MATHS

BOOKS - MAXIMUM PUBLICATION

VECTOR ALGEBRA

Example

1. Find $\vec{a} + \vec{b}$, $\vec{a} - \vec{b}$ and $\vec{b} + \vec{c}$ using the vectors.

$\vec{a} = 3i + 4j + k$, $\vec{b} = 2i - 7j - 3k$ and

$\vec{c} = 2i + 3j - 9k$.

Watch Video Solution

2. Find the vectors passing through the point $A(1, 2, -3)$ and $B(-1, -2, 1)$.

Watch Video Solution

3. Find the Direction cosiness along $\overrightarrow{AB}$ where A(4,5,6) and B(6,3,8)

Watch Video Solution

4. Show that the points A, B and C with position vectors $\vec{a} = 3i - 4j - 4k$, $\vec{b} = 2i - j + k$ and $\vec{c} = i - 3j - 5k$ respectively form the vertices of a right angled triangle.

Watch Video Solution

5. Prove that $\left[\vec{a}+\vec{b}\,\vec{b}+\vec{c}\,\vec{c}+\vec{a}\right]=2\left[\vec{a}\,\vec{b}\,\vec{c}\right]$

Watch Video Solution

6. Consider the vector $\vec{p}=2i-j+k$. Find two vectors $\vec{q}$ and $\vec{r}$ such that $\vec{p}, \vec{q}$ and $\vec{r}$ are mutually perpendicular.

Watch Video Solution

7. Find $\vec{a}.\ \vec{b}, \vec{a}\times\vec{b}$ and $\vec{b}\times\vec{c}$ using the vectors.

$\vec{a}=3i+4j+k, \vec{b}=2i-7j-3k$ and

$\vec{c} = 2i + 3j - 9k.$

Watch Video Solution

8. If $\vec{a} = 3i + j + 2k$, FInd magnitude of $\vec{a}$,

Watch Video Solution

9. If $\vec{a} = 3i + j + 2k$,

If the projection of $\vec{a}$ on another vector $\vec{b}$ is $\sqrt{14}$, which among the following could be $\vec{b}$?

i+j+k

6i+2j+4k

3i-j+2k

2i+3j+k

A. i+j+k

B. 6i+2j+4k

C. 3i-j+2k

D. 2i+3j+k

Answer:

Watch Video Solution

10. If $\vec{a} = 3i + j + 2k$,

If $\vec{a}$ makes an angle 60° with a vector $\vec{c}$, find the projection of $\vec{a}$ on $\vec{c}$.

Watch Video Solution

11. The projection of the vector $2i + 3j + 2k$ on the vector $i + j + k$ is a) $\frac{3}{\sqrt{3}}$ b) $\frac{7}{\sqrt{3}}$ c) $\frac{3}{\sqrt{17}}$ d) $\frac{7}{\sqrt{17}}$

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

B. $\frac{7}{\sqrt{3}}$

C. $\frac{3}{\sqrt{17}}$

D. $\frac{7}{\sqrt{17}}$

Answer:

Watch Video Solution

12. Find the area of a parallelogram whose adjacent sides are the vector $2i + j + k$ and $i - j$.

Watch Video Solution

13. The angle between the vectors $i + j$ and $j + k$ is

A. 60°

B. 30°

C. 45°

D. 90°

Answer:

Watch Video Solution

14. If $\vec{a}$, $\vec{b}$, $\vec{c}$ are unit vectors such that $\vec{a} + \vec{b} + \vec{c} = 0$, find the value of

$\vec{a} . \vec{b} + \vec{b} . \vec{c} + \vec{c} . \vec{a}$.

Watch Video Solution

15. If $\vec{a}$, $\vec{b}$, $\vec{c}$ are unit vectors then,

$\vec{a} . \vec{a}$ =_____

Watch Video Solution

16. Hence, show that $\vec{a} . \vec{b} + \vec{b} . \vec{c} + \vec{c} . \vec{a} = \frac{-3}{2}$ if $\vec{a} + \vec{b} + \vec{c} = 0$.

Watch Video Solution

17. Let $A(2, 3), B(1, 4), C(0, -2)$ and $D(x, y)$ are vertices of a parallelogram ABCD.

Write the postion vectors A,B,C and D.

Watch Video Solution

18. Let $A(2, 3), B(1, 4), C(0, -2)$ and $D(x, y)$ are vertices of a parallelogram ABCD.

Find the value of x and y.

Watch Video Solution

19. Find the position vector of a point R which divides the line joining the points P and Q whose vectors are

$i + 2j - k$ and $-i + j + k$ in the ratio $2:1$

Internally.

Watch Video Solution

20. Find the position vector of a point R which divides the line joining the points P and Q whose vectors $i + 2j - k$ and $-i + j + k$ in the ratio $2:1$

externally.

Watch Video Solution

21. Choose the correct answer from the backet. If a unit vector $\hat{a}$ makes angles $\frac{\pi}{4}$ with i and $\frac{\pi}{3}$ with j and acute

angle θ with k.

then θ is

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

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

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

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

Answer:

Watch Video Solution

22. Find a unit vector $\hat{a}$.

Watch Video Solution

23. Write down a unit vector in XY plane, making an angle of 60° with the positive direction of x-axis.

Watch Video Solution

24. Let the vectors $\vec{a}, \vec{b}, \vec{c}$ denotes the sides of a triangle ABC.

Prove that $\vec{a} \times \vec{b} = \vec{b} \times \vec{c} = \vec{c} \times \vec{a}$.

