



MATHS

BOOKS - RS AGGARWAL MATHS (HINGLISH)

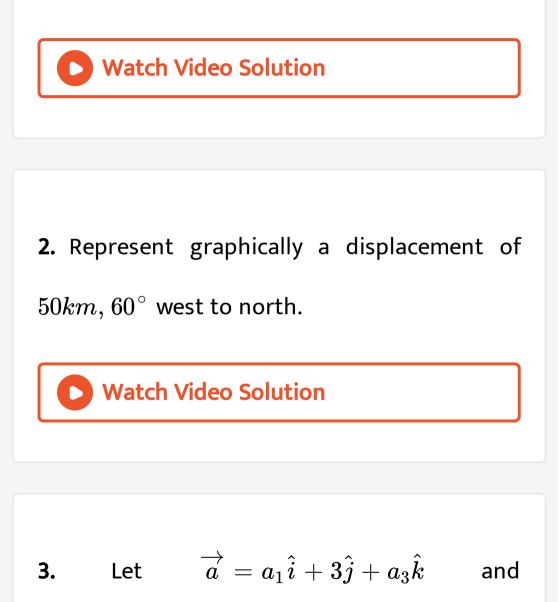
VECTOR AND THEIR PROPERTIES

Solved Examples

1. Classify the following measures as scalars and vectors :

(i) 40 seconds , (ii) $100m^2$, (iii) $30gm\,/\,cm^3$

(iv) $60 km \,/\,hr$, (v) $56m \,/\,s$ towards south



 $\overrightarrow{b}=2\hat{i}+b_{2}\hat{j}+\hat{k}$. If $\overrightarrow{a}=\overrightarrow{b}$, find the values

of a_1, b_2 and a_3 .

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4. Let
$$\overrightarrow{a} = 3\hat{i} + 2\hat{j}$$
 and $\overrightarrow{b} = 2\hat{i} + 3\hat{j}$. Is $\left|\overrightarrow{a}\right| = \left|\overrightarrow{b}\right|$? Is $\overrightarrow{a} = \overrightarrow{b}$?

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5. Find a unit vector in the direction of vector

$$\stackrel{
ightarrow}{b}=\hat{i}+2\hat{j}+3\hat{k}.$$

6. Write a vector of magnitude 15 units in the

direction of the vector

$$\Bigl(\hat{i}-2\hat{k}+2\hat{k}\Bigr).$$

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7. Find a unit vector parallel to the sum of the

vector
$$\left(\hat{i} + \hat{j} + \hat{k}
ight)$$
 and $\left(2 \hat{i} - 3 \hat{j} + 5 \hat{k}
ight)$.

8. If
$$\overrightarrow{a} = (\hat{i} + \hat{j} + \hat{k}), \ \overrightarrow{b} = (4\hat{i} - 2\hat{i} + 3\hat{k})$$

and $\overrightarrow{c} = (\hat{i} - 2\hat{j} + \hat{k}),$ find a vector of
magnitude 6 units which is parallel to the
vector $(2\overrightarrow{a} - \overrightarrow{b} + 3\overrightarrow{c}).$
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9. Find the unit vector in the direction of \overrightarrow{PQ} , where P and Q are the points (1, 2, 3) and (4, 5, 6), respectively.

10. For what value of a, the vector s $\left(2\hat{i}-3\hat{j}+4\hat{k}
ight)$ and $\left(a\hat{i}+6\hat{j}-8\hat{k}
ight)$

collinear ?

A.-4

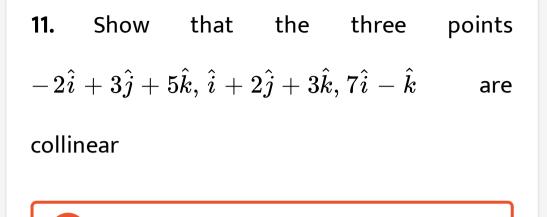
B.-5

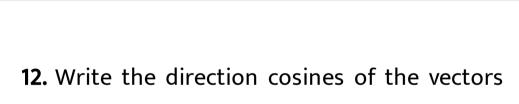
C.-6

 $\mathsf{D.}-7$

Answer: A







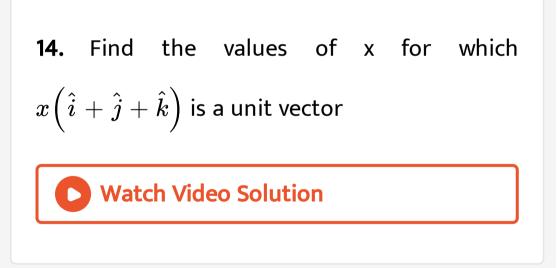
$$\Big(-2\hat{i}+\hat{j}-5\hat{k}\Big).$$

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13. What is the cosine of the angle which the

vector $\sqrt{2}\hat{i}+\hat{j}+\hat{k}$ makes with y-axis?





