$$\Rightarrow x = \frac{65}{5} \text{ (Dividing both sides by 5)}$$

$$\Rightarrow x = 13$$

$$\Rightarrow 4x = 4 \times 13 = 52$$
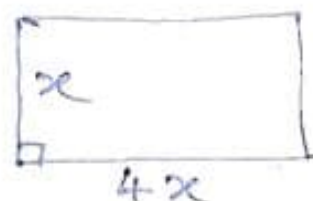
∴ the numbers are $x = 13$ and $4x = 52$

5. The length of a rectangle is 4 times the breadth. If the perimeter is 125 m, find the length and breadth of the rectangle.

Solution: suppose breadth = x m

Then Length = $4x$ m

Perimeter = 125 m (given)

But, perimeter = 2 (Length + Breadth)

$$\Rightarrow 125 m = 2(4x + x)$$

$$\Rightarrow 125 m = 2(5x)$$

$$\Rightarrow 125 = 10x$$

$$\Rightarrow x = \frac{125}{10} \text{ (Dividing both sides by 10)}$$

$$\Rightarrow x = 12.5 m.$$

∴ $\Rightarrow 4x = 4 \times 12.5 m = 50 m$

∴ Length = $4x$ = 50 m

and Breadth = x = 12.5 m

6. In a school, the number of female teachers is 11 more than the number of male teachers. If the total number of teachers in the school is 55, how many are male and how many are female?

Solution: Suppose male Teachers = x

Then Female Teachers = $x + 11$

Total no. of teachers = 55

$$\Rightarrow x + (x + 11) = 55$$

$$\Rightarrow 2x + 11 = 55$$

$$\Rightarrow 2x = 55 - 11 = 44$$

$$\Rightarrow x = \frac{44}{2} = 22$$

$$\Rightarrow x + 11 = 22 + 11 = 33$$

∴ Male teachers = 22

Female Teachers = $x + 11 = 33$

7. Tinku is 5 years younger than his brother. If the sum of their ages is 43 years, now, find their present ages and their ages 2 years later.

Solution: Suppose age of Tinku = x years

Then, Age of Tinku's brother = $(x + 5)$ years

Sum of their ages = 43 years

$$\Rightarrow x + (x + 5) = 43$$

$$\Rightarrow x + x + 5 = 43$$

$$\Rightarrow 2x + 5 = 43$$

$$\Rightarrow 2x = 43 - 5 = 38$$

$$\Rightarrow x = \frac{38}{2} = 19$$

$$\Rightarrow x + 5 = 19 + 5 = 24$$

∴ Age of Tinku (present) = x = 19 years.

Age of Tinku's Brother (present) = x + 5

= 24 years.

Age of Tinku (2 years later) = 19 + 2

= 21 years.

Age of Tinku's Brother
(2 years later) = 24 + 2

= 26 years.

8. Pinky's mother's age is 4 years more than 3 times Pinky's age. If the sum of their ages is 44 years, find the age of Pinky's mother. [HOTS]

Solution: Suppose pinky's age = x years.

Then, 3 times Pinky's age = 3x years.

∴ Pinky's mother's age = $(3x + 4)$ years.

Sum of their ages = 44 years.

$\Rightarrow x + (3x + 4) = 44$

$\Rightarrow x + 3x + 4 = 44$

$\Rightarrow 4x + 4 = 44$

$\Rightarrow 4x = 44 - 4 = 40$

$\Rightarrow x = \dfrac{40}{4} = 10$

$\Rightarrow 3x = 3 \times 10 = 30$

$\Rightarrow 3x + 4 = 30 + 4 = 34$ years.

∴ Pinky's mother age = 34 years.

9. Malini will be 6 times her present age after 30 years. How old is she now? [HOTS]

Solution : Suppose Malini present age $= x$ years

then, Malini age after 30 years $= (x+30)$ years

But given that,

Malini age after (30 years) $= 6 \times$ (Malini present) age.

$$\therefore \quad x + 30 = 6x$$
$$\implies \quad 30 = 6x - x$$
$$\implies \quad 5x = 30$$
$$\implies \quad x = \frac{30}{5} = 6 \text{ years.}$$

$\therefore$ Malini present age $= 6$ years.

