



# MATHS

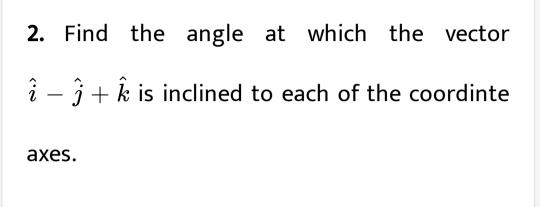
# **BOOKS - KC SINHA MATHS (HINGLISH)**

# **3D - ANGLE BETWEEN TWO LINES**

Solved Examples

1. Find the direction cosines of the vector

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





**3.** Show by using direction ratios, that the points

(2, -4, 5), (1, -1, 3) and (5, -13, 11)

are collinear



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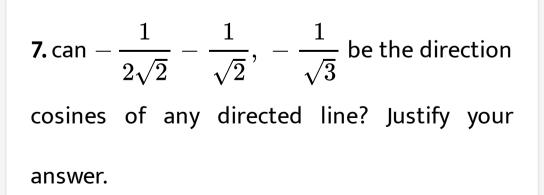
**4.** Find the values of a for which points (8, -7, a), (5, 2, 4) and (6, -1, 2) are collinear.

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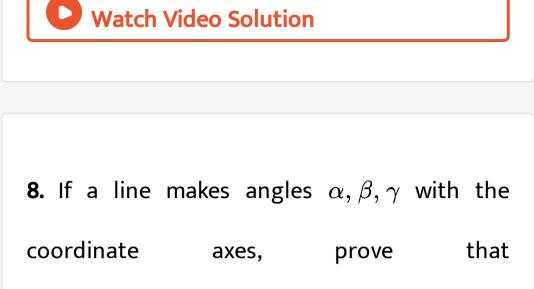
5. If Q be the foot of perpendicular from P(2, 4, 3) on the line joining the points A(1, 2, 4) and B(3, 4, 5), then co-ordinate of Q is given by



6. Find the direction cosines of the lines, connected by the relations: l + m + n = 0 and  $2lm + 2\ln - mn = 0$ .



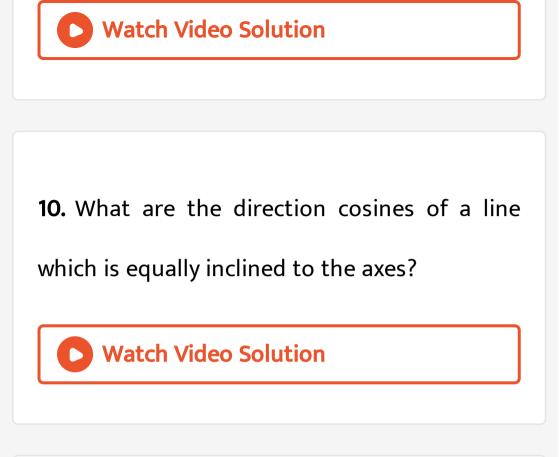




 $\sin^2lpha+\sin^2eta+\sin^2\gamma=2$ 

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**9.** A line OP through origin O is inclined at  $60^{\circ}$  and  $45^{\circ}$  to OX and OY respectivey, where O is the origin. Find the angle at which it is inclined to OZ.



11. What are the direction cosines of a line

whose direction ratios are 3,4,12?

12. Find the angles at which a line with direction ratios 2, -1, 2 is inclined to each of the coordinate axes.

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**13.** A line passes through the points (6, -7, -1) and (2, -3, 1). Find te direction cosines off the line if the line makes an acute angle with the positive direction of the x-axis.

**14.** Show that the three lines drawn from the origin with direction cosines proportional to 1,-1,1,2,-3,0 and 1,0,3 are coplanar

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**15.** If  $l_1$ ,  $m_1$ ,  $n_1$  and  $l_2$ ,  $m_2$ ,  $n_2$  are the direction cosines of two mutually perpendicular lines, show that the direction cosines of the line perpendicular to both of these are

 $m_1n_2-m_2n_1, n_1l_2-n_2l_1, l_1m_2-l_2m_1.$ 

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16. Prove that the lines whose direction cosines are given by the equations l+m+n=0 and 3lm-5mn+2nl=0

are mutually perpendicular.