Watch Video Solution

25. Find the projection of a vector $i + 3j + 7k$ on the vector $7i - j + 8k$.

Watch Video Solution

26. If $\vec{a}$ and $\vec{b}$ are any two vectors, then $\vec{a} \times \vec{b}$ is

a) a vector on the same plane where $\vec{a}$ and $\vec{b}$ lie.

b) ab cos theeta

c) a vector parallel to both a and b

d) a vector perpendicular to both a and b.

Watch Video Solution

27. Let $\vec{a} = 2i + 4j - 5k$, $\vec{b} = i + 2j + 3k$. Then find a unit vector perpendicular to both $\vec{a}$ and $\vec{b}$.

Watch Video Solution

28. Find a vector of magnitude 5 in the direction parpendicular to both $\vec{a}$ and $\vec{b}$.

Watch Video Solution

29. Consider a vector that is inclined at an angle 45° to x - axis and 60° to y - axis. Find the dc's of the Vector.

Watch Video Solution

30. Consider a vector that is inclined at an angle 45° to x - axis and 60° to y - axis. Find a unit vector in the direction of the above vector.

Watch Video Solution

31. Find a vector which is of magnitude 10 units in the direction of the above vector.

Watch Video Solution

32. Consider the point $A(2, 1, 1)$ and $B(4, 2, 3)$

Find the vector $\overrightarrow{ab}$

Watch Video Solution

33. Consider the point $A(2, 1, 1)$ and $B(4, 2, 3)$.Find the direction cosines of $\overrightarrow{ab}$

Watch Video Solution

34. Consider the point $A(2, 1, 1)$ and $B(4, 2, 3)$. Find the angle made by $\overrightarrow{ab}$ with the positive direction of X-axis.

Watch Video Solution

35. If $i + j + k, 2i + 5j, 3i + 2j - 3k, i - 6j - k$ respectively are the position vector of points A,B,C and D. Then find $\overrightarrow{AB}$ and $\overrightarrow{CD}$.

Watch Video Solution

36. If $i + j + k, 2i + 5j, 3i + 2j - 3k, i - 6j - k$ respectively are the position vector of points A,B,C and D.

Then find the angle between the vectors $\overrightarrow{AB}$ and $\overrightarrow{CD}$.

Watch Video Solution

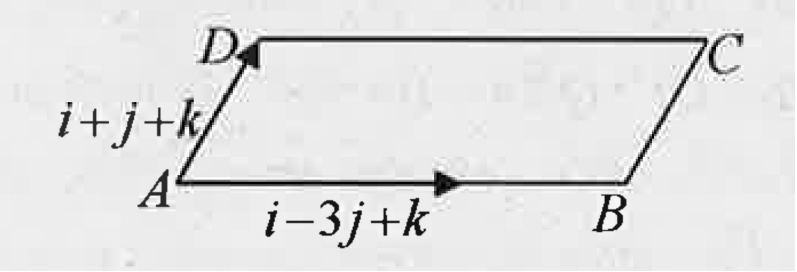
37. If $i+j+k, 2i+5j, 3i+2j-3k, i-6j-k$ respectively are the position vector of points A,B,C and D. Then

Deduce that $\overrightarrow{AB}$ parallel to $\overrightarrow{CD}$.

Watch Video Solution

38. Let ABCD be a parallelogram with sides as given in the figure.

Find the distance between the sides AB and DC.



Watch Video Solution

39. Consider $\vec{a} = i + 2j - 3k$, $\vec{b} = 3i - j + 2k$, $\vec{c} = 11i + 2j$. Find $\vec{a} + \vec{b}$ and $\vec{a} \cdot \vec{b}$.

Watch Video Solution

40. Consider $\vec{a} = i + 2j - 3k$, $\vec{b} = 3i - j + 2k$, $\vec{c} = 11i + 2j$.

Show that $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ are orthogonal.

Watch Video Solution

41. Let A (1,-1,4), B(2,1,2) and C(1,-2,-3). Find $\overrightarrow{AB}$.

Watch Video Solution

42. Let A (1,-1,4), B(2,1,2) and C(1,-2,-3).Find the angle between $\overrightarrow{AB}$ and $\overrightarrow{AC}$.

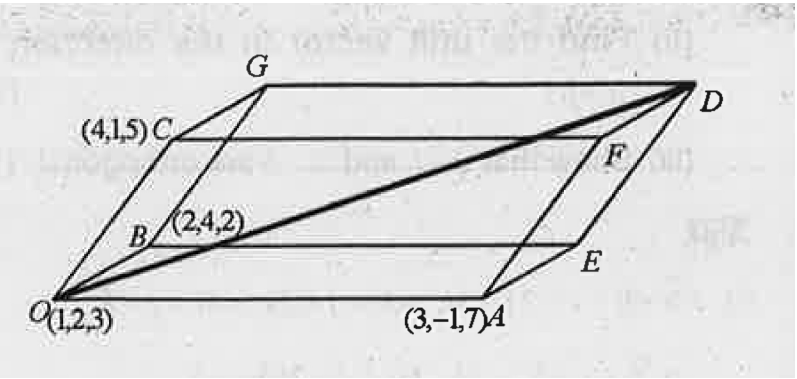
Watch Video Solution

43. Let A (1,-1,4), B(2,1,2) and C(1,-2,-3).Find the area of the parallelogram formed by $\overrightarrow{AB}$ and $\overrightarrow{AC}$ as adjacent sides.

