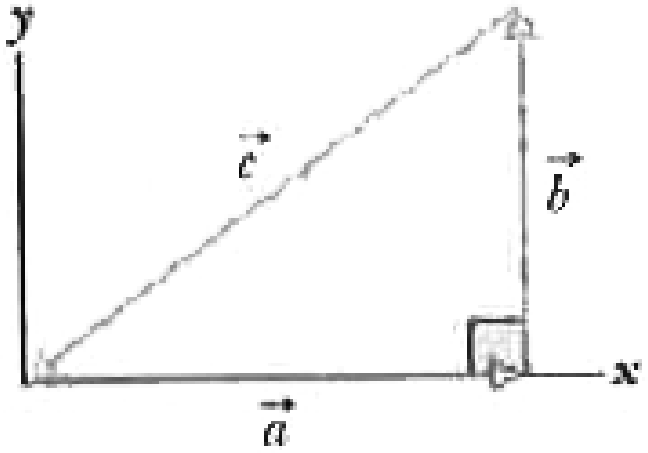
$\vec{a} = (4.0m)\hat{i} - (3.0m)\hat{j}$ and $\vec{b} = (6.0m)\hat{i} + (8.0m)\hat{j}$.

What are (a) the magnitude and (b) the angle (relative to $\hat{i}$) of $\vec{a}$? What are (c) the magnitude and (d) the angle of $\vec{b}$? What are(e) the magnitude and (f) the angle $\vec{a} + \vec{b}$, of (g) teh magnitude and (h) the

angle of $\vec{a} = -\vec{b}$, and (i) the magnitude and (i) the angle of $\vec{a} - \vec{b}$ and $\vec{a} - \vec{b}$?

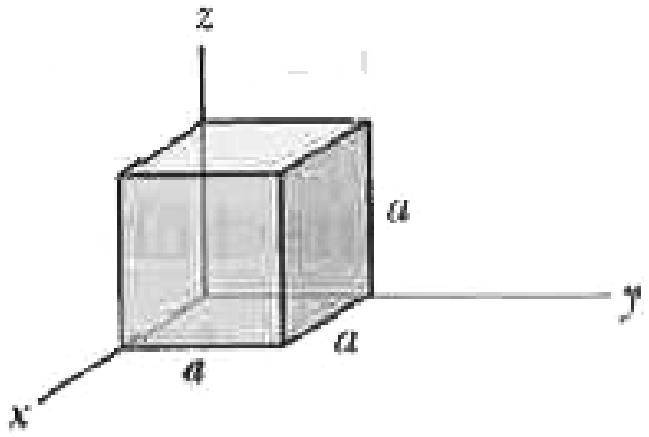
View Text Solution

25. For the vectors in with $a = 4, b = 3,$ and $c = 5,$ what are (a) the magnitude and (b) the direction of $\vec{a} \times \vec{b}$, (c) the magnitude and (d) the direction of $\vec{a} \times \vec{c}$ and (e) the magnitude and (f) the direction of $\vec{b} \times \vec{c}$? (The z axis is not shown.)



Watch Video Solution

26. In a cube of edge length a sits with one corncr at the origin of an xyz coordinate system. A body diagonal is a line that extends from one corner to another through the center. In unit-vector , what is the body diagonal that extends from the corner at (a) corrdianates $(0, 0, 0)$, (b) corrdinates (a,0,0) (c) coordinates (0,a,0) and (d) coordinates (a,a,0)? (e) Determine the angles that the body diagonals make with the adjacent edges . (f) Determine the length of the boedy diagonals in terms of a.



Problem 26.

View Text Solution

27. Two vectors are presented as $\vec{a} = 3.0\hat{i} + 5.0\hat{j}$ and $\vec{b} = 2.0\hat{i} + 4.0\hat{j}$. Find (a) $\vec{a} \times \vec{b}$, (b) $\vec{a} . \vec{b}$, (c) $\left(\vec{a} + \vec{b}\right) . \vec{b}$,

Watch Video Solution

28. Two vectors $\vec{p}$ and $\vec{q}$ lie in the xy plane. Their magnitudes are 3.50 and 6.30 units, repspectively, and their directions are 220° and 75.0°, respectively, as measured countercloskwise from the positive x axis. What are the values of $(a)\vec{p} \times \vec{q}\,(b)\vec{p} . \vec{q}$?

