Exercise 11.1

1. এডাল ৰেখাই x, y আৰু z অক্ষৰ লগত যথাক্ৰমে $90°$, $135°$ আৰু $45°$ কোণ উৎপন্ন কৰিলে ইয়াৰ দিশাংকবোৰ উলিওৱা।

Sol: Here

$$\alpha = 90°,\ \beta = 135°,\ \gamma = 45°.$$

$\therefore$ d.c. are;

$$l = \cos\alpha = \cos 90° = 0$$

$$m = \cos\beta = \cos 135° = \cos(90° + 45°)$$
$$= -\sin 45°$$
$$= -\frac{1}{\sqrt{2}}$$

$$n = \cos\gamma = \cos 45° = \frac{1}{\sqrt{2}}.$$

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2. এডাল ৰেখাই ধনাত্মক অক্ষবোৰৰ সৈতে একে কোণ সৃষ্টি কৰিলে ইয়াৰ দিশাংকবোৰ উলিওৱা।

Sol: Let the angle be α.

$\therefore$ d.c. are: $\cos\alpha, \cos\alpha, \cos\alpha$.

i.e., $l = \cos\alpha,\ m = \cos\alpha,\ n = \cos\alpha$

We know,

$$l^2 + m^2 + n^2 = 1$$
$$\Rightarrow \cos^2\alpha + \cos^2\alpha + \cos^2\alpha = 1$$
$$\Rightarrow 3\cos^2\alpha = 1$$
$$\Rightarrow \cos^2\alpha = 1/3$$
$$\Rightarrow \cos\alpha = \pm\frac{1}{\sqrt{3}}$$

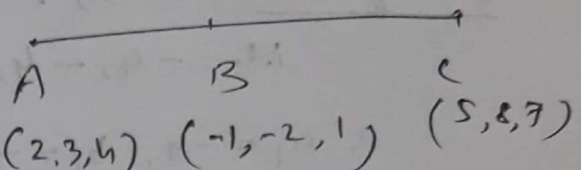
$\therefore$ d.c. are: $\pm\frac{1}{\sqrt{3}}, \pm\frac{1}{\sqrt{3}}, \pm\frac{1}{\sqrt{3}}$.

Exercise 11.1

4. দেখুওৱা যে $(2,3,4)$, $(-1,-2,1)$ আৰু $(5,8,7)$ বিন্দু তিনিটা একৰেখীয়।

Sol: Let the given points are

$$A(2,3,4),\ B(-1,-2,1),\ C(5,8,7)$$



Now, d.r. (দিশানুপাত) of the line joining A and B are:

$$-1-2,\ -2-3,\ 1-4$$

i.e. $-3, -5, -3 \longrightarrow$ (i)

Also, d.r. of the line joining B and C are:

$$5-(-1),\ 8-(-2),\ 7-1$$

i.e. $6, 10, 6 \longrightarrow$ (ii)

Thus, from (i) & (ii), we see that the d.r. of the line AB and BC are proportional (সমানুপাতিক).

[$\because$ AB আৰু BC ৰেখাৰ দিশানুপাতবোৰ সমানুপাতিক]

$\therefore$ $AB \parallel BC$

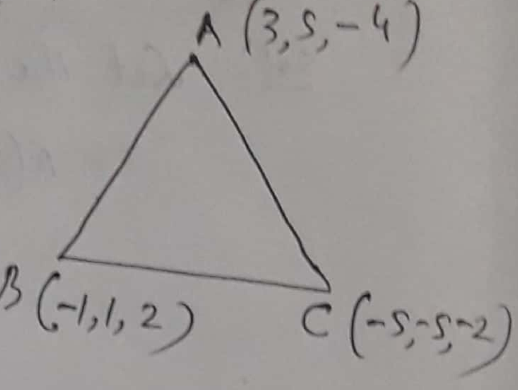
But, B is the common point of AB and BC.

$\therefore$ A, B, C একৰেখীয় (co-linear).

Proved.

Exercise - 11.1

5. (3,5,-4), (-1,1,2) আৰু (-5,-5,-2) শীৰ্ষবিন্দু বিশিষ্ট ত্ৰিভুজৰ বাহুবোৰৰ দিক্‌কোসাইনবোৰ নিৰ্ণয় কৰা।



Solⁿ: ধৰা বিন্দুবোৰ (let the points are)
$A(3,5,-4)$, $B(-1,1,2)$, $C(-5,-5,-2)$.

D.r. of AB: $-1-3,\ 1-5,\ 2-(-4)$
i.e. $-4, -4, 6$

$\therefore a_1 = -4,\ b_1 = -4,\ c_1 = 6.$

$\therefore$ d.c. of AB:
$$\begin{cases} l_1 = \dfrac{a_1}{\sqrt{a_1^2+b_1^2+c_1^2}} = \dfrac{-4}{\sqrt{(-4)^2+(-4)^2+6^2}} = \dfrac{-4}{\sqrt{2^2(4+4+9)}} = \dfrac{-2}{\sqrt{17}} \\ m_1 = \dfrac{b_1}{\sqrt{a_1^2+b_1^2+c_1^2}} = \dfrac{-2}{\sqrt{17}} \\ n_1 = \dfrac{6}{\sqrt{a_1^2+b_1^2+c_1^2}} = \dfrac{3}{\sqrt{17}} \end{cases}$$

Again,
d.r. of BC are: $-5-(-1),\ -5-1,\ -2-2$, i.e. $-4, -6, -4$

$\therefore a_2 = -4,\ b_2 = -6,\ c_2 = -4.$

$\therefore$ d.c. of BC are:
$$\begin{cases} l_2 = \dfrac{a_2}{\sqrt{a_2^2+b_2^2+c_2^2}} = \dfrac{-4}{\sqrt{4^2+6^2+4^2}} = \dfrac{-2}{\sqrt{17}} \\ m_2 = \dfrac{-3}{\sqrt{17}}, \\ n_2 = \dfrac{-2}{\sqrt{17}} \end{cases}$$

similarly, we can find the d.c. of the line CA.

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