Watch Video Solution

44. Using the figure following questions.

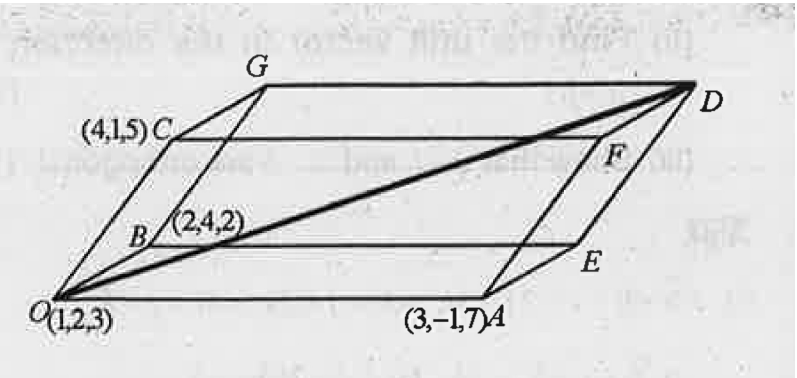
Find $\overrightarrow{OD}$.



Watch Video Solution

45. Using the figure following questions.

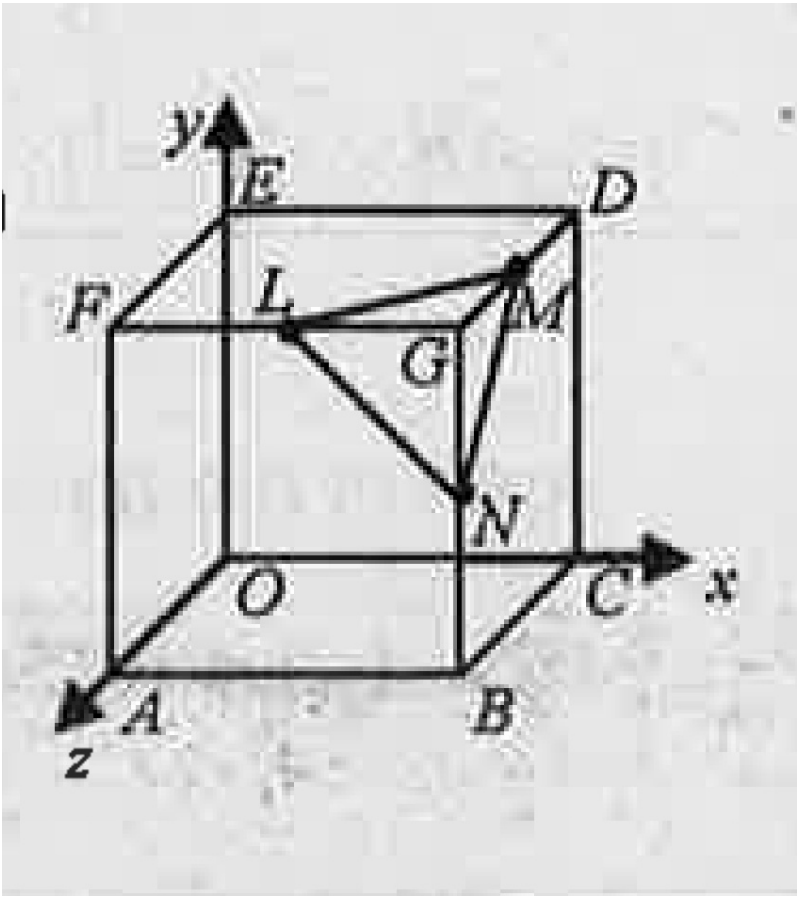
Find the coordinate of the vertexD.



Watch Video Solution

46. OABCDEFG is acube with edges of length 8 units and axes are shown. L,M,N are midpoints of the edges FG, GD, GB respectively.

Find p.v's of F,B,D and G.

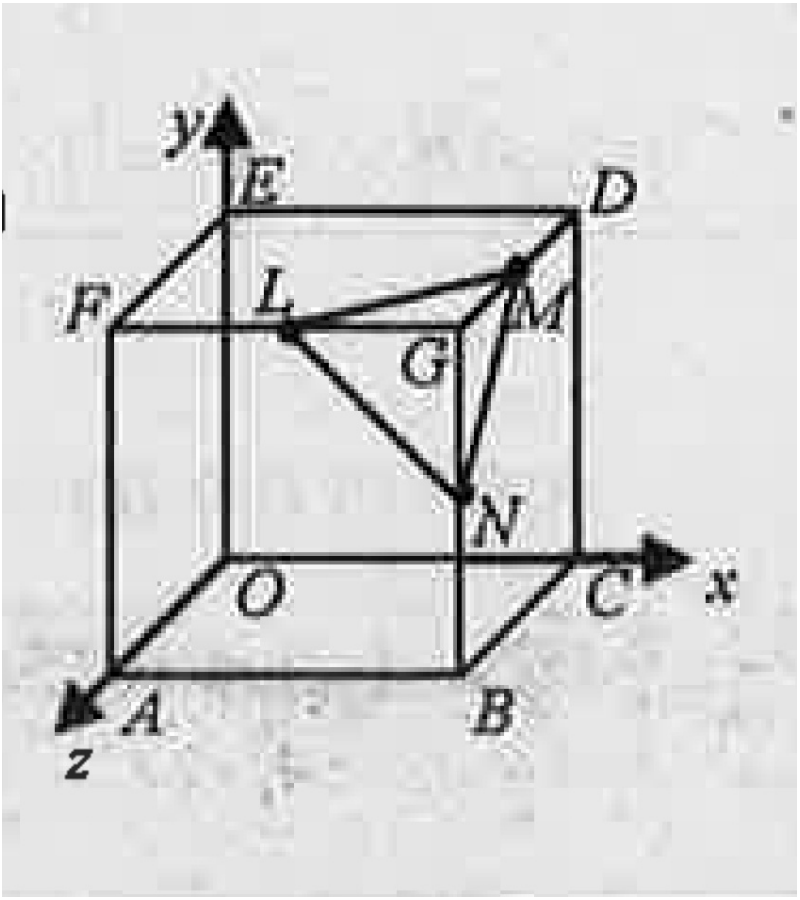


Watch Video Solution

47. OABCDEFG is acube with edges of length 8 units and axes are shown. L,M,N are midpoints of the edges FG, GD,

GB respectively.

