

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 on 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,

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

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

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

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

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

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 .