10. Mrs. Gill won certain prize money in a cooking competition. She spent half the prize money on clothes, one third on crockery and gave away the remaining ₹ 2000 to an orphanage. How much prize money did she win? [HOTS]

Solution : Suppose prize money Mrs. Gill

Won in Cooking Competition $= Rs\ x$

Prize Money Spent on clothes $= \frac{1}{2} x$

Prize money Spent on Crockery $= ₹ \frac{1}{3} x$

Remaining prize money $= ₹ 2000$

$\therefore$ prize money $= \left(\frac{1}{2} x + \frac{1}{3} x + 2000 \right)$ Rupees.

$\therefore \quad x = \frac{1}{2} x + \frac{1}{3} x + 2000$

LCM of 2 and 3 = 6

∴ Multiplying both sides by 6
We get,

$$6x = (6 \times \frac{x}{2}) + (6 \times \frac{x}{3}) + (6 \times 2000)$$

$$\Rightarrow 6x = 3x + 2x + 12000$$

$$\Rightarrow 6x - 5x = 12000$$

$$\Rightarrow x = 12000.$$

∴ prize money Mrs. Gill won = ₹ 12000.

11. Salim wishes to visit his grandparents' village during school holidays. He plans to travel $\frac{2}{3}$ rd of the distance by train, $\frac{1}{4}$ th by bus and the remaining 50 km by a taxi. What is the distance to be covered? **[HOTS]**

Solution: Suppose Total Distance = x km

Distance travelled by Train = $\frac{2x}{3}$ km.

Distance travelled by Bus = $\frac{1}{4} x$ km.

Distance travelled by Taxi = 50 km.

∴ Distance to be covered = $(\frac{2x}{3} + \frac{x}{4} + 50)$ km

∴ $x = (\frac{2x}{3} + \frac{x}{4} + 50)$

$\Rightarrow$ LCM of 3 and 4 = 12

Multiplying both sides by 12
We get,

$$12x = (12 \times \frac{2x}{3}) + (12 \times \frac{x}{4}) + (12 \times 50)$$

$$\Rightarrow \quad 12x = 8x + 3x + 600$$
$$\Rightarrow \quad 12x - 8x - 3x = 600$$
$$\Rightarrow \quad 12x - 11x = 600$$
$$\Rightarrow \quad x = 600$$

∴ The Distance to be Covered $= x$

$$= 600 \text{ Km}.$$

12. The cost of a school bag is ₹ 80 more than twice the cost of a tiffin box. Find the cost of school bag, if the total cost is ₹ 260.

___

Solution: Suppose cost of tiffin box = ₹ x

Then, twice the cost of tiffin box = ₹ $2x$

Cost of School bag = ₹ $(2x + 80)$

Total cost $= ₹\, x + ₹\,(2x + 80)$

$\quad "" \quad\quad "" \quad = ₹\, 260$ (given.

$$\therefore \quad x + (2x + 80) = 260$$
$$\Rightarrow \quad x + 2x + 80 = 260$$
$$\Rightarrow \quad 3x + 80 = 260$$
$$\Rightarrow \quad 3x = 260 - 80 = 180$$
$$\Rightarrow \quad x = \frac{180}{3} = 60$$
$$\Rightarrow \quad 2x + 80 = (2 \times 60) + 80$$
$$\quad = 120 + 80$$
$$\quad = 200$$

∴ Cost of School Bag = ₹ 200

___ × ___

MISCELLANEOUS EXERCISE

1. Identify the linear equations from the following :

    (i) $2x^2 + 19 = 4x$

    (ii) $4y - 11y^3 = 15$

    (iii) $3x + 11 = 4x - 6$

    (iv) $9x^2 = 81$

Solution : (iii) $3x + 11 = 4x - 6$ is linear equation. All other equations are not linear.

2. Write an equation for each of the following statements :

    (i) One-third of a number is 96.

    (ii) The difference of a number and its third is 80.

    (iii) Twice a number subtracted from one-fourth the number is 49.