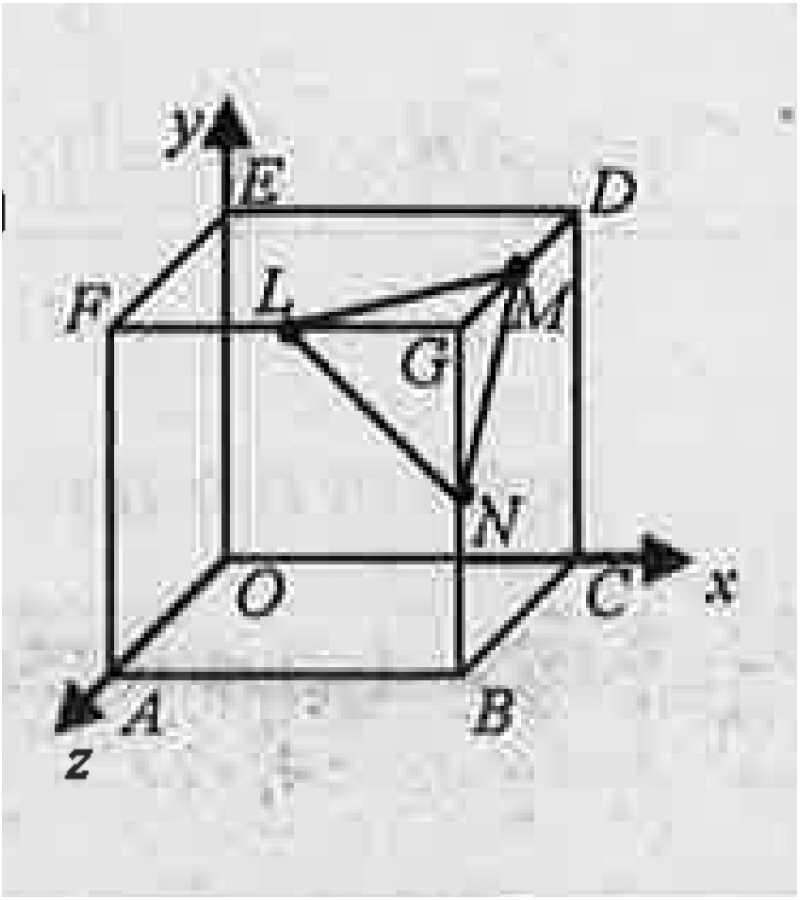
Show that the angle between the main diagonis is $\theta = \cos^{-1}\left(\frac{1}{3}\right)$



Watch Video Solution

48. OABCDEFG is acube with edges of length 8 units and axes are shown. L,M,N are midpoints of the edges FG, GD, GB respectively.

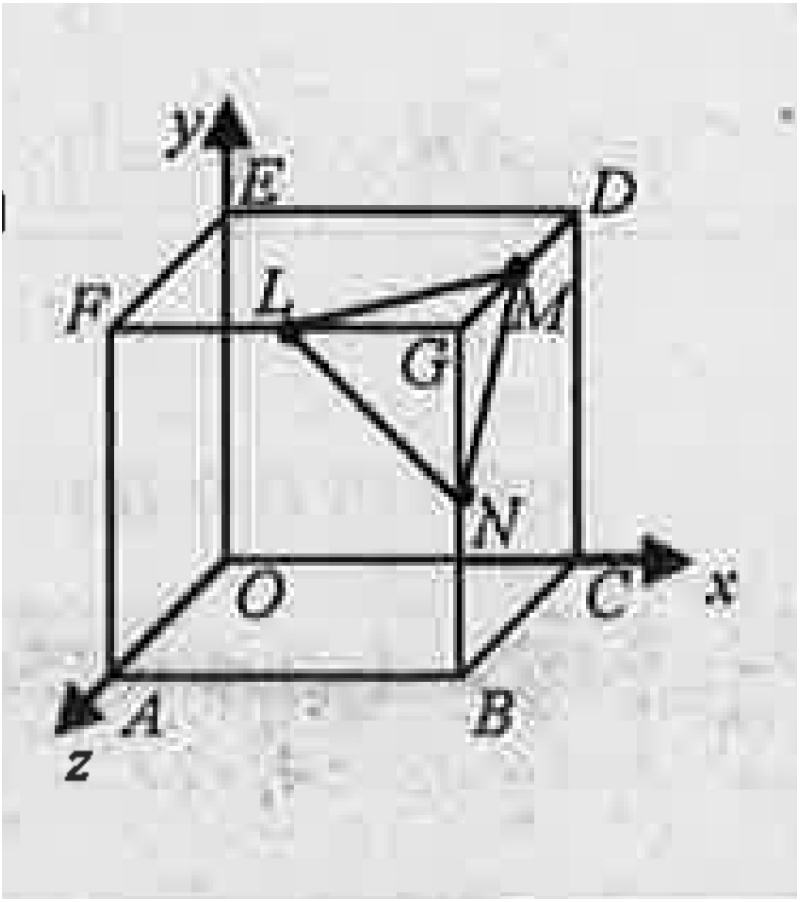
Find the p.v's of L,M,N.



Watch Video Solution

49. OABCDEFG is acube with edges of length 8 units and axes are shown. L,M,N are midpoints of the edges FG, GD, GB respectively.