15. If A(1, 2, -3) and B(-1, -2, 1) are the two given points in space then find (i) the direction ratios of \overrightarrow{AB} and (ii) the direction cosines of \overrightarrow{AB} . Express \overrightarrow{AB} in terms of \hat{i}, \hat{j} and \hat{k} .

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16. Find the scalar and scalar components of the vector with initial points A(-3, -1, 2)and terminal point B(-5, 4, 3).





17. Write two different vectors having same

magnitude.



18. Write the different vectors having same

magnitude.

19. Prove that the points $2\hat{i} - \hat{j} + \hat{k}, \hat{i} - 3\hat{j} - 5\hat{k}$ and $3\hat{i} - 4\hat{j} - 4\hat{k}$ are the vertices of a right angled triangle. Also find the remaining angles of the triangle.



20. Find the position vector of a point R which

divides the line joining the point $Pig(\hat{i}+2\hat{j}-\hat{k}ig)$ and $Qig(-\hat{i}+\hat{j}+\hat{k}ig)$ in the

ratio 2:1, (i) internally and (ii) externally.

21. *P* and *Q* are two points with position vectors $3\overrightarrow{a} - 2\overrightarrow{b}$ and $\overrightarrow{a} + \overrightarrow{b}$ respectively. Write the position vector of a point R which divides the line segment PQ in the ratio 2:1 externally.

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22. Find the position vector of a point R which divides the line segment joining the points

 $A(2,\ -3,4)$ and $B(3,1,\ -2)$ externally in

the ratio 3:2.

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23. Find the position vector of the mid point of

the vector joining the points

 $P(2,3,4) and \ Q(4,1,\ -2) \cdot$

24. Show that the points A(1, -2, -8), B(5, 0, -2) and C(11, 3, 7) are collinear, and find the ratio in which B divides AC.

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1. Write down the magnitude of each of the following vectors :

(i)
$$\overrightarrow{a} = \hat{i} + 2\hat{j} + 5\hat{k}$$
, (ii) $\overrightarrow{b} = 5\hat{i} - 4\hat{j} - 3\hat{k}$
(iii) $\overrightarrow{c} = \left(\frac{1}{\sqrt{3}}\hat{i} - \frac{1}{\sqrt{3}}\hat{j} + \frac{1}{\sqrt{3}}\hat{k}\right)$, (iv)
 $\overrightarrow{d} = \left(\sqrt{2}\hat{i} + \sqrt{3}\hat{j} - \sqrt{5}\hat{k}\right)$
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2. Find a unit vector in the diection of the vector.

(i)
$$\left(3\hat{i}+4\hat{j}-5\hat{k}
ight)$$
 , (ii) $\left(3\hat{i}-2\hat{j}+6\hat{k}
ight)$
(iii) $\left(\hat{i}+\hat{k}
ight)$, (iv) $\left(2\hat{i}+\hat{j}+2\hat{k}
ight)$

3. If $\overrightarrow{a} = \left(2\hat{i} - 4\hat{j} + 5\hat{k}\right)$ then find the value of λ so that $\lambda \overrightarrow{a}$ may be a unit vector.

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4. If
$$\overrightarrow{a} = \left(- \hat{i} + \hat{j} - \hat{k}
ight)$$
 and

 $\overrightarrow{b}=\left(2\hat{i}-2\hat{j}+2\hat{k}
ight)$ then find the unit vector in the direction of $\left(\overrightarrow{a}+\overrightarrow{b}
ight)$.

5. If
$$\overrightarrow{a} = \left(3\hat{i} + \hat{j} - 5\hat{k}
ight)$$
 and

 $\overrightarrow{b}=\left(\hat{i}+2\hat{j}-\hat{k}
ight)$ then find a unit vector in

the direction of $\left(\overrightarrow{a} - \overrightarrow{b}\right)$.

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6. If
$$\overrightarrow{a} = (\hat{i} - 2\hat{j} - 3\hat{k})$$
 and
 $\overrightarrow{b} = (2\hat{i} + 4\hat{j} + 9\hat{k})$ then find a unit vector
parallel to $(\overrightarrow{a} + \overrightarrow{b})$.