Watch Video Solution

29. Consider two vectors $\vec{p}_1 = 4\hat{i} - 3\hat{j} + 5\hat{k}$ and $\vec{p}_2 = -6\hat{i} + 3\hat{j} - 2\hat{k}$. What is $\left(\vec{p}_1 + \vec{p}_2\right) . \left(\vec{p}_1 \times 5\vec{p}_2\right)$?

Watch Video Solution

30. There vectors are given by $\vec{a} = 3.0\hat{i} + 3.0\hat{j} - 2.0\hat{k}$, $\vec{b} = -1.0\hat{i} - 4.0\hat{j} + 2.0\hat{k}$ and $\vec{c} = 2.0\hat{i} + 2$ Find (a) $\vec{a}\left(\vec{b} \times \vec{c}\right)$, (b) $\vec{a}.\left(\vec{b} + \vec{c}\right)$, and © $\vec{a} \times \left(\vec{b} + \vec{c}\right)$.

Watch Video Solution

31. For the following three vectors, what is $3\vec{C}.\left(2\vec{A} \times \vec{B}\right)$?

$\vec{A} = 2.00\hat{i} + 3.00\hat{j} - 4.00\hat{k}$

$\vec{B} = -3.00\hat{i} + 4.00\hat{j} + 2.00\hat{k}\vec{C} = 7.00\hat{i} - 8.00\hat{j}$

Watch Video Solution

32. Vector $\vec{A}$ has a magnitude of 6.00 vector $\vec{B}$ has a magnitude of 7.00 units, and $\vec{A}.\vec{B}$ has a value of 14.0 What is the angle between the direction of $\vec{A}$ and $\vec{B}$?

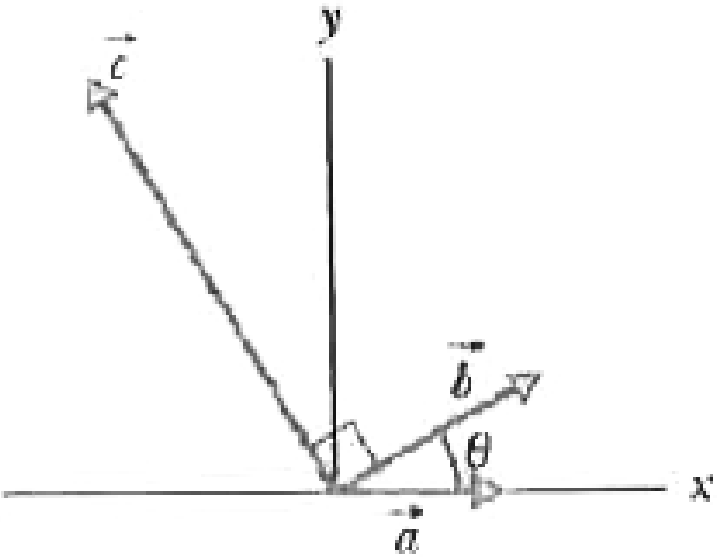
Watch Video Solution

33. Displacement $\vec{d}_1$ is in the yz plane 63.0° from the positive direction of the y axis, has a positive z component , and has a magnitude of 4. 80 m. Displacement $\vec{d}_2$ is in the xz plane 30.0° from the positive direction of the x axis, has a positive z component, and has magnitude $1.40m$. What are (a) $\vec{d}_1 . \vec{d}_2$, (b)$\vec{d}_1 x \vec{d}_1$, and (c) the angle between $\vec{d}_1$ and $\vec{d}_2$?

View Text Solution

34. The three vectors in have magnitudes $a = 3.00m, b = 4.00m,$ and $c = 10.0m$ and angle $\theta = 30.0^\circ$. What are (a) the x component and (b) the y component of $\vec{a}$, (c) the x component and (d) the y component of $\vec{b}$, and (e) the x component and (f) the y component of $\vec{c}$? If $\vec{c} = p\vec{a} + qb$, what are the values of (g) p

and (h) q ?