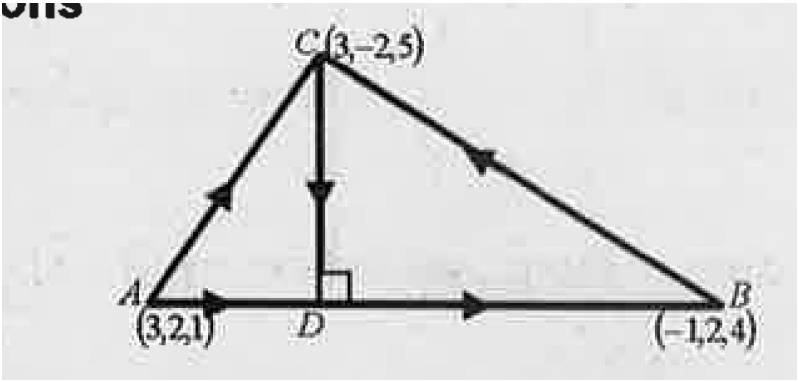
Show that $\overrightarrow{LM} + \overrightarrow{MN} + \overrightarrow{NL} = 0$



Watch Video Solution

50. Using the figure answer the following questions

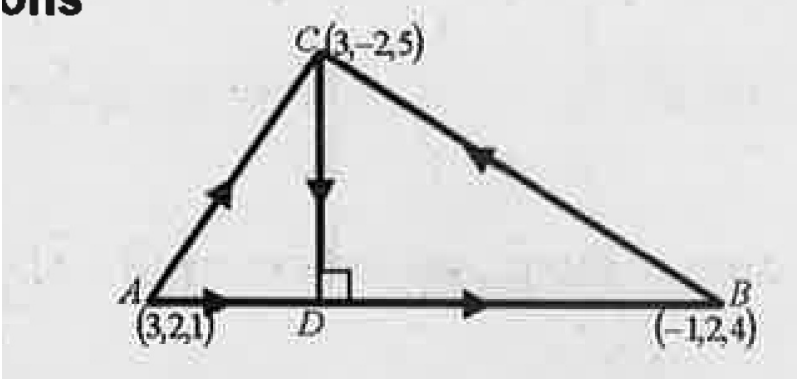
Find $\overrightarrow{AD}$



Watch Video Solution

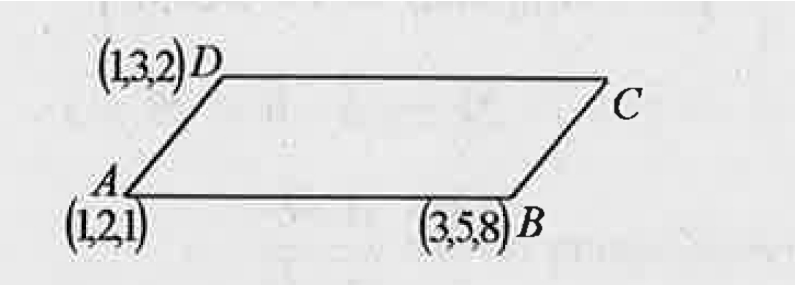
51. Using the figure answer the following questions

Find the coordinate of D.