7. Find a vector of magnitude 9 units in the direction of the vector $\Big(-2\hat{i}+\hat{j}+2\hat{k}\Big).$

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8. Find a vector of magnitude 8 units in the direction of the vector $\left(5\hat{i}-\hat{j}+2\hat{k}
ight)$.

9. Find a vector of magnitude 21 units in the

direction of the vector
$$\left(2\hat{i}-3\hat{j}+6\hat{k}
ight)$$
 .

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10. If
$$\overrightarrow{a} = (\hat{i} - 2\hat{j}), \overrightarrow{b} = (2\hat{i} - 3\hat{j})$$
 and $\overrightarrow{c} = (2\hat{i} + 3\hat{k}), \text{find } (\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c}).$

11. If A(-2, 1, 2) and B(2, -1, 6) are two given point, find a unit vector in the direction of \overrightarrow{AB} .



12. Find the direction ratios and direction cosines of the vector $\overrightarrow{a}=\Big(5\hat{i}-3\hat{j}+4\hat{k}\Big).$

13. Find the direction ratios and the direction cosines of the vector joining the points A(2, 1, -2) and B(3, 5, -4).

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14. Show that the points A, B and C having

vectors

position vectors
$$ig(\hat{i}+2\hat{j}+7\hat{k}ig),ig(2\hat{i}+6\hat{j}+3\hat{k}ig),$$
 and $ig(3\hat{i}+10\hat{j}-3\hat{k}ig)$ respectively, are collinear.

15. The position vectors of the points A,B and C

are
$$\Big(2\hat{i}+\hat{j}-\hat{k}\Big), \Big(3\hat{i}-2\hat{j}+\hat{k}\Big)$$
 and

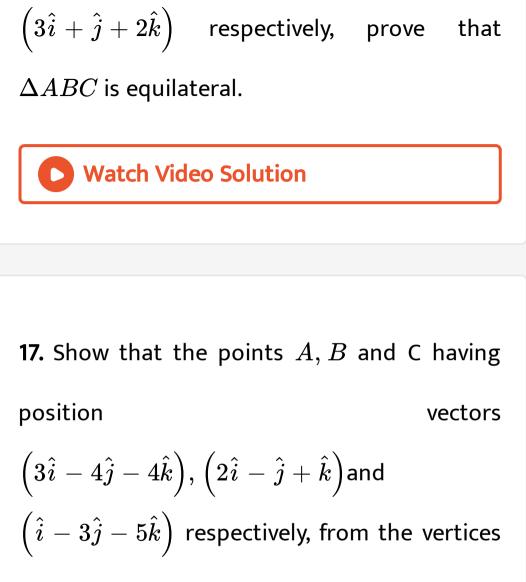
 $\left(\hat{i}+4\hat{j}-3\hat{k}
ight)$ respectively. Show that the

points A,B and C are collinear.

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16. If the position vector of the vertices A,B and

C of a
$$\Delta ABC$$
 be $\left(\hat{i}+2\hat{j}+3\hat{k}
ight), \left(2\hat{i}+3\hat{j}+\hat{k}
ight)$ and



of a right-angled triangle.

18. Using vector method, show that the points A(1, -1, 0), B(4, -3, 1) and C(2, -4, 5) are the vertices of a right -angled triangle.

19. Find the position vector of the point which divides the join of the points $\left(2\overrightarrow{a} - 3\overrightarrow{b}\right)$ and $\left(3\overrightarrow{a} - 2\overrightarrow{b}\right)$ (i) internally and (ii) externally in the ratio 2:3.

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20. Find the position vector of a point R which divides the line joining two points P and Q whose position vectors are $\left(2\overrightarrow{a}+\overrightarrow{b}\right)$ and ($\overrightarrow{a}-3\overrightarrow{b}$) respectively, externally in the ratio 1:2.Also, show that P is the mid-point of the line segment RQ.

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21. Find the position vector of a point R which divides the line joining A(-2,1,3) and

 $B(3,\,5,\,-2)$ in the ratio $2\!:\!1$ (i) internally (ii)

externally.



22. Find the position vector of the mid-point of

the vector joining the points

$$A \Big(3 \hat{i} + 2 \hat{j} + 6 \hat{k} \Big)$$
 and $B \Big(\hat{i} + 4 \hat{j} - 2 \hat{k} \Big)$

23. If
$$\overrightarrow{AB} = \left(2\hat{i}+\hat{j}-3\hat{k}
ight)$$
 and $A(1,2,\ -1)$

is the given point, find the coordinates of B.

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24. Write a unit vector in the direction of \overrightarrow{PQ} , where P and Q are the points (1, 3, 0) and (4, 5, 6) respectively.