

**RD Sharma**  
**Solutions**  
**Class 11 Maths**  
**Chapter 23**  
**Ex 23.6**

## Straight Lines Ex 23.6 Q1

(i)

If  $(a,0)$  and  $(0,b)$  are the intercepts of a line then the intercept form of equation is

$$\frac{x}{a} + \frac{y}{b} = 1$$

Here,  $a = 3, b = 2$

$\therefore$  The required equation is

$$\frac{x}{3} + \frac{y}{2} = 1$$

$$\Rightarrow 2x + 3y = 6$$

(ii) If  $(a,0)$  and  $(0,b)$  are the intercepts of a line then the intercept form of equation is

$$\frac{x}{a} + \frac{y}{b} = 1$$

Here,  $a = -5, b = 6$

$\therefore$  The required equation is

$$\frac{x}{-5} + \frac{y}{6} = 1$$

$$\Rightarrow 6x - 5y = -30$$

## Straight Lines Ex 23.6 Q2

The equation of straight line in the intercept form is

$$\frac{x}{a} + \frac{y}{b} = 1 \quad \text{---(1)}$$

If (1) passes through the point  $(1,-2)$  and has equal intercepts ( $a = b = k$ ), we get,

$$\frac{1}{k} + \frac{-2}{k} = 1$$

$$\frac{1}{k} - \frac{2}{k} = 1$$

$$1 - 2 = k$$

$$k = -1$$

$$\Rightarrow a = b = -1$$

Putting in (1)

$$\frac{x}{-1} + \frac{y}{-1} = 1$$

$$x + y = -1$$

### Straight Lines Ex 23.6 Q3

(i) Intercepts are equal and positive

$$\Rightarrow a = b = k$$

The equation of straight line is

$$\frac{x}{a} + \frac{y}{b} = 1 \quad \text{---(1)}$$

Since this line passes through (5, 6) and  $a = b = k$ , we get:

$$\frac{5}{k} + \frac{6}{k} = 1$$

$$k = 1$$

$$\therefore \frac{x}{11} + \frac{y}{11} = 1$$

$$\Rightarrow x + y = 11$$

(ii) Intercepts are equal but opposite in sign

$$\text{Let, } a = k, b = -k$$

Putting in (1), we get,

$$\frac{5}{k} + \frac{6}{-k} = 1$$

$$\frac{5}{k} - \frac{6}{k} = 1$$

$$\Rightarrow k = -1$$

thus from (1)

$$x - y = -1$$

### Straight Lines Ex 23.6 Q4

The equation of the given line is,

$$ax + by + 8 = 0$$

$$\Rightarrow -\frac{x}{\frac{8}{a}} - \frac{y}{\frac{8}{b}} = 1$$

It cuts the axes at  $A\left(\frac{-8}{a}, 0\right)$  and  $B\left(0, \frac{-8}{b}\right)$ .

The equation of the given line is,

$$2x - 3y + 6 = 0$$

$$\Rightarrow \frac{-x}{3} + \frac{y}{2} = 1$$

It cuts the axes at  $C(-3, 0)$  and  $D(0, 2)$ .

The intercepts of both the lines are opposite in sign

$$\Rightarrow \left(\frac{-8}{a}, 0\right) = -(-3, 0) \quad \text{and} \quad \left(0, \frac{-8}{b}\right) = -(0, 2)$$

$$\Rightarrow \frac{-8}{a} = 3 \quad \text{and} \quad \frac{-8}{b} = -2$$

$$\Rightarrow a = \frac{-8}{3} \quad \text{and} \quad b = 4$$

### Straight Lines Ex 23.6 Q5

Let the intercepts on the axes be  $(a, 0)$  and  $(0, a)$ .

Then,

$$a \times a = 25$$

$$a^2 = 25$$

$$a = 5$$

(Ignoring negative sign because it is given that the intercepts are positive)

$$\Rightarrow a = b = 5 \quad (\text{given the intercepts are equal})$$

$\therefore$  Putting in equation of straight line

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{5} + \frac{y}{5} = 1$$

$$x + y = 5$$

### Straight Lines Ex 23.6 Q6

The equation of the given line is,

$$\frac{x}{a} + \frac{y}{b} = 1$$

It cuts the axes at  $A(a, 0)$  and  $B(0, b)$ .