17. The direction cosines of two lines are given

by the equations

3m + n + 5l = 0, 6nl - 2lm + 5mn = 0.

find the angle between them

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18. Find the angel between any two diagonals

of a cube.

**19.** Find the projection of the line joining (1,2,3) and (-1,4,2)` on the line having direction ratios 2,3,-6.



# **20.** If P,Q,R,S are (3,6,4),(2,5,2),(6,4,4,),(0,2,1)

## respectively find the projection of PQ on RS.

**21.** The projection of a vector on the coordinate axes are 6, -3, 2. Find its length and direction cosines.





**1.** If a line makes angle 90*o*, 60*o* and 30*o* with the positive direction of x, y and z-axis respectively,

find its direction cosines.





**2.** If a line makes angles 90o, 135o, 45o with the x, y and z-axes respectively, find its direction cosines.

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**3.** If 
$$\overrightarrow{r}=2\hat{i}-3\hat{j}+2\hat{k}$$
 find the direction

cosines of `vecr.

**4.** Find the direction COSINES of the joining the points P(4, 3, -5) and Q(-2, 1, -8)

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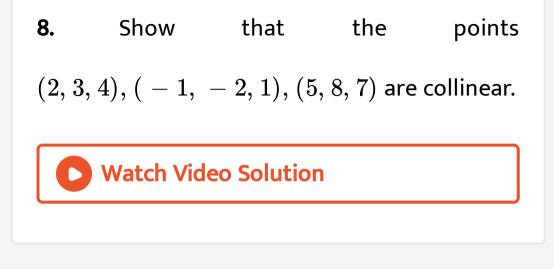
5. If a line has direction ratios -18, -12, -4 then what are its direction cosines?

**6.** Show that the joint of the points (1,2,3), (4,5,7) is parallel to the join of the points (-4,3,-6),(2,9,2).



**7.** Show that the line joining the points (1,2,3), (-1,-2,-3) is perpendicular to the line joining (-2,1,5),(3,3,2).





**9.** Show that the points A(2, 3, 4), B(1, 2, 3)and C(3, 8, 11) are collinear.

**10.** Find the direction cosines of the sides of the triangle whose vertices are (3, 5, 4), (1, 1, 2) and (5, 5, 2).



**11.** Determine the value of k so that the line joining points A(k, 1, -1) and B(2, 0, 2k) is perpendicular to the line joining the points C(4, 2k, 1) and D(2, 3, 2).

**12.** Determine the values of x and y so that thelinejoiningthepointsA(x, 3, 11), B(1, 1, -2) is parallel to thelinejoiningthepointsC(2, 5, 3), D(-4, y, -6).

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13. Find the direction cosines of the lines, connected by the relations: l+m+n=0 and  $2lm+2\ln-mn=0$ .



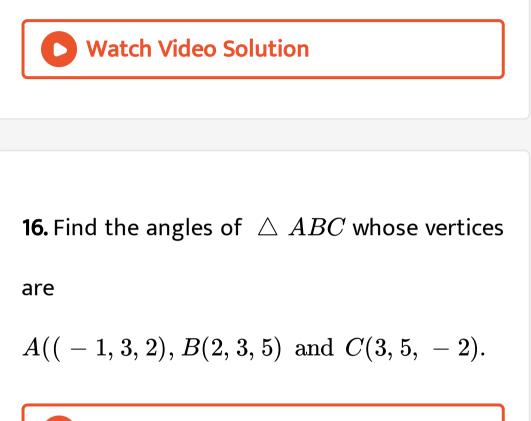
# **14.** Find the coordinates of the foot of the perpendicular from P(2, 1, 3) on the lines joining the points A(1, 2, 4) and B(3, 4, 5).



**15.** If O be the origin and OP makes an angle of  $45^0$  and  $60^0$  with the positive direction of x

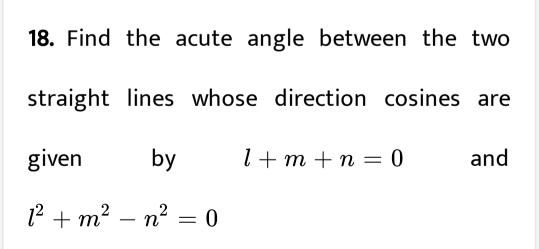
and y axes respectively and OP=12 units, find

the coordinates of P.