Watch Video Solution

Practice Questions

1. Which one of the following statements is true concerning scalar quantities ?

A. Scalar quantities must be represented by base units.

B. Scalar quantities have both magnitude and direction.

C. Scalar quantities can be added to vector quantities using rules of trigonometry.

D. Scalar quantities can be added to other scalar quantities using rules of ordinary addition.

Answer: D

Watch Video Solution

2. Which one of the following quantities is a vector quantity ?

A. the age of the earth

B. the mass of a freight train

C. the Earth's pull on your body

D. the temperature of hot cup of coffee

Answer: C

Watch Video Solution

3. Which one of the following statements concerning vectors and scalars is false ?

A. In calculations, the vector components of a vector may be used in place of the vector itself.

B. It is possible to use vector components that are not perpendicular.

C. A scalar component may be either positive or negative.

D. A vector that is zero may have components other that zero.

Answer: D

Watch Video Solution

4. 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

Watch Video Solution

5. If vectors $\vec{A} = \hat{i} + 2\hat{j} + 4\hat{k}$ and $\vec{B} = 5\hat{i}$ represent the two sides of a triangle, then the third side of the triangle can have length equal to

A. 6

B. $\sqrt{56}$

C. both (a) and (b)

D. none of the above

Answer: C

Watch Video Solution

6. mark the correct statement .

A. $\left|\vec{a}+\vec{b}\right| \geq \vec{a}|+|\vec{b}|$

B. $\left|\vec{a}+\vec{b}\right| \leq \left|\vec{a}\right|\vec{b}|$

C. $\left|\vec{a}-\vec{b}\right| \geq \left|\vec{a}\right|+\vec{b}|$

D. All of the above

Answer: B

Watch Video Solution

7. Two vectors A and B, are added together to form the vector $C = A + B$. The relationship between the magnitudes of these vectors is given by $C_x = A\cos 30^\circ + B$ and $C_y = -A\sin 30^\circ$. Which statement best describes the orientation of these vectors ?

A. A points in the negative x direction while B points in the positive y direction.

B. A points in the negative y direction while B points in the positive x direction.

C. A points 30° below the positive x axis while B points in the positive x direction.

D. A points 30° above the positive x axis while B points in the positive x direction.

Answer: C

Watch Video Solution

8. Three vectors A, B, and C add together to yield zero : $A + B + C = 0$. The vectors A and C point in opposite direction and their magnitudes are related by the expression: $A = 2C$. Which one of the following conclusions is correct ?

A. A and B have equal magnitudes and point in opposite directions.

B. B and C have equsal magnitudes and point in the same direction.

C. B and C have equal magnitudes and point in opposite directions.

D. A and B point in the same direction, but A has twice the magnitude of B.

Answer: B

Watch Video Solution

9. If vector $\vec{C}$ is added to vector $\vec{D}$, the results is a third vector that is perpendicular to $\vec{D}$ and has a magnitude equal to $3\vec{D}$. What is the ratio of the magnitude of $\vec{C}$ to that of $\vec{D}$?

A. 1.8

B. 2.2

C. 3.2

D. 1.3

Answer: C

View Text Solution

10. Given that $\vec{A} + 2\vec{B} = x_1\hat{j}2\vec{A} - \vec{B} = x_2\hat{i} + y_2\hat{j},$ what is $\vec{A}$?

Watch Video Solution

11. A vector $\vec{A}$ ur is rotated by a small angle $\triangle\theta$ radian $(\triangle\theta < l)$ to get a new vector $\overline{B}$ In that case $\left|\vec{B} - \vec{A}\right|$ is:

A. 0

B. $\left|\vec{A}\right|\left(1 - \frac{\Delta\theta^2}{2}\right)$

C. $\left|\vec{A}\right|\Delta\theta$

D. $\left|\vec{B}\right|\Delta\theta - \left|\vec{A}\right|$

Answer: C

Watch Video Solution

12. The vector $\vec{A}$ has components + 5 and + 7 along the x-axes and y-axes, respectively. Along a set of axes rotated 90 degrees counterclockwise relative to the original axes, the vector's components are