The portion of  $AB$  intercepted between the axis is 5:3.

$$\therefore h = \frac{3 \times a + 5 \times 0}{8} \quad \text{and} \quad k = \frac{3 \times 0 + 5 \times b}{8}$$

$$\Rightarrow p = \left( \frac{3a}{8}, \frac{5b}{8} \right)$$

The line is passing through the point  $(-4,3)$

$$\Rightarrow \frac{3a}{8} = -4 \quad \frac{5b}{8} = 3$$

$$\Rightarrow a = \frac{-32}{3} \quad b = \frac{24}{5}$$

$\therefore$  The equation of the given line is,

$$\frac{x}{\frac{-32}{3}} + \frac{y}{\frac{24}{5}} = 1$$

$$\frac{-3x}{32} + \frac{5y}{24} = 1$$

$$9x - 20y + 96 = 0$$

### Straight Lines Ex 23.6 Q7

The line intercepted by the axes are  $(a,0)$  and  $(0,b)$ , if this line segment is bisected at point  $(\alpha, \beta)$

then  $\frac{a+0}{2} = \alpha, \frac{0+b}{2} = \beta$  (Using mid point formula)

$$a = 2\alpha, b = 2\beta$$

The equation of straight line in the intercept form is

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{2\alpha} + \frac{y}{2\beta} = 1$$

### Straight Lines Ex 23.6 Q8

Suppose  $P = (3,4)$  divides the line joining the points  $A(a,0)$  and  $B(0,b)$  in the ration 2:3.

Then,

$$3 = \frac{2(0) + 3(a)}{2+3} \Rightarrow 3 = \frac{3a}{5} \Rightarrow a = 5$$

$$4 = \frac{2(b) + 3(0)}{2+3} \Rightarrow 4 = \frac{2b}{5} \Rightarrow b = 10$$

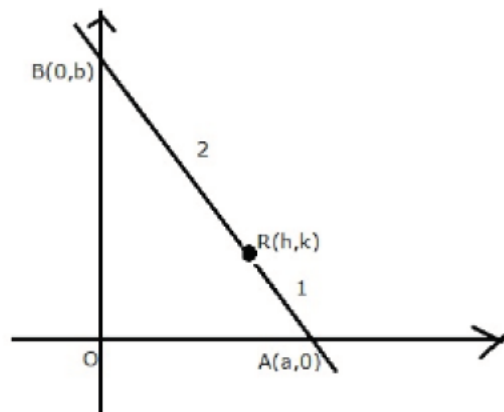
$\therefore A$  is  $(5,0)$ ,  $B$  is  $(0,10)$

Equation of line  $AB$  is

$$\frac{x}{5} + \frac{y}{10} = 1$$

$$2x + y = 10$$

## Straight Lines Ex 23.6 Q9



Point  $(h, k)$  divides the line segment in the ratio 1:2

Thus, using section point formula, we have

$$h = \frac{2 \times a + 1 \times 0}{1 + 2}$$

and

$$k = \frac{2 \times 0 + 1 \times b}{1 + 2}$$

Therefore, we have,

$$h = \frac{2a}{3} \text{ and } k = \frac{b}{3}$$

$$\Rightarrow a = \frac{3h}{2} \text{ and } b = 3k$$

Thus, the corresponding points of A and B are  $\left(\frac{3h}{2}, 0\right)$  and  $(0, 3k)$

Thus, the equation of the line joining the points A and B is

$$\frac{y - 3k}{3k - 0} = \frac{x - 0}{0 - \frac{3h}{2}}$$

$$\Rightarrow -\frac{3h}{2}(y - 3k) = x \times 3k$$

$$\Rightarrow -3hy + 9hk = 6kx$$

$$\Rightarrow 2kx + hy = 3kh$$