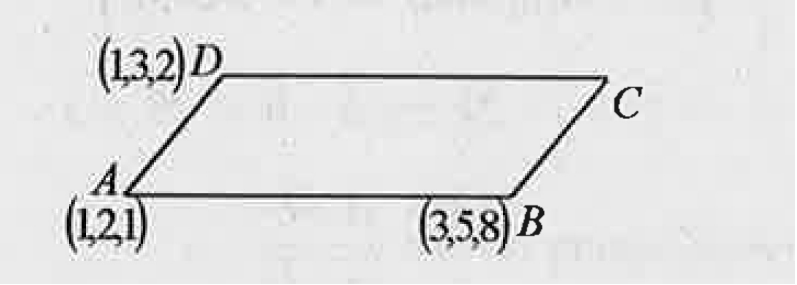
Watch Video Solution

52. Consider the parallelogram ABCD .Find $\overrightarrow{AB}$ and $\overrightarrow{AD}$



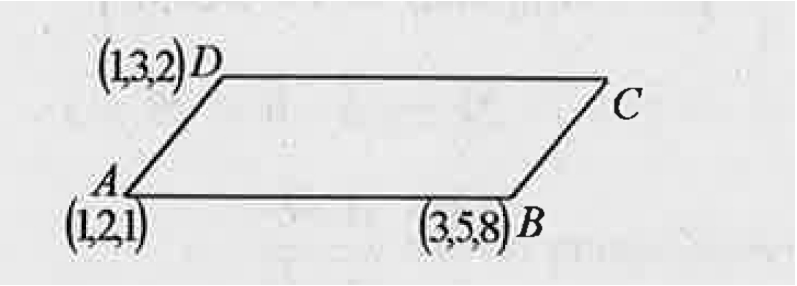
Watch Video Solution

53. Consider the parallelogram ABCD.Find the area of the parallelogram ABCD.



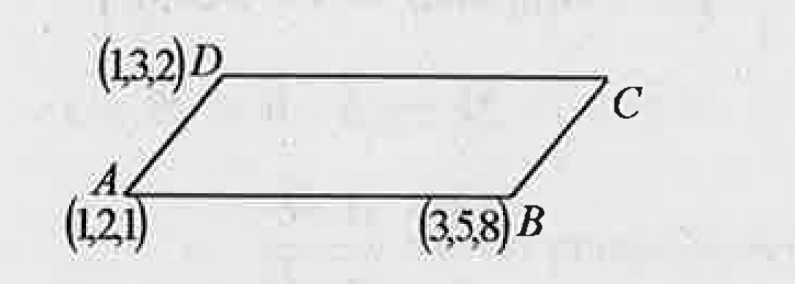
Watch Video Solution

54. Consider the parallelogram ABCD.Find $\overrightarrow{AC}$.



Watch Video Solution

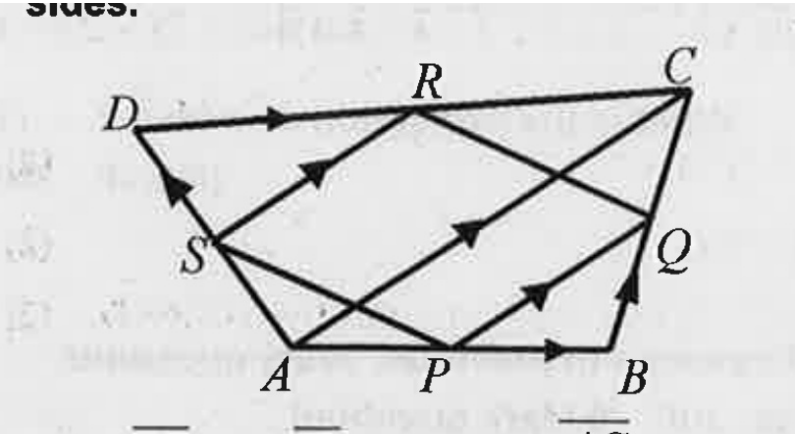
55. Consider the parallelogram ABCD.Find coordinate of C.



Watch Video Solution

56. Consider the following quadrilateral ABCD in which P,Q,R,S are the mid points of the sides.

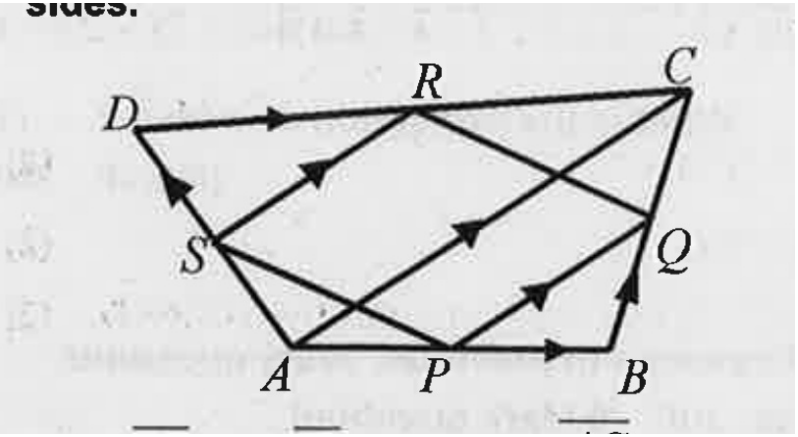
Find $\overrightarrow{PQ}$ and $\overrightarrow{SR}$ in terms of $\overrightarrow{AC}$.



Watch Video Solution

57. Consider the following quadrilateral ABCD in which P,Q,R,S are the mid points of the sides.

Show that PQRS is a parallelogram.



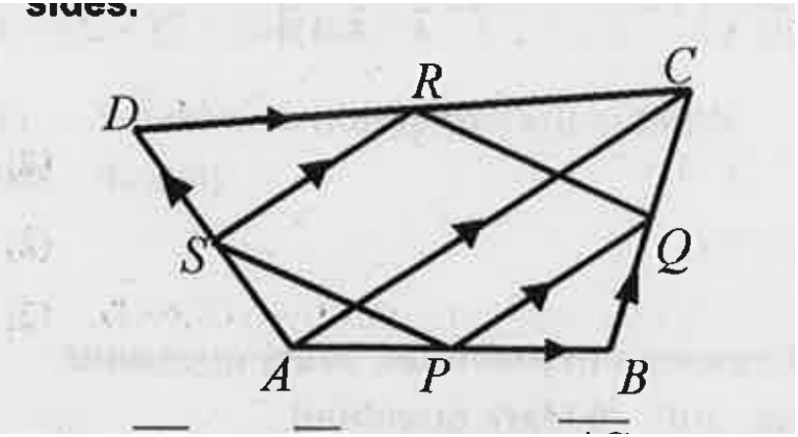
Watch Video Solution

58. Consider the following quadrilateral ABCD in which P,Q,R,S are the mid points of the sides.

If $\vec{a}$ is any vector, prove that

$\vec{a} = \left(\vec{a} \cdot i\right) i + \left(\vec{a} \cdot j\right) j + \left(\vec{a} \cdot k\right) k.$

sides.



Watch Video Solution

59. With help of a suitable figure for any three vectors $\vec{a}, \vec{b}$ and $\vec{c}$ show that $\left(\vec{a} + \vec{b}\right) + \vec{c} = \vec{a} + \left(\vec{b} + \vec{c}\right)$

Watch Video Solution

60. If $\vec{a} = i - j + k$ and $\vec{b} = 2i - 2j - k$. What is the projection of $\vec{a}$ on $\vec{b}$?

Watch Video Solution

61. If $\vec{a} = 3i - j - 5k$ and $\vec{b} = i - 5j + 3k$ Show that $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ are perpendicular.

Watch Video Solution

62. Given the position vectors of three points as $A(i - j + k), B(4i + 5j + 7k)C(3i + 3j + 5k)$ Find $\overrightarrow{AB}$ and $\overrightarrow{BC}$.

Watch Video Solution

63. Given the position vectors of three points as $A(i-j+k), B(4i+5j+7k)C(3i+3j+5k)$. Prove that A,B and C are collinear points.