Solution : (i) $\dfrac{x}{3} = 96$

(ii) $x - \dfrac{1}{3}x = 80$

(iii) $\dfrac{x}{4} - 2x = 49$

3. Solve the following equations and check the answer :

    (i) $5a + 7 = 2a - 5$

    (ii) $15m + \dfrac{2}{3} = \dfrac{5}{3} + 14m$

    (iii) $4(x + 2) - 3(2 - 5x) = 5(3x - 2)$ [HOTS]

    (iv) $\dfrac{2}{7}(x - 9) + \dfrac{x}{3} = 3$

    (v) $7(x - 4) + 2(3 - x) = 3(2x - 8)$ [HOTS]

    (vi) $2.4(3 - x) - 0.6(2x - 3) = 0$

Solution : (i) $5a + 7 = 2a - 5$

$5a - 2a = -5 - 7$

$3a = -12$

$a = \dfrac{-12}{3} = -4$

$\therefore a = -4$ is the solution.

check : LHS $= 5a + 7 =$

$= 5(-4) + 7$

$= -20 + 7 = -13$

RHS $= 2a - 5$

$\qquad = 2(-4) - 5$

$\qquad = -8 - 5 = -13$

$\therefore$ LHS $= -13 =$ RHS

$\therefore a = -4$ is the solution.

ii) $\quad 15m + \dfrac{2}{3} = \dfrac{5}{3} + 14m$

multiplying both sides by 3
we get,

$\qquad 45m + 2 = 5 + 42m$

$\implies 45m - 42m = 5 - 2$

$\implies \quad 3m = 3$

$\implies \quad m = \dfrac{3}{3} = 1$

check : LHS $= 15m + \dfrac{2}{3}$

$\qquad = (15 \times 1) + \dfrac{2}{3}$

$\qquad = 15 + \dfrac{2}{3} = \dfrac{47}{3}$

RHS $= \dfrac{5}{3} + 14m$

$\qquad = \dfrac{5}{3} + 14(1)$

$\qquad = \dfrac{5}{3} + 14 = \dfrac{5 + 42}{3}$

$\qquad = \dfrac{47}{3}$

$\therefore$ LHS $= \dfrac{47}{3} =$ RHS

$\therefore m = 1$ is the solution.

(iii) $4(x+2) - 3(2-5x) = 5(3x-2)$

$\Rightarrow 4x + 8 - 6 + 15x = 15x - 10$

$\Rightarrow 4x + 15x - 15x = -10 + 6 - 8$

$\Rightarrow 4x = -12$

$\Rightarrow x = \dfrac{-12}{4} = -3 \text{ (Solution)}$

check : $LHS = 4(x+2) - 3(2-5x)$

$= 4(-3+2) - 3(2 - 5(-3))$

$= 4(-1) - 3(2 + 15)$

$= -4 - 3(17)$

$= -4 - 51$

$= -55$

$RHS = 5(3x-2)$

$= 5(3(-3) - 2)$

$= 5(-9 - 2)$

$= 5(-11)$

$= -55$

$\therefore LHS = -55 = RHS$

$\therefore x = -3$ is the solution.

(iv) $\dfrac{2}{7}(x-9) + \dfrac{x}{3} = 3$

LCM of 7 and 3 = 21

$\therefore$ Multiplying both sides by 21

We get

$$21 \times \frac{2}{7}(x-9) + \left(21 \times \frac{x}{3}\right) = 21 \times 3$$

$$\Rightarrow 6(x-9) + 7x = 63$$
$$\Rightarrow 6x - 54 + 7x = 63$$
$$\Rightarrow 13x = 63 + 54$$
$$\Rightarrow 13x = 117$$
$$\Rightarrow x = \frac{117}{13} = 9 \text{ (Solution)}$$

check: $LHS = \frac{2}{7}(x-9) + \frac{x}{3}$

$$= \frac{2}{7}(9-9) + \frac{9}{3}$$
$$= \frac{2}{7}(0) + 3$$
$$= 0 + 3 = 3 = RHS$$

$\therefore LHS = 3 = RHS$
$\therefore x = 9$ is the solution.