A. $-7, -5$

B. $7, -5$

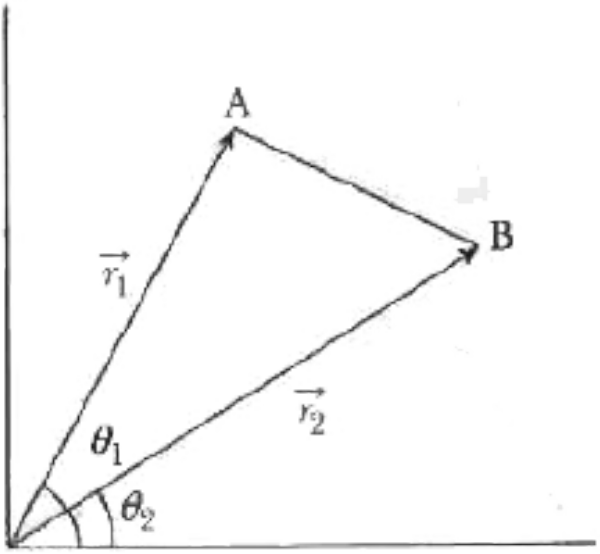
C. $-7, 5$

D. $7, 5$

Answer: B

Watch Video Solution

13. In a two-dimensional motion of a particle, the particle moves from point A of position vector $\overrightarrow{r}_1$, to point B of vectors are , respectively, $r_1 = 3$ and $r_2 = 4$ and the angles they make with the x axis are $\theta_1 = 75^\circ$ and $\theta_2 = 15^\circ$, respectively, then find the magnitude of the displacement vector.



A. 15

B. $\sqrt{13}$

C. 17

D. $\sqrt{15}$

Answer: B

Watch Video Solution

14. Each of two vectors $\vec{D}_1$ and $\vec{D}_2$ lies along a coordinamte axis in the x-y plane. Each vector has its tail at the origin, and the dot product of the two vectors is $\vec{D}_1, \vec{D}_2 = -\left|\vec{D}_1\right|.\left|\vec{D}_2\right|$ Which is possiblility is correct ?

A. $\vec{D}_1$ and $\vec{D}_2$ both lie along the positive x-axis.

B. $\vec{D}_1$ lies along the positive x-axis $\vec{D}_2$ lies along the negative x-axis.

C. $\vec{D}_1$ and $\vec{D}_2$ both lie along the positive y-axis.

D. $\vec{D}_1$ lies along the negative x-axis $\vec{D}_2$ lies along the negative y-axis.

Answer: B

Watch Video Solution

15. Town A lies 20 km north of town B. Town C lies 13 km west of town A.A small plane flies directly from town B to town C. What is the displacement of the plane ?

A. $33km$, 33° north of west

B. $19km$, 33° north of west

C. $24km$, 57° north of west

D. $31km$, 57° north of west

Answer: C

Watch Video Solution

16. A force $F_1,$ of magnitude $2.0N$ and directed due east is exerted on an object. A second force exerted on the object is $F_2 = 2.0N,$ due north. Wha tis the magnitude and direction of a third force, $F_3,$ which must be exerted on the object so that the resultant force is zero ?

A. $1.4N$, 45° north of east

B. $1.4N$, 45° south of west

C. $2.8N$, 45° north of east

D. $2.8N$, 45° south of west

Answer: D

Watch Video Solution

17. A race car will make one lap around a circular track of radius R. When the car has traveled halfway around the track, what is the magnitude of the car's displacement from the starting point ?

A. 2R

B. R

C. πR

D. $2\pi R$

Answer: A

Watch Video Solution

18. what is the direction of his total displacemetn vector with respect to due east ?

A. 43° south of east

B. 47° north of east

C. 56° north of east

D. 34° south of east

Answer: B

View Text Solution

19. Consider the following four force vectors:

$\vec{F}_1 = 50.0N,$ due east, $\vec{F}_2 = 10.0N,$ due east,

$\vec{F}_3 = 40.0N,$ due west,$\vec{F}_4 = 30.0N,$ due west

Which two vectors add together to give a resultant with smallest magnitude ? In the option below, the two vectors are given followed by a magnitude and direction.