**17.** Find the angle between the lines whose direction-cosines are give / + 2m + 3n = 0 and 3/m - 4/n + mn = 0



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**19.** Find the projection of the line segment joining (2,-1,3) and (4, 2, 5) on a line which makes equal acute angles with co-ordinate axes.

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**20.** The length of the line segment whose projection on the coordinate axes are of magnitudes 12,4,3 is (1) 13 (2) 17 (3) 19 (4) 21

21. The direction cosines of x-axis are (A) 0,0,1

(B) 1,0,0 (C) 0,1,0 (D) 0,1,1



## 22. The direction cosines of any normal to the

xy-plane are (A) 1,0,0 (B) 0,1,0 (C) 1,1,0 (D) 0,01

23. How many lines through the origin make equal angles with the coordinate axes? (A) 1 (B) 4 (C) 8 (D) 2



24. The number 3,4,5 can be (A) direction cosines of a line in space (B) direction numbers of a line in space (C) coordinates of a point on the line y = 4z = 0 (D) coordinates of a point in the plane x + y - z = 0



**25.** If the direction cosines of a straighat line are k,k,k the (A) k > 0 (B) 0 < k < 1 (C) k = 1(D)  $k = \frac{1}{\sqrt{3}}$  or  $-\frac{1}{\sqrt{3}}$ Watch Video Solution

26. The direction cosines of line joining (1, -1, 1) and (-1, 1, 1) are (A) 2, -2, 0 (B) 1, -1, 0 (C)  $\frac{1}{\sqrt{2}} - \frac{1}{\sqrt{2}}$ , 0 (D) none of

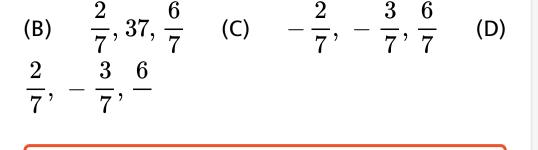
#### these

27. If  $\alpha + \beta + \gamma$  are the angle which a half ray makes with the positive direction of the axes then  $\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma = (A) \ 1 (B) \ 2 (C)$ 0 (D) -1

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28. The direction cosines of the ray from  $(0,0,0) 
ightarrow (2,\ -3,6)$  are (A)  $-rac{2}{7},rac{3}{7},\ -rac{6}{7}$ 



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29. Two lines with direction cosines  $l_1, m_1, n_1$  and  $l_2, m_2, n_2$  are at righat angles iff (A)  $l_1 l_2 + m_1 m_2 + n_1 n_2 = 0$  (B)  $l_1 = l_2, m_1 = m_2, n_1 = n_2$  (C)  $\frac{l_1}{l_2} = \frac{m_1}{m_2} = \frac{n_1}{n_2}$  (D) $l_1 l_2 = m_1 m_2 = n_1 n_2$ 

**30.** The projections of the segment PQ on the coordinate axes are -9,12,-8 respectively. The direction cosines of the line PQ are (A)  $-\frac{9}{\sqrt{17}}, \frac{12}{\sqrt{17}}, -\frac{8}{\sqrt{17}}$  (B)  $-\frac{9}{288}, \frac{12}{289}, -\frac{8}{289}$  (C)  $-\frac{9}{17}, \frac{12}{17}, -\frac{8}{17}$  (D) none of these

**31.** If the direction cosines of a line are 
$$rac{1}{c}, rac{1}{c}, rac{1}{c}$$
 rthen (A)  $c.0$  (B)  $0 < c < 1$  (C)  $c = \pm \sqrt{3}$  (D)  $c > 2$ 



**32.** A line making angles  $45^{0}$  and  $60^{0}$  with the positive directions of the x and y axes respectively, makes with the positive direction of z-axis an angle of (A)  $60^{0}$  (B)  $120^{0}$  (C)  $60^{0}$  or  $120^{0}$  (D) none of these

33. Find the angle between the following pair

of lines: A lines with direction ratios 2,2,1 A line

joning (3,1,4)to (7,2,12)



#### 34. Show that the direction cosines of a vector

equally inclined to the axes OX, OY and OZ are

$$\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}.$$

**35.** If a line makes angles  $\alpha, \beta, \gamma$  with the axes

then  $\cos 2\alpha + \cos 2\eta + \cos 2\gamma$ =

(A) - 2(B) - 1(C)1(D)2