$\Rightarrow$ 7(x-4) + 2(3-x) = 3(2x-8)

$$\Rightarrow 7x - 28 + 6 - 2x = 6x - 24$$
$$\Rightarrow 7x - 2x - 6x = -24 + 28 - 6$$
$$\Rightarrow -x = -2$$
$$\Rightarrow x = 2 \text{ (Solution)}$$

check: $LHS = 7(x-4) + 2(3-x)$
$$= 7(2-4) + 2(3-2)$$

$$= 7(-2) + 2(1)$$
$$= -14 + 2$$
$$= -12$$

$$RHS = 3(2x - 8)$$
$$= 3(2(2) - 8)$$
$$= 3(4 - 8)$$
$$= 3(-4)$$
$$= -12$$

$$\therefore LHS = -12 = RHS$$

$$\therefore x = 2 \text{ is the solution.}$$

vi) $2.4(3 - x) - 0.6(2x - 3) = 0.$

$$\Rightarrow \frac{24}{10}(3 - x) - \frac{6}{10}(2x - 3) = 0.$$

multiplying both sides by 10
we get

$$\Rightarrow 24(3 - x) - 6(2x - 3) = 0$$

$$\Rightarrow 72 - 24x - 12x + 18 = 0$$

$$\Rightarrow 72 + 18 - 36x = 0$$

$$\Rightarrow 90 = 36x$$

$$\Rightarrow x = \frac{90}{36} = \frac{10}{4} = \frac{5}{2} \text{ (solution)}$$
$$= 2.5$$

check: $LHS = 2.4(3 - x) - 0.6(2x - 3)$

$$= 2.4(3 - 2.5) - 0.6(2(2.5) - 3)$$

$$= (2.4)(0.5) - (0.6)(5 - 3)$$

$$= \left(\frac{24}{10} \times \frac{5}{10}\right) - \left(\frac{6}{10}\right)^2$$

$$= \frac{120}{100} - \frac{12}{10}$$

$$= \frac{120}{100} - \frac{120}{100} = 0 = RHS$$

$$\therefore LHS = 0 = RHS$$

$$\therefore \quad x = 2.5 \text{ is the solution.}$$

4. The sum of three consecutive numbers is 105. Find the numbers.

Solution: Suppose the numbers are

$$x, \; x+1, \; x+2$$

$$\text{Sum} = 105 \text{ (given)}$$

$$\therefore \quad x + (x+1) + (x+2) = 105$$

$$\Rightarrow x + x + x + 1 + 2 = 105$$

$$\Rightarrow 3x + 3 = 105$$

$$\Rightarrow 3x = 105 - 3 = 102$$

$$\Rightarrow x = \frac{102}{3} = 34$$

$$\Rightarrow x + 1 = 34 + 1 = 35$$

$$\Rightarrow x + 2 = 34 + 2 = 36$$

$$\therefore \text{ the numbers are } 34, 35 \text{ and } 36.$$

5. Divide 128 into two parts such that one part is 2 less than the other.

Solution: Suppose the two parts are
$$x \text{ and } (x+2).$$

$$\text{Then,} \quad x + (x+2) = 128$$

$$\Rightarrow x + x + 2 = 128$$

$$\Rightarrow 2x + 2 = 128$$

$$\Rightarrow 2x = 128 - 2$$
$$\Rightarrow 2x = 126$$
$$\Rightarrow x = \frac{126}{2} = 63$$
$$\Rightarrow x + 2 = 63 + 2 = 65$$

∴ the two parts are 63 and 65

6. **Vandana's Mother's age is 6 years more than twice Vandana's age. If the sum of their ages is 57, find their ages.**

Solution: Suppose Vandana's age = x years.

Then, Twice Vandana's age = $2x$ years.

∴ Vandana's Mother's age = $(2x + 6)$ years.

Sum of their ages = 57 (given)

$$\therefore x + (2x + 6) = 57$$
$$\Rightarrow x + 2x + 6 = 57$$
$$\Rightarrow 3x + 6 = 57$$
$$\Rightarrow 3x = 57 - 6 = 51$$
$$\Rightarrow x = \frac{51}{3} = 17$$
$$\Rightarrow 2x + 6 = 2(17) + 6$$
$$= 34 + 6$$
$$= 40$$

∴ Vandana's age = 17 years.

Vandana's mother's age = 40 years.