A. $\vec{F}_1 + \vec{F}_3, 10 - N,$ due east

B. $\vec{F}_1 + \vec{F}_3, 10N,$ due east

C. $\vec{F}_1 + \vec{F}_2, 20N$ due east

D. $\vec{F}_1 + \vec{F}_4, 20N$ due west

Answer: A

Watch Video Solution

20. Two bicyclists, starting at the same place, are riding toward the same compground by two different routes. One cyclist rides 1080 m due east and then turns due north and travels norther 1430 m before reaching the campground. The second cyclist starts out by heading due north for 1950

m and then turns and heads directly toward the compground. At the turning point, how far is the second cyclist from the campground ?

A. 1200 m

B. 1700m

C. 1100 m

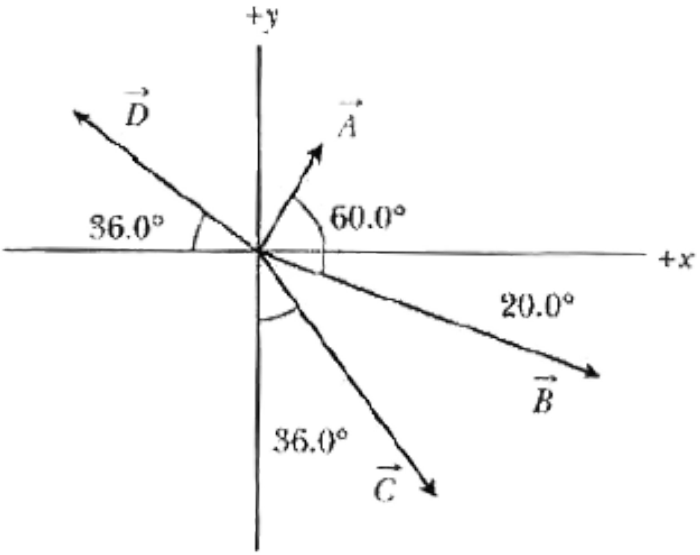
D. 1600 m

Answer: A

Watch Video Solution

21. Use the component method of vector addition to find the components of the resultant of the four displacements show in the figure. The magnitudes of the displacements are :

$A = 2.25cm, B = 6.35cm, C = 5.47cm$ and $D = 4.19cm$.



A.

x component	y component
$2.19cm$	$-6.92cm$

B.

x component	y component
$3.71cm$	$-1.09cm$

C.

x component	y component
$5.45cm$	$-2.82cm$

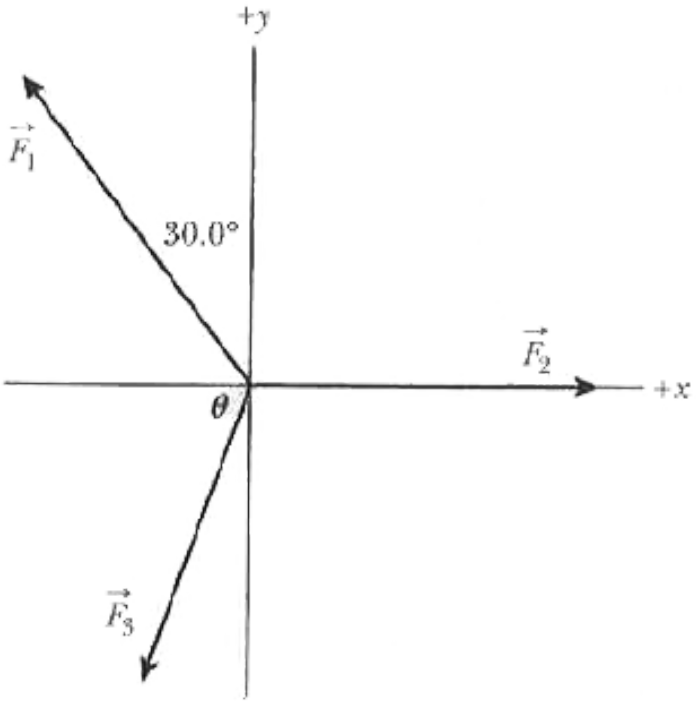
D.

x component	y component
$6.93cm$	$-2.19cm$

Answer: D

Watch Video Solution

22. Three forces are applied to an object, as indicated in the drawing. Force $\overrightarrow{F}_1$ has a magnitude of 21.0 newton $(21.0N)$ and is directed 30.0° to the left of the +y axis. Force $\overrightarrow{F}_2$ has a magnitude of 15.0 N and points along the +x axis. What must be the magnitude and direction (spectified by the angle θ in the draeing) of the third force $\overrightarrow{F}_3$ such that the vector sum of the three force is 0 N ?



