Chapter - 11 Three Dimensional Geometry edukalpclasses.com

# Exercise 11.1

#### Question 1:

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

Answer

Let direction cosines of the line be l, m, and n.

 $l = \cos 90^\circ = 0$ 

$$m = \cos 135^\circ = -\frac{1}{\sqrt{2}}$$
$$n = \cos 45^\circ = \frac{1}{\sqrt{2}}$$

 $\sqrt{2}$ 

Therefore, the direction cosines of the line are

#### Question 2:

Find the direction cosines of a line which makes equal angles with the coordinate axes.

and

#### Answer

Let the direction cosines of the line make an angle a with each of the coordinate axes. ..  $I = \cos a, m = \cos a, n = \cos a$ 

$$l^{2} + m^{2} + n^{2} = 1$$
  

$$\Rightarrow \cos^{2} \alpha + \cos^{2} \alpha + \cos^{2} \alpha = 1$$
  

$$\Rightarrow 3\cos^{2} \alpha = 1$$
  

$$\Rightarrow \cos^{2} \alpha = \frac{1}{3}$$
  

$$\Rightarrow \cos \alpha = \pm \frac{1}{\sqrt{3}}$$
  
Thus, the direction cosines o

s of the line, which is equally inclined to the coordinate axes,

are 
$$\pm \frac{1}{\sqrt{3}}, \pm \frac{1}{\sqrt{3}}, \text{ and } \pm \frac{1}{\sqrt{3}}.$$

## For more study Materials login to edukalpclasses.com

### Class 12

### Chapter - 11 Three Dimensional Geometry edukalpclasses.com

### Question 3:

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

If a line has direction ratios of -18, 12, and -4, then its direction cosines are

$$\frac{-18}{\sqrt{(-18)^2 + (12)^2 + (-4)^2}}, \frac{12}{\sqrt{(-18)^2 + (12)^2 + (-4)^2}}, \frac{-4}{\sqrt{(-18)^2 + (12)^2 + (-4)^2}}$$
  
i.e.,  $\frac{-18}{22}, \frac{12}{22}, \frac{-4}{22}$   
 $\frac{-9}{11}, \frac{6}{11}, \frac{-2}{11}$   
9 6 cation2/ Sc

Thus, the direction cosines are 111

10

Question 4:

Show that the points (2, 3, 4), (-1, -2, 1), (5, 8, 7) are collinear.

Answer

The given points are A (2, 3, 4), B (-1, -2, 1), and C (5, 8, 7).

It is known that the direction ratios of line joining the points,  $(x_1, y_1, z_1)$  and  $(x_2, y_2, z_2)$ , are given by,  $x_2 - x_1$ ,  $y_2 - y_1$ , and  $z_2 - z_1$ .

11

The direction ratios of AB are (-1 - 2), (-2 - 3), and (1 - 4) i.e., -3, -5, and -3.

The direction ratios of BC are (5 - (-1)), (8 - (-2)), and (7 - 1) i.e., 6, 10, and 6.

It can be seen that the direction ratios of BC are -2 times that of AB i.e., they are proportional.

Therefore, AB is parallel to BC. Since point B is common to both AB and BC, points A, B, and C are collinear.

#### Question 5:

Find the direction cosines of the sides of the triangle whose vertices are (3, 5, -4), (-1, 1, 2) and (-5, -5, -2)Answer

## For more study Materials login to edukalpclasses.com



# Chapter - 11 Three Dimensional Geometry edukalpclasses.com

The vertices of  $\triangle$ ABC are A (3, 5, -4), B (-1, 1, 2), and C (-5, -5, -2).



The direction ratios of side AB are (-1 - 3), (1 - 5), and (2 - (-4)) i.e., -4, -4, and 6.

Then, 
$$\sqrt{(-4)^2 + (-4)^2 + (6)^2} = \sqrt{16 + 16 + 36}$$
  
=  $\sqrt{68}$   
=  $2\sqrt{17}$   $\sqrt{10}$   $\sqrt{$ 

Therefore, the direction cosines of AB are

$$\frac{-4}{\sqrt{(-4)^2 + (-4)^2 + (6)^2}}, \frac{-4}{\sqrt{(-4)^2 + (-4)^2 + (6)^2}}, \frac{6}{\sqrt{(-4)^2 + (-4)^2 + (6)^2}}, \frac{-4}{\sqrt{(-4)^2 + (-4)^2 + (6)^2}}, \frac{-4}{\sqrt{17}}, \frac{-4}{2\sqrt{17}}, \frac{-2}{\sqrt{17}}, \frac{-2}{\sqrt{17}}, \frac{3}{\sqrt{17}}$$

 $= 2\sqrt{17}$ 

The direction ratios of BC are (-5 - (-1)), (-5 - 1), and (-2 - 2) i.e., -4, -6, and -4. Therefore, the direction cosines of BC are

$$\frac{-4}{\sqrt{(-4)^2 + (-6)^2 + (-4)^2}}, \frac{-6}{\sqrt{(-4)^2 + (-6)^2 + (-4)^2}}, \frac{-4}{\sqrt{(-4)^2 + (-6)^2 + (-4)^2}}, \frac{-4}{\sqrt{(-4)^2 + (-6)^2 + (-4)^2}}, \frac{-4}{2\sqrt{17}}, \frac{-6}{2\sqrt{17}}, \frac{-4}{2\sqrt{17}}$$

The direction ratios of CA are (-5 - 3), (-5 - 5), and (-2 - (-4)) i.e., -8, -10, and 2. Therefore, the direction cosines of AC are

$$\frac{-8}{\sqrt{(-8)^2 + (10)^2 + (2)^2}}, \frac{-5}{\sqrt{(-8)^2 + (10)^2 + (2)^2}}, \frac{2}{\sqrt{(-8)^2 + (10)^2 + (2)^2}}, \frac{-8}{\sqrt{(-8)^2 + (10)^2 + (2)^2}}, \frac{-10}{2\sqrt{42}}, \frac{2}{2\sqrt{42}}, \frac{-10}{2\sqrt{42}}, \frac{-10}{2\sqrt$$

## For more study Materials login to edukalpclasses.com