7. **Find two consecutive natural numbers whose sum is 63.**

Solution: Suppose the two numbers are x and $(x + 1)$

Sum = 63 (given)

$\Rightarrow x + (x+1) = 63$

$\Rightarrow x + x + 1 = 63$

$2x + 1 = 63$

$2x = 63 - 1$

$2x = 62$

$\Rightarrow x = \dfrac{62}{2} = 31$

$\Rightarrow x + 1 = 31 + 1 = 32$

∴ The two consecutive numbers are 31 and 32

8. Find two consecutive positive odd integers whose sum is 76.

Solution: Suppose the two consecutive positive odd integers are x and $(x+2)$

Their Sum = 76 (given)

∴ $x + (x+2) = 76$

$\Rightarrow x + x + 2 = 76$

$\Rightarrow 2x + 2 = 76$

$\Rightarrow 2x = 76 - 2 = 74$

$\Rightarrow x = \dfrac{74}{2} = 37$

$\Rightarrow x + 2 = 37 + 2 = 39$

∴ the two consecutive positive odd integers are 37 and 39

9. A number is $\frac{2}{5}$ times another number. If their sum is 70, find the numbers.

Solution: suppose the number = x

∴ Another number = $\frac{2}{5}x$

Sum = 70 (given)

∴ $x + \frac{2}{5}x = 70$

multiplying both sides by 5

we get, $5x + 2x = 350$

$\Rightarrow 7x = 350$

$\Rightarrow x = \frac{350}{7} = 50$

$\Rightarrow \frac{2}{5}x = \frac{2}{5} \times 50 = 20$

∴ the numbers are 20 and 50.

10. In a class of 49 students, the number of girls is $\frac{1}{6}$ times the number of boys. Find the number of boys and girls in the class.

Solution: suppose number of Boys = x

Then, number of Girls = $\frac{1}{6}x$

Total number of students = 49

∴ $x + \frac{1}{6}x = 49$

multiplying both sides by 6

We get, $6x + x = 294$

$\Rightarrow 7x = 294$

$$\Rightarrow \quad x = \frac{294}{7} = 42$$

$$\Rightarrow \quad \frac{1}{6}x = \frac{1}{6} \times 42 = 7$$

∴ No. of Boys $= x = 42$

No. of Girls $= \frac{1}{6}x = 7$

MULTIPLE CHOICE QUESTIONS

Tick (✓) the correct option :

1. '7 more than twice x equals 15' can be represented as :

(a) $2x - 7 = 15$ (b) $x + 7 = 15$ (c) $x + 14 = 15$ (d) $2x + 7 = 15$

Answer : (d) $2x + 7 = 15$

2. $1 + 2x + 3x + 4x = 4x$ is an equation in :

(a) 1 variable (b) 2 variables (c) 3 variables (d) 4 variables

Answer : (a) 1 variable.

3. The statement form of the equation $\frac{m}{3} + 2 = 5$ is :

(a) On third of a number gives 5
(b) 2 added to half of a number gives 5.
(c) 2 more than one-third of a number is 5
(d) 3 more than half of a number gives 5.

Answer : (c)

4. The solution of the equation $3m - 5 = -7$ is :

(a) $m = -4$ (b) $m = 4$ (c) $m = -\frac{2}{3}$ (d) $m = -12$

Answer : (c) $m = \frac{-2}{3}$ $\begin{bmatrix} 3m - 5 = -7 \\ 3m = 5 - 7 = -2 \\ m = \frac{-2}{3} \end{bmatrix}$

5. If $2x + 4 = 12$, then $3x$ is equal to :

(a) 10 (b) 11 (c) 12 (d) 14

Answer : c (12) : $2x + 4 = 12$
$2x = 12 - 4 = 8$
$x = \frac{8}{2} = 4$
$3x = 3 \times 4 = 12$

6. The equation having $x = 5$ as a solution is :

   (a) $x + 3 = 8$ (b) $2x - 1 = 7$ (c) $\frac{x}{5} + 4 = 5$ (d) $x + \frac{1}{3} = \frac{7}{3}$

Answer : (c) $\frac{x}{5} + 4 = 5$

$$\frac{5}{5} + 4 = 5$$
$$1 + 4 = 5$$
$$5 = 5$$

7. A number added to itself gives 36. The number is :

   (a) 18   (b) 20   (c) 24   (d) 36

Answer : (a) 18

$$18 + 18 = 36$$
$$36 = 36$$

8. In x weeks and x days, there are :

   (a) x^2 days   (b) $7x^2$ days   (c) 7 days   (d) $7x + x$ days

Answer : (d) $7x + x$ days.