A. $16.9N, 81^\circ$

B. $20.4N, 75^\circ$

C. $22.3N, 79^\circ$

D. $18.7N, 76^\circ$

Answer: D

Watch Video Solution

23. Displacemtn vector $\vec{A}$ points due east and has a magnitude of $2.00km$. Displacement vector $\vec{B}$ $p\int sduen$ or th and $hasamagnitudeof$3.75Km.$Displacement$ $\longrightarrow r$ vecC points due west and has a magnitude of $2.50km$. Displacement vector $\vec{D}$ points due south and has a magnitude of $3.00km$. Find the magnitude and direction (relative to due west) of the resultant vector $\vec{A} + \vec{B} + \vec{C} + \vec{D}$.

A. $0.90km, 56^\circ$ north of west

B. $0.50km, 34^\circ$ south of west

C. $0.75k, 48^\circ$ south of west

D. $1.25km$, 44° north of west

Answer: A

View Text Solution

24. A jogger travels a route that has two parts. The first is a displacement $\vec{A}$ of $2.50km$ due south, and the second involves a displacement $\vec{B}$ that points due east, Suppose that $\vec{A} - \vec{B}$ had a magnitude of $3.75km$. What then would be the magnitude of $\vec{B}$, and what is the direction of $\vec{A} - \vec{B}$ relative to due south ?

A. $4.5km$, 63° east of south

B. $4.5km$, 56° west of south

C. $3.7km$, 56° west of south

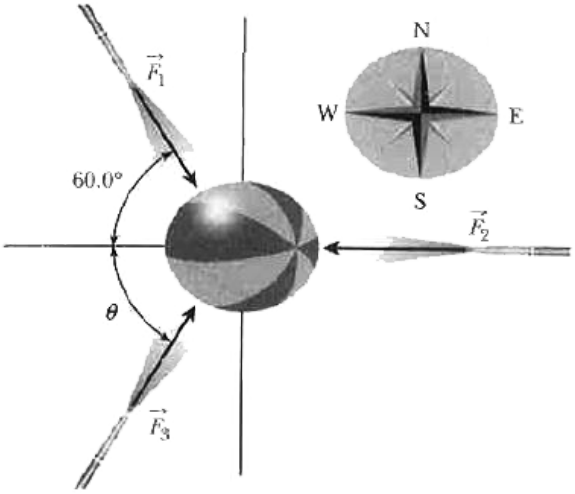
D. $2.8km$, 48° west of south

Answer: D

Watch Video Solution

Watch video solution

25. At a picnic, there is a contest in which hoses are used to shoot water at a beach ball from three directions. As a result, three forces act on the ball, $\overrightarrow{F}_1, \overrightarrow{F}_2$ and $\overrightarrow{F}_3$ (see the drawing). The magnitudes of $\overrightarrow{F}_1$ and $\overrightarrow{F}_2 = 50.0N$ and $F_2 = 90.0N$. Using the graphical technique, determine the angle such that the resultant force acting on the ball is zero.