Watch Video Solution

64. Write the unit vector in direction of $i+2j-3k$.

Watch Video Solution

65. If $\overrightarrow{PQ}=3i+2j-k$ and the coordinate of P are (1,-1,2), find the coordinates of Q.

Watch Video Solution

66. The angle between the vectors $\vec{a}$ and $\vec{b}$ such that $\left|\vec{a}\right| = \left|\vec{b}\right| = \sqrt{2}$ and $\vec{a} . \vec{b} = 1$ is

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

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

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

D. 0

Answer:

Watch Video Solution

67. Find the unit vector along $\vec{a} - \vec{b}$ where $\vec{a} = i + 3j - k$ and $\vec{b} = 3i + 2j + k$.

Watch Video Solution

68. Consider the vectors $\vec{a} = 2i + j - 2k$ and $\vec{b} = 6i - 3j + 2k$.Find $\vec{a} . \vec{b}$ and $\vec{a} \times \vec{b}$.

Watch Video Solution

69. Consider the vectors $\vec{a} = 2i + j - 2k$ and $\vec{b} = 6i - 3j + 2k$.Verify that $\left|\vec{a} \times \vec{b}\right|^2 = \left|\vec{a}\right|^2 \left|\vec{b}\right|^2 - \left(\vec{a} . \vec{b}\right)^2$

Watch Video Solution

70. For any three vectors $\vec{a}, \vec{b}, \vec{c}$, show that $\vec{a} \times \left(\vec{b} + \vec{c}\right) + \vec{b} \times \left(\vec{c} + \vec{a}\right) + \vec{c} \times \left(\vec{a} + \vec{b}\right) = 0$

Watch Video Solution

71. Given $A(1, 1, 1), B(1, 2, 3), C(2, 3, 1)$ are the vertices of $\triangle ABC$ a triangle. Find the area of the $\triangle ABC$.

Watch Video Solution

72. Consider $A(2, 3, 4), B(4, 3, 2)$ and $C(5, 2, -1)$ be any three points.

Find the projection of $\overrightarrow{BC}$ on $\overrightarrow{AB}$.

Watch Video Solution

73. Consider $A(2, 3, 4), B(4, 3, 2)$ and $C(5, 2, -1)$ be any three points. Find the area of triangle ABC.

Watch Video Solution

74. Find the angle between the vectors $\vec{a} = 3i + 4j + k$ and $\vec{b} = 2i + 3j - k$.

Watch Video Solution

75. The adjacent sides of a parallelogram are $\vec{a} = 3i + \lambda j + 4k$ and $\vec{b} = i - \lambda j + k$. Find $\vec{a} \times \vec{b}$

Watch Video Solution

76. The adjacent sides of a parallelogram are $\vec{a} = 3i + \lambda j + 4k$ and $\vec{b} = i - \lambda j + k$.If the area of the parallelogram is $\sqrt{42}$ square units, find the value of λ.

Watch Video Solution

77. Let $\vec{a} = 2i - j + 2k$ and $\vec{b} = 6i + 2j + 3k$.Find a unit vector in the direction of $\vec{a} + \vec{b}$.

Watch Video Solution

78. Let $\vec{a} = 2i - j + 2k$ and $\vec{b} = 6i + 2j + 3k$

Find the angle between $\vec{a}$ and $\vec{b}$.

Watch Video Solution

79. Consider the triangle ABC with vertices A(1,1,1), B(1,2,3) and C(2,3,1)

Find $\overrightarrow{AB}$ and $\overrightarrow{AC}$.

Watch Video Solution

80. Consider the triangle ABC with vertices A(1,1,1), B(1,2,3) and C(2,3,1).Find $\overrightarrow{AB} \times \overrightarrow{AC}$.

Watch Video Solution

81. Consider the triangle ABC with vertices A(1,1,1), B(1,2,3) and C(2,3,1).Hence find the area of the triangle.

Watch Video Solution

82. Consider the vectors

$\vec{a} = i - 7j + 7k, \vec{b} = 3i - 2j + 2k.$

Find $\vec{a} . \vec{b}$.

Watch Video Solution

83. Consider the vectors $\vec{a} = i - 7j + 7k, \vec{b} = 3i - 2j + 2k$.Find the angle

between $\vec{a}$ and $\vec{b}$.

Watch Video Solution

84. Consider the vectors

$\vec{a} = i - 7j + 7k, \vec{b} = 3i - 2j + 2k.$

Find the area of parallelogram with adjacent sides $\vec{a}$ and $\vec{b}$.

Watch Video Solution

85. If the points A and B are (1,2,-1) and (2,1,-1) respectively, then $\overrightarrow{AB}$ is

A. i+j

B. i-j

C. 2i+j-k

D. i+j+k

Answer:

Watch Video Solution

86. Find the value of λ for which the vectors $2i - 4j + 5k$, $i - \lambda j + k$ and $3i + 2j - 5k$ are coplanar.

Watch Video Solution

87. Find the angle between the vectors $\vec{a} = 2i + j - k$ and $\vec{b} = i - j + k$.

Watch Video Solution

88. $\left(\vec{a} - \vec{b}\right) \times \left(\vec{a} + \vec{b}\right)$ is equal to a) $\vec{a}$ b) $\left|\vec{a}\right|^2 - \left|\vec{b}\right|^2$ c) $\vec{a} \times \vec{b}$ d) $2\left(\vec{a} \times \vec{b}\right)$

A. $\vec{a}$

B. $\left|\vec{a}\right|^2 - \left|\vec{b}\right|^2$

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

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

Answer:

Watch Video Solution

89. Using vectors, show that the points

$A(1, 2, 7), B(2, 6, 3), C(3, 10, -1)$ are collinear.

Watch Video Solution

90. Find a vector in the direction of $\vec{r} = 3i - 4j$ that has a magnitude of 9.

Watch Video Solution

91. For any three vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$, and, prove that $\left(\vec{a} + \vec{b}\right) + \vec{c} = \vec{a} + \left(\vec{b} + \vec{c}\right)$.