9. If $4x - 1 = 7$, then $x + 2$ is equal to :

   (a) 2   (b) 3   (c) 4   (d) 5

Answer : (c) 4

$$4x - 1 = 7$$
$$4x = 7 + 1 = 8$$
$$x = \frac{8}{4} = 2$$
$$\therefore x + 2 = 2 + 2 = 4$$

10. A number when multiplied by 3 exceeds itself by 14. The number is :

   (a) 14   (b) 7   (c) 21   (d) 10

Answer : (b) 7

$$3x = x + 14$$
$$\Rightarrow 2x = 14$$
$$\Rightarrow x = 7$$

VALUE BASED QUESTIONS

1. People of Sundargram planted a total of 102 trees in a village garden. Some of the trees were fruit trees. The number of non-fruit trees were two more than three times the number of fruit trees.

   (a) How many fruit trees were planted?

   (b) How many non-fruit trees were planted?

   (c) By planting trees, which value do the people of Sundargram depict?

Solution: Suppose number of fruit trees

$$= x$$

Then, Number of non fruit trees

$$= 3x + 2$$

Total no. of trees $= 102$ (given)

$$\therefore x + (3x + 2) = 102$$

$$\Rightarrow x + 3x + 2 = 102$$

$$\Rightarrow 4x = 102 - 2$$

$$\Rightarrow x = \frac{100}{4} = 25$$

$$\therefore \Rightarrow 3x + 2 = 3(25) + 2$$

$$= 75 + 2$$

$$= 77$$

$\therefore$ (a) Number of fruit trees $= 25$

(b) Number of Non fruit trees $= 77$

(c) they value Environment protection.

2. Children love to play different games. In a group of children two-fifths play cricket, one-fifth play badminton, one-fourth play football and the remaining 30 play other games.

(a) How many children are there in the group?

(b) How many play: (i) cricket? (ii) badminton? (iii) football?

(c) What do you think, playing games is good for our health or it is just a waste of time and energy?

Solution: Suppose no. of children $= x$

No. of children play cricket $= \frac{2}{5}x$

No. of children play badminton $= \frac{1}{5}x$

No. of children play football $= \frac{1}{4}x$

No. of children play other games $= 30$

No. of children in the group

$$= \frac{2}{5}x + \frac{1}{5}x + \frac{1}{4}x + 30$$

$$\therefore \quad x = \frac{2}{5}x + \frac{1}{5}x + \frac{1}{4}x + 30$$

LCM of 5 and 4 $= 20$

$\therefore$ multiplying both sides by 20 we get

$$\Rightarrow 20x = 8x + 4x + 5x + 600$$

$$\Rightarrow 20x - 8x - 4x - 5x = 600$$

$$\Rightarrow 3x = 600$$

$$\Rightarrow x = \frac{600}{3} = 200.$$

$$\Rightarrow \frac{2}{5}x = \frac{2}{5} \times 200 = 80$$

$$\Rightarrow \frac{1}{5}x = \frac{1}{5} \times 200 = 40$$

$$\Rightarrow \frac{1}{4}x = \frac{1}{4} \times 200 = 50.$$

∴ (a) there are 200 children in the group.

(b) 80 play cricket, 40 play badminton, 50 play football.

(c) It is good for our health.

MENTAL MATHS

Write T for true and F for false statements :

1. $2 \times 3 + 4 + 2 = 8$ is an equation. _____

Answer : F

2. $5x + 3 < 8$ is a linear equation in one variable. _____

Answer : F

3. LHS of the equation $1 - 2x = 7x$ is $1 - 2x$. _____

Answer : T

4. $x - \frac{3}{4} = 2x + 1$ can also be written as $x - 2x = 1 + \frac{3}{4}$. _____

Answer : T

5. $x^2 + 5 = 8$ is a simple equation. _____

Answer : F

6. The solution of $\frac{4x}{3} - 1 = 7$ is $x = 6$. _____

Answer : T

7. Sum of two consecutive natural numbers is always odd. _____

Answer : T

8. An equation remains unchanged if the LHS and RHS are interchanged. _____

Answer : T

9. We can always divide both sides of an equation by the same non-zero number. _____

Answer : T

10. $2 + (1 - 3x) = (x - 4) + 7$ is an equation in two variables. _____

Answer : F