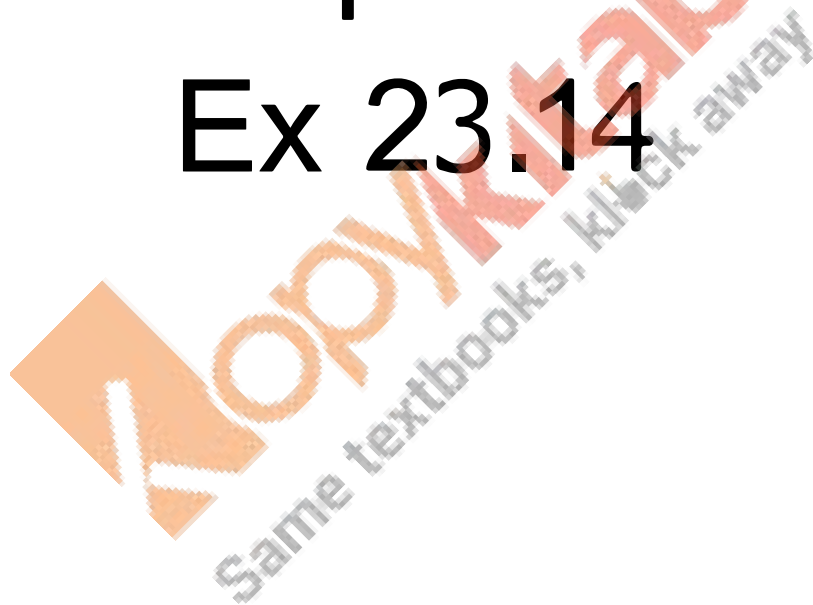


RD Sharma  
Solutions  
Class 11 Maths  
Chapter 23  
Ex 23.14



## Straight lines Ex 23.14 Q1

Let  $ABC$  be the triangle of the equations whose sides  $AB$ ,  $BC$  and  $CA$  are respectively  $x - 5y + 6 = 0$ ,  $x - 3y + 2 = 0$  and  $x - 2y - 3 = 0$

The coordinates of the vertices are  $A(9, 3)$ ,  $B(4, 2)$  and  $C(13, 5)$ .

If the point  $P(\alpha, \alpha^2)$  lies in side the  $\triangle ABC$ , then

- (i)  $A$  and  $P$  must be on the same side of  $BC$ .
- (ii)  $B$  and  $P$  must be on the same side of  $AC$ .
- (iii)  $C$  and  $P$  must be on the same side of  $AB$ .

Now,

$A$  and  $P$  are on the same side of  $BC$  if,

$$\begin{aligned} & (9(1) + 3(-3) + 2)(\alpha^2 - 3\alpha + 2) > 0 \\ & (9 - 9 + 2)(\alpha^2 - 3\alpha + 2) > 0 \\ & \alpha^2 - 3\alpha + 2 > 0 \\ & (\alpha - 1)(\alpha - 2) > 0 \\ & \alpha \in (-\infty, 1) \cup (2, \infty) \end{aligned} \quad \text{---(i)}$$

$B$  and  $P$  will lie on the same side of  $CA$  if,

$$\begin{aligned} & (13(1) + 5(-5) + 6)(\alpha^2 - 5\alpha + 6) > 0 \\ \Rightarrow & (-6)(\alpha^2 - 5\alpha + 6) > 0 \\ \Rightarrow & \alpha^2 - 5\alpha + 6 < 0 \\ \Rightarrow & (\alpha - 2)(\alpha - 3) < 0 \\ \Rightarrow & \alpha \in (2, 3) \end{aligned} \quad \text{---(ii)}$$

$C$  and  $P$  will lie on the same side of  $AB$  if,

$$\begin{aligned} & (4(1) + 2(-2) - 3)(\alpha^2 - 2\alpha - 3) > 0 \\ & (-3)(\alpha^2 - 2\alpha - 3) > 0 \\ & \alpha^2 - 2\alpha - 3 < 0 \\ & (\alpha - 3)(\alpha + 1) < 0 \\ & \alpha \in (-1, 3) \end{aligned} \quad \text{---(iii)}$$

From i, ii, iii

$$\alpha \in [2, 3]$$

### Straight lines Ex 23.14 Q2

Let  $ABC$  be the triangle. The coordinates of the vertices of the triangle  $ABC$  are marked in the following figure.

Point  $P(a, 2)$  lie inside or on the triangle if.

- (i)  $A$  and  $P$  lie on the same side of  $BC$ .
- (ii)  $B$  and  $P$  lie on the same side of  $AC$ .
- (iii)  $C$  and  $P$  lie on the same side of  $AB$ .

$A$  and  $P$  will lie on the same side of  $BC$  if.

$$(7(3) - 7(-3) - 8)(3a - 7(2) - 8) > 0$$

$$(21 + 21 - 8)(3a - 14 - 8) > 0$$

$$3a - 22 > 0$$

$$a > \frac{22}{3} \quad \text{---(i)}$$

$B$  and  $P$  will lie on the same side of  $AC$  if.

$$\left(4\left(\frac{18}{5}\right) - \left(\frac{2}{5}\right) - 31\right)(4a - 2 - 31) > 0$$

$$4a - 33 > 0$$

$$a > \frac{33}{4} \quad \text{---(ii)}$$

$C$  and  $P$  will lie on the same side of  $BC$  if.

$$\left(\frac{209}{25} + \frac{61}{25} - 4\right)(a + 2 - 4) > 0$$

$$a + 2 > 0$$

$$a > -2 \quad \text{---(iii)}$$

From (i), (ii), (iii)

$$a \in \left(\frac{22}{3}, \frac{33}{4}\right)$$

### Straight lines Ex 23.14 Q3

Let  $ABC$  be the triangle, then coordinates of the vertices are marked in the following figure.

$P(-3, 2)$  lie inside if.

- (i)  $A$  and  $P$ ,  $B$  and  $P$ ,  $C$  and  $P$  lie on the same side of  $BC$ ,  $AC$  and  $BA$  respectively.

If  $A$  and  $P$  lie on the same side of  $BC$  then,

$$(3(7) - 7(-3) + 8)(3(-3) - 7(2) + 8) > 0$$

$$(21 + 21 + 8)(-9 - 14 + 8) > 0$$

But,  $(50)(-15)$  is not  $> 0$

$\therefore$  The point  $(-3, 2)$  is outside  $ABC$ .