Exercise 8.4

Unit 8 · Geometry of Straight Lines

In $y = mx + c$: m = rate of change, c = starting value

1 **A fruit seller sells fruiters at Rs 120 per dozen and Shakri Malta at Rs 150 per dozen, and earns Rs 1200.**

Let x = dozens of fruiters and y = dozens of Shakri Malta.

$120x + 150y = 1200 \Rightarrow 120x + 150y - 1200 = 0$

$\Rightarrow 30(4x + 5y - 40) = 0$

$\therefore 4x + 5y - 40 = 0$ (standard form) ...(i)

If he sold 4 dozen Shakri Malta, put $y = 4$ in (i):

$4x + 20 - 40 = 0 \Rightarrow 4x = 20 \Rightarrow x = 5$

$\therefore$ He sold 5 dozen fruiters.

2 **The total cost of a trip to a hotel is given by $y = 1450x + 2000$, where x is the number of people and y is the total cost (Rs).**

(i) Cost for 7 people: $y = 1450(7) + 2000 = 10150 + 2000$

$\therefore y =$ Rs 12,150

(ii) Number of people if the cost is Rs 13,600:

$13600 = 1450x + 2000 \Rightarrow 1450x = 11600 \Rightarrow x = 8$

$\therefore$ 8 people

3 **Company 1 pays Rs 5500 per week plus a bonus of Rs 700. Company 2 pays Rs 800 per day. Which is better for a 2-week job?**

Company 1: $y = 5500x + 700$, where x = number of weeks

For 2 weeks: $y = 5500(2) + 700 =$ Rs 11,700

Company 2: 2 weeks = 14 days, so pay = $800 \times 14 =$ Rs 11,200

Rs 11,700 > Rs 11,200

$\therefore$ Company 1 is better for a 2-week job.

4 **A worker gets Rs 500 plus Rs 120 per hour.**

Let x = number of hours and y = total earning (Rs).

$\therefore y = 120x + 500$, i.e. $120x - y + 500 = 0$

(i) Earning after 12 hours: $y = 120(12) + 500 = 1440 + 500$

$\therefore$ Rs 1,940

(ii) Comparing $y = 120x + 500$ with $y = mx + c$:

$m = 120$ (Rs earned per hour)

(iii) $c = 500$ (the fixed amount he gets even for 0 hours)

5 **An electricity meter showed 44 units at the start, and 18 units are used each day.**

Let x = number of days and y = meter reading (units).

(i) Equation:

$\therefore y = 18x + 44$ ...(i)

(ii) Reading after 30 days: $y = 18(30) + 44 = 540 + 44$

$\therefore$ 584 units

(iii) Bill for the month at Rs 20 per unit = 584×20

$\therefore$ Rs 11,680

(iv) When will the meter show 404 units?

$$404 = 18x + 44 \Rightarrow x = \frac{404 - 44}{18} = \frac{360}{18} = 20$$

$\therefore$ After 20 days

6 **Charges are Rs 450 for 30 minutes (Rs 900 per hour), plus a fixed charge of Rs 1500.**

Let x = time in hours and y = total cost (Rs).

(i) Equation:

$\therefore y = 900x + 1500$ ...(i)

(ii) Cost for 5 hours: $y = 900(5) + 1500 = 4500 + 1500$

$\therefore$ Rs 6,000

(iii) Comparing (i) with $y = mx + c$: $m = 900$, the charge per hour.

7 **The relation between Fahrenheit and Celsius is $F = \frac{9}{5}C + 32$.**

(i) Let y = temperature in °F and x = temperature in °C:

$\therefore y = \frac{9}{5}x + 32$ (slope-intercept form)

(ii) $m = \frac{9}{5}$: °F rises by $\frac{9}{5}$ for every 1°C.

$c = 32$: 0°C is 32°F.

(iii) $x = 5$°C: $y = \frac{9}{5}(5) + 32 = 9 + 32$

$\therefore 5$°C $= 41$°F

8 **A batting side scores 96 runs in 16 overs and 180 runs in 30 overs, at a steady rate.**

Let x = number of overs and y = number of runs.

Points: (16, 96) and (30, 180).

$$m = \frac{180 - 96}{30 - 16} = \frac{84}{14} = 6$$

(i) $y - 96 = 6(x - 16) \Rightarrow y - 96 = 6x - 96$

$\therefore y = 6x$ ...(i)

(ii) Gradient $m = 6$ means 6 runs per over (the run rate).

(iii) y-intercept = 0: the score starts from 0 at 0 overs.

(iv) Predicted score after 45 overs: $y = 6(45)$

$\therefore 270$ runs

(v) Overs needed for 240 runs: $240 = 6x \Rightarrow x = 40$

$\therefore 40$ overs

9 **Hiring a car costs a fixed Rs 5000 plus a rate per km. A 125 km trip cost Rs 30,000.**

Let x = distance (km) and y = total amount (Rs).

m = rate per km, c = Rs 5000 (fixed amount)

(i) $y = mx + c \Rightarrow 30000 = m(125) + 5000$

$$125m = 25000 \Rightarrow m = \frac{25000}{125} = 200$$

$\therefore$ Rate = Rs 200 per km

(ii) At $x = 0$, $y = 5000$, so the line passes through $(0, 5000)$.

Point-slope form: $y - 5000 = 200(x - 0)$

$\therefore y = 200x + 5000$

(iii) Cost for 180 km: $y = 200(180) + 5000 = 36000 + 5000$

$\therefore$ Rs 41,000

10 **At latitude 25° the average temperature is 67°F, and at latitude 32° it is 54°F. Find the temperature at latitude 39°.**

Let x = latitude and y = temperature (°F).

Points: $(25, 67)$ and $(32, 54)$.

$$m = \frac{54 - 67}{32 - 25} = -\frac{13}{7}$$

$$y - 67 = -\frac{13}{7}(x - 25)$$

$$x = 39: \; y - 67 = -\frac{13}{7}(14) = -26 \Rightarrow y = 41$$

$\therefore$ Temperature at latitude 39° = 41°F

11 **The length and width of a rectangular plot are in the ratio 2 : 1.**

Let length = y ft and width = x ft.

(i) $y : x = 2 : 1 \Rightarrow \frac{y}{x} = \frac{2}{1}$

$\therefore y = 2x$ ...(i)

If the width is 30 ft: $y = 2(30)$

$\therefore$ Length = 60 ft

(ii) Comparing (i) with $y = mx + c$: $m = 2$. The length is always 2 times the width.