Watch Video Solution

92. Find a unit vector perpendicular to $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$, where $\vec{a} = i - 3j + 3k$ and $\vec{b} = 3i - 3j + 2k$.

Watch Video Solution

93. Let $A(2, 3, 4), B(4, 3, 2)$ and $C(5, 2, -1)$ be three points.Find $\overrightarrow{AB}$ and $\overrightarrow{BC}$.

Watch Video Solution

94. Let $A(2, 3, 4), B(4, 3, 2)$ and $C(5, 2, -1)$ be three points .Find the projection of $\overrightarrow{BC}$ on $\overrightarrow{AB}$.

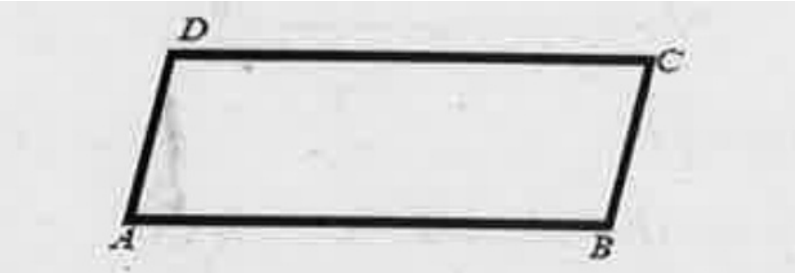
Watch Video Solution

95. Let $A(2, 3, 4), B(4, 3, 2)$ and $C(5, 2, -1)$ be three points

Find the area of the triangle ABC.

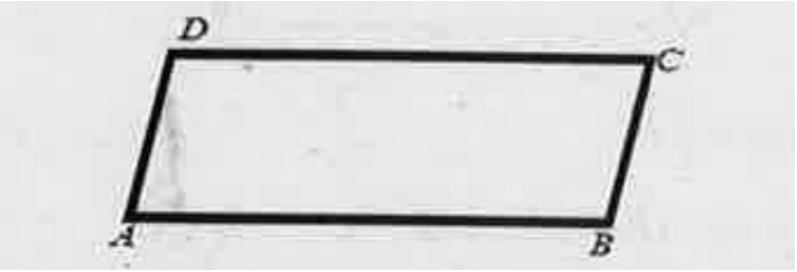
Watch Video Solution

96. ABCD is a parallelogram with A as the origin. $\vec{b}$ and $\vec{d}$ are position vector of B and D respectively. What is the position of vector C?



Watch Video Solution

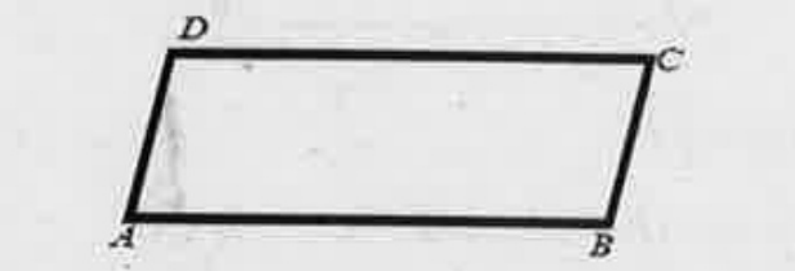
97. ABCD is a parallelogram with A as the origin. $\vec{b}$ and $\vec{d}$ are position vector of B and D respectively.What is the angle between $\overrightarrow{AB}$ and $\overrightarrow{AD}$?



Watch Video Solution

98. ABCD is a parallelogram with A as the origin. $\vec{b}$ and $\vec{d}$ are position vector of B and D respectively.

If $\left|\overrightarrow{AC}\right| = \left|\overrightarrow{BD}\right|$, show that ABCD is a Rectangle.



Watch Video Solution

99. If $\overrightarrow{a}, \overrightarrow{b}, \overrightarrow{c}, \overrightarrow{d}$ respectively are the position vectors representing the vertices A,B,C,D of a parallelogram, then write $\overrightarrow{d}$ in terms of $\overrightarrow{a}, \overrightarrow{b}, \overrightarrow{c}$.

Watch Video Solution

100. Find the projection vector of $\overrightarrow{b} = i + 2j + k$ along the vector

$\vec{a} = 2i + j + 2k$. Also write $\vec{b}$ as the sum of a vector along $\vec{a}$ and a parpendicular to $\vec{a}$.

Watch Video Solution

101. Find the area of a parallelogram for which the vectors $2i + j, 3i + j + 4k$ are adjacent sides.

Watch Video Solution

102. Write the magnitude of a vector $\vec{a}$ in terms of dot product.

Watch Video Solution

103. If $\vec{a}, \vec{b}, \vec{a}+\vec{b}$ are unit vectors, then prove that the angle between $\vec{a}$ and $\vec{b}$ is $\frac{2\pi}{3}$

Watch Video Solution

104. If $2i+j-3k$ and $mi+3j-k$ are parpendicular to each other, then find 'm'. Also find the area of the Rectangle having these two vectors as sides.

Watch Video Solution

105. Consider the triangle ABC with vertices $A(1,2,3), B(-1,0,4), C(0,1,2)$

Find $\overrightarrow{AB}$ and $\overrightarrow{AC}$.

Watch Video Solution

Watch Video Solution

106. Consider the triangle ABC with vertices $A(1, 2, 3), B(-1, 0, 4), C(0, 1, 2)$

Find $\angle A$.

Watch Video Solution

107. Consider the triangle ABC with vertices $A(1, 2, 3), B(-1, 0, 4), C(0, 1, 2)$

Find the area of the triangle ABC.

Watch Video Solution