A. 21°

B. 26°

C. 34°

D. 39°

Answer: C

View Text Solution

26. The x-component of the resultant of several vectors

A. is equal to the sum of the x-components of the vectors.

B. may be equal to the sum of the magnitude of the vectors.

C. may be smaller than the sum of the magnitude of the vectors.

D. may be greater than the sum of the magnitude of the vectors.

Answer: A::B::C

Watch Video Solution

27. If $\vec{A} = 2\hat{i} + \hat{j} + \hat{k}$ and $\vec{B} = \hat{i} + \hat{j} + \hat{k}$ are two vectores, then the unit vector is

A. perpendicular to $\vec{A}$ $is\left(\frac{-\hat{j}+\hat{k}}{\sqrt{2}}\right)$.

B. parallel to $\vec{A}$ $is\left(\frac{2\hat{i}+\hat{j}+\hat{k}}{\sqrt{6}}\right)$.

C. perpendicular to $\vec{A}$ $is\left(\frac{-\hat{j}+\hat{k}}{\sqrt{2}}\right)$.

D. parallel to $\vec{A}$ $is\left(\frac{\hat{i}+\hat{j}+\hat{k}}{\sqrt{3}}\right)$.

Answer: A::B::C

Watch Video Solution

28. Two vectors, A and B, are added together to form the vector $C = A + B$. The realtionship between the magnitudes of these vectors is given by:

$C_x = 0$

$C_y = A\sin 60^\circ + B\sin 30^\circ$

A_x and A_y point in the positive x and y directions, respectively.

Which one of the following statements best describes the orientation of vectors A and B ?

A. A and B point in opposite directions.

B. A points 60° above the positive x axis while B points 30° above the negative x axis.

C. A point 60° above the negative x axis while B points 30° above the positive x axis.

D. A point 60° below the positive x axis while B points 30° above the positive y axis.

Answer: B

Watch Video Solution

29. Two vectors, A and B, are added together to form the vector $C = A + B$. The realtionship between the magnitudes of these vectors is given by:

$C_x = 0$

$C_y = A\sin 60^\circ + B\sin 30^\circ$

A_x and A_y point in the positive x and y directions, respectively.

How does the magnitude of A compare with that of B ?

A. $A = B$

B. $A = 1.7B$

C. $A = 0.4B$

D. $A = 0.5B$

Answer: B

Watch Video Solution

30.

Vector	x component	y component
A	+15 units	+10 units
B	+15 units	−10 units

Which one of the following statements concerning these vectors is true ?

A. The vector A-B has no x component.

B. The two vectos have different magnitudes.

C. A makes a 56° angle with the positive x axis.

D. B markes $a34^\circ$ angle with the positive y axis.

Answer: A

Watch Video Solution

31.

Vector	x component	y component
A	+15 units	+10 units
B	+15 units	−10 units

Determine the magnitude of the vector sum, $A + B$.

A. 5 units

B. 15 units

C. 20 units

D. 30 units

Answer: D

Watch Video Solution

Vector	x component	y component
A	+15 units	+10 units
B	+15 units	-10 units

32.

Determine the magnitude of the vector difference , A-B

A. 5 units

B. 15 units

C. 20 units

D. 30 units

Answer: C

Watch Video Solution

33. A boat radioed a distress call to a Coast Guard station. At the time of the call, a vector A from the station to the boat had a magnitude of 45.0 km and was directed 15.0° east of north. A vector from the station to the point where the boat was later found is $B = 30.0km15.0^\circ$ north of east. What are the components of the vector from the point where the distress call was made to the point where the boat was found? In other words, what are the components of vector $C = B - A$?

x component	*y* component
(a) 35.7 km, west	17.4 km, north
(b) 40.6 km, east	51.2 km, south
(c) 17.3 km, west	51.2 km, south
(d) 17.3 km, east	35.7 km, south

View Text Solution

34. A boat radioed a distress call to a Coast Guard station. At the time of the call, a vector A from the station to the boat had a magnitude of 45.0 km and was directed 15.0° east of north. A vector from the station to the point where the boat was later found is $B = 30.0km15.0^\circ$ north of east.

How far did the boat travel from the point where the distress call was made to the point where the boat was found ? In other words, what is the magnitude of vector C ?

