DAY 6

APPLICATION OF LINEAR EQUATIONS

With the help of linear equations we will solve several types of practical problems. To solve these problems, first we convert them in the form of equations then we will solve them.

1. **The coach of a cricket team buys 3 bats and 6 balls for ₹3900. Later he buys 2 bats and 2 more balls of the same kind for ₹ 2300. Find the coast of one bat and one ball each.** **[NCERT Ex. 3.1, Q3]**

Sol: Suppose cost of a bat = ₹ x and cost of a chair = ₹ y.

Acc to question: **Cost of 3 bats and 6 balls = ₹3900**

$\Rightarrow \quad 3x + 6y = 3900 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$ i)

and **Cost of 2 bats and 2 balls = ₹ 2300**

$\Rightarrow \quad 2x + 2y = 2300 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$ ii)

{Now both equations can be solved by any of the method discussed previous}

To equate the coefficients of x, multiply i) by 2 & Multiply ii) by 3 & subtract, we get

$$(6x + 12y) - (6x + 6y) = 7800 - 6900$$

$$\Rightarrow 6x + 12y - 6x - 6y = 900 \quad \Rightarrow 6y = 900 \quad \Rightarrow y = \frac{900}{6} = \mathbf{150}$$

Replace value of y in i), we get

$$\text{i)} \Rightarrow 3x + 6\boldsymbol{y} = 3900 \quad \Rightarrow 3x + 6(\mathbf{150}) = 3900$$

$$\Rightarrow 3x + 900 = 3900 \quad \Rightarrow 3x = 3900 - 900 = 3000 \quad \Rightarrow x = \frac{3000}{3} = \mathbf{1000}$$

$\therefore$ Cost of a bat is ₹1000 and cost of a ball is ₹150.

2. **2 tables & 3 chairs cost ₹ 425 and 3 tables & 2 chairs cost ₹ 350. What are the prices of a table & a chair?**

Sol: Suppose Cost of a table = x Rs. And cost of a chair = y Rs.

Acc to question **2 tables & 3 chairs cost = ₹ 425**

$\Rightarrow \quad 2x + 3y = 425 \ldots\ldots\ldots\ldots$ i)

and **3 tables & 2 chairs cost = ₹ 350**

$\Rightarrow \quad 3x + 2y = 350 \ldots\ldots\ldots\ldots\ldots$ ii)

To equate the coefficients of x, multiply i) by 3 & Multiply ii) by 2 & subtract, we get

$$\Rightarrow (6x + 9y) - (6x + 4y) = 1275 - 700 \quad \Rightarrow 5y = 575$$

$$\Rightarrow y = \frac{575}{5} = \mathbf{115}$$ Replace value of y in i), we get

$$\text{i)} \Rightarrow 2x + 3\boldsymbol{y} = 425 \quad \Rightarrow 2x + 3(115) = 425$$

$$\Rightarrow 2x = 425 - 345 = 80$$

$$\Rightarrow x = \frac{80}{2} = \mathbf{40}$$

$\therefore$ Price of Table is 40 Rs. & Price of chair is 115 Rs.

EXERCISE

1. The cost of 2 pencils & 3 erasers is ₹9 and the cost of 3 pencils & 4 erasers is ₹ 13. Find the cost of each pencil & eraser.
2. 5 tables & 2 chairs cost ₹ 1625 and 2 tables & 1 chair cost ₹ 750. What is the cost of 1 table and 1 chair?
3. 2 kg apples and 1 kg grapes cost ₹160, while 5kg apples and 3kg grapes of same kind cost ₹420. Find the cost of 1kg apples and 1kg grapes.
4. The cost of 5 pencils & 7 pens is ₹50 and the cost of 7 pencils & 5 pens is ₹ 46. Find the cost of each pencil & pen. [NCERT Ex. 3.2, Q 1(ii)]
5. Exercise 3.3, Q3
6. Example 14

3. A fraction becomes $\frac{9}{11}$, if 2 is added to both the numerator and the denominator. If 3 is added to both the numerator and denominator, it becomes $\frac{5}{6}$. Find the fraction. [NCERT Ex. 3.3, Q 3(v)]

Sol :- Acc to question: $\frac{\text{Numerator}+2}{\text{Denominator}+2} = \frac{9}{11}$ and $\frac{\text{Numerator}+3}{\text{Denominator}+3} = \frac{5}{6}$

Let numerator $= x$ and denominator $= y$ So fraction $= \frac{x}{y}$

First Equation $\frac{x+2}{y+2} = \frac{9}{11} \Rightarrow 11(x+2) = 9(y+2)$

$\Rightarrow 11x + 22 = 9y + 18$

$\Rightarrow 11x - 9y = 18 - 22 = -4 \ldots\ldots\ldots\ldots\ldots\ldots \text{i)}$

Second Equation $\frac{x+3}{y+3} = \frac{5}{6} \Rightarrow 6(x+3) = 5(y+3) \Rightarrow 6x + 18 = 5y + 15$

$\Rightarrow 6x - 5y = 15 - 18 = -3 \ldots\ldots\ldots\ldots\ldots\ldots \text{ii)}$

Multiply i) by 6 and ii) by 11 then subtract both, we get

$\Rightarrow 6(11x - 9y) - 11(6x - 5y) = 6 \times (-4) - 11 \times (-3)$

$\Rightarrow 66x - 54y - 66x + 55y = -24 + 33 \Rightarrow \boldsymbol{y = 9}$

Replace value of y in equation i), we get

i) $\Rightarrow 11x - 9y = -4 \Rightarrow 11x - 9(9) = -4 \Rightarrow 11x - 81 = -4$

$\Rightarrow 11x = -4 + 81 = 77 \Rightarrow x = \frac{77}{11} = \mathbf{7}$

$\therefore$ Required Fraction is $\frac{7}{9}$

4. If we add 5 to the numerator and subtract 5 from the denominator of a fraction, it reduces to $\frac{1}{7}$. If we subtract 3 from the numerator and add 3 to its denominator. It reduces to $\frac{1}{3}$. Find the fractions.

Sol :- Acc to question: $\frac{\textbf{Numerator}+5}{\textbf{Denominator}-5}=\frac{1}{7}$ and $\frac{\textbf{Numerator}-3}{\textbf{Denominator}+3}=\frac{1}{3}$

Let numerator $= x$ & denominator $= y$ So fraction $=\frac{x}{y}$

First Equation $\frac{x-5}{y+5}=\frac{1}{7} \Rightarrow 7(x-5)=y+5 \Rightarrow 7x-35=y+5$

$\Rightarrow 7x-y=5+35=40$ ..... i)

Second Equation $\frac{x-3}{y+3}=\frac{1}{3} \Rightarrow 3(x-3)=y+3 \Rightarrow 3x-9=y+3$

$\Rightarrow 3x-y=3+9=12$ ..... ii)

As in both equations coefficients of y are same so subtracting ii) from i),we get

$(7x-y)-(3x-y)=40-12 \Rightarrow 7x-y-3x+y=28$

$\Rightarrow 4x=28 \Rightarrow x=\frac{28}{4}=\mathbf{7}$

Replace value of x in equation ii), we get

ii) $\Rightarrow 3\boldsymbol{x}-y=12 \Rightarrow 3(\mathbf{7})-y=12$

$\Rightarrow 21-y=12 \Rightarrow y=21-12=9$

$\therefore$ Required Fraction is $\frac{x}{y}=\frac{7}{9}$

EXERCISE

1. Exercise 3.4, Q 2(i)
2. Exercise 3.5, Q 4(ii)