A. $64.3km$

B. $39.7km$

C. $26.5km$

D. $54.0km$

Answer: B

View Text Solution

35. If $\vec{A} = 2\hat{i} + \hat{j} + \hat{k}$ and $\vec{B} = \hat{i} + \hat{j} + \hat{k}$ are the two vectors, match the following answer the questions by appropriately matching the information given in the three columns of the following table:

Column I	Column II	Column III
(I) Perpendicular	(i) $\vec{A}$	(J) $\left(\frac{\hat{j}+\hat{k}}{2\sqrt{2}}\right)$
(II) Parallel	(ii) $\vec{B}$	(K) $\left(\frac{2\hat{i}+\hat{j}+\hat{k}}{\sqrt{6}}\right)$
(III) Collinear	(iii) $\vec{A}$ and $\vec{B}$	(L) $\left(\frac{-\hat{j}+\hat{k}}{3\sqrt{2}}\right)$
(IV) Orthogonal	(iv) $\vec{A}\times\vec{B}$	(M) $\left(\frac{\hat{i}+\hat{j}+\hat{k}}{\sqrt{3}}\right)$

The correct alternative for a collinear vector to $\overrightarrow{A}$ is

A. $(III)(iv)(L)$

B. $(II)(ii)(K)$

C. $(IV)(i)(J)$

D. $(I)(iii)(M)$

Answer: B

Watch Video Solution

36. If $\overrightarrow{A} = 2\hat{i} + \hat{j} + \hat{k}$ and $\overrightarrow{B} = \hat{i} + \hat{j} + \hat{k}$ are the two vectors, match the following answer the questions by appropriately matching the information given in the three columns of the following table:

Column I	Column II	Column III
(I) Perpendicular	(i) $\vec{A}$	(J) $\left(\frac{\hat{j}+\hat{k}}{2\sqrt{2}}\right)$
(II) Parallel	(ii) $\vec{B}$	(K) $\left(\frac{2\hat{i}+\hat{j}+\hat{k}}{\sqrt{6}}\right)$
(III) Collinear	(iii) $\vec{A}$ and $\vec{B}$	(L) $\left(\frac{-\hat{j}+\hat{k}}{3\sqrt{2}}\right)$
(IV) Orthogonal	(iv) $\vec{A}\times\vec{B}$	(M) $\left(\frac{\hat{i}+\hat{j}+\hat{k}}{\sqrt{3}}\right)$

Which option represents a vector orthogonal to $\overrightarrow{A} \times \overrightarrow{B}$?

A. $(IV)(ii)(M)$

B. $(II)(ii)(J)$

C. $(I)(i)(L)$

D. $(III)(iv)(K)$

Answer: C

View Text Solution

37. If $\vec{A} = 2\hat{i} + \hat{j} + \hat{k}$ and $\vec{B} = \hat{i} + \hat{j} + \hat{k}$ are the two vectors, match the following answer the questions by appropriately matching the information given in the three columns of the following table:

Column I	Column II	Column III
(I) Perpendicular	(i) $\vec{A}$	(J) $\left(\frac{\hat{j}+\hat{k}}{2\sqrt{2}}\right)$
(II) Parallel	(ii) $\vec{B}$	(K) $\left(\frac{2\hat{i}+\hat{j}+\hat{k}}{\sqrt{6}}\right)$
(III) Collinear	(iii) $\vec{A}$ and $\vec{B}$	(L) $\left(\frac{-\hat{j}+\hat{k}}{3\sqrt{2}}\right)$
(IV) Orthogonal	(iv) $\vec{A}\times\vec{B}$	(M) $\left(\frac{\hat{i}+\hat{j}+\hat{k}}{\sqrt{3}}\right)$

Which vector represents the direction of $\vec{A} \times \vec{B}$?

A. $(II)(iv)(K)$

B. $(I)(ii)(J)$

C. $(IV)(i)(M)$

D. $(I)(iv)(L)$

Answer: D

Watch Video Solution

38. If $\vec{B}$ is added to $\vec{C} = 3.0\hat{i} + 4.0\hat{j}$, the result is a vector in the positive direction of the y axis, with a magnitude equal to that of $\vec{C}$. What is the magnitude of $\vec{B}$?

Watch Video Solution

39. Vector $\vec{A}$, which is directed along an x axis , is to be added to vector $\vec{B}$, which has a magnitude of $7.0m$. The sum is a third vector that is directed along the y axis, with a magnitude that is 3.0 times that of $\vec{A}$. What is that magnitude of $\vec{A}$?

Watch Video Solution