

LINEAR EQUATION IN ONE VARIABLE

EQUATION: A statement of equality which contains one or more unknown quantity (variables).

eg: *i.* $3x + 7 = 12$ *ii.* $\frac{x}{3} + 5 = \frac{x}{3} - 5$ *iii.* $2x + \frac{y}{3} = 3$

LINEAR EQUATION: An equation involving only linear polynomials (i.e. power of variable as one)

eg: *i.* $3x - 2 = 7$ *ii.* $\frac{3}{2}x + 9 = \frac{1}{2}$ *iii.* $7x + 4 = 8$

SOLVING LINEAR EQUATION: It means determining the value of variable which satisfies it. Also called the solution, zero, root and answer of equation.

ILLUSTRATION

1. Verify that $x = 8$ is a solution of equation $\frac{5x-4}{8} - \frac{x-3}{5} = \frac{x+6}{4}$.

Sol. Substituting $x = 8$ in the equation, we get

$$\text{LHS } \frac{5 \times 8 - 4}{8} - \frac{8 - 3}{5} = \left(\frac{40 - 4}{8} \right) - \frac{5}{5} = \left(\frac{36}{8} \right) - 1 = \frac{9}{2} = \frac{9 - 2}{2} = \frac{7}{2}$$

$$\text{RHS } = \frac{x + 6}{4} = \frac{8 + 6}{4} = \frac{14}{4} = \frac{7}{2}$$

$$\therefore \text{LHS} = \text{RHS}$$

Hence, $x = 8$ is the root of given equation.

RULES FOR SOLVING LINEAR EQUATIONS IN ONE VARIABLE

Without changing the value of equation, we can

- Add a number on both sides of equation.
- Subtract a number on both sides of equation.
- Multiply a non zero number on both sides of equation.
- Divide a non zero number on both sides of equation.

ILLUSTRATION

2. Solve: $2m + 1 = 7$

Sol. $2m + 1 - 1 = 7 - 1$

$$2m = 6$$

[Subtract 1 on both sides]

$$\frac{2}{2}m = \frac{6}{2} = 3$$

[Divide 2 on both sides]

$$\therefore m = 3$$

3. Solve: $\frac{x}{5} + 11 = \frac{1}{15}$

Sol. $\frac{x}{5} + 11 - 11 = \frac{1}{15} - 11$

[Subtracting 11 on both sides]

$$\frac{x}{5} = \frac{15-165}{15}$$

$$\frac{x \times 5}{5} = 5 \times \frac{150}{15} = 50$$

[Multiply 5 on both sides]

$$x = 50$$

PRACTICE QUESTION - 1

1. Solve the following equation and check your answers.

a. $\frac{1}{3}x - \frac{5}{2} = 6$ b. $\frac{x}{2} + \frac{x}{3} - \frac{x}{4} = 7$ c. $\frac{y-1}{3} - \frac{y-2}{4} = 1$ d. $0.5m + 7.5 = 11.5$

e. $\frac{-13b}{2} = \frac{13}{5}$ f. $4y - 3.8 = 8.2$ g. $(x+2)(x+3) + (x-3)(x-2) - 2x(x+1) = 0$

h. $\frac{2x-1}{3} - \frac{6x-2}{5} = \frac{1}{3}$ i. $\frac{2}{3}(x-5) - \frac{1}{4}(x-2) = \frac{9}{2}$

TRANSPOSING

Equations can be solved by transposing terms i.e. moving them from one side of equation to other side. i.e. from LHS to RHS or vice versa.

ILLUSTRATION

4. Solve: $\frac{3m}{4} + 3 = 18$

Sol. $\frac{3m}{4} = 18 - 3$

[Transposing 3 on RHS]

$$\frac{3m}{4} = 15$$

$$3m = 15 \times 4$$

[Transposing 4 on RHS]

$$3m = 60$$

$$m = \frac{60}{3}$$

[Transposing 3 on RHS]

$$m = 30.$$

5. Solve: $3y - 28 = 17$

Sol. $3y = 17 + 28$

[Transposing 28 on RHS]

$$3y = 45$$

$$y = \frac{45}{3}$$

[Transposing 3 on RHS]

$$y = 15$$

PRACTICE QUESTION - 2

1. Solve the following equation and check your answers.

a. $9\frac{1}{4} = y - 1\frac{1}{3}$

b. $\frac{2}{3}(x-5) - \frac{1}{4}(x-2) = \frac{9}{2}$

c. $\frac{x}{2} + \frac{x}{8} = \frac{1}{8}$

d. $\frac{2x-1}{3} - \frac{6x-2}{5} = \frac{1}{3}$

e. $\frac{15(2-y) - 5(y+6)}{1-3y} = 10$

f. $(y+3)(y-3) - y(y+5) = 6$

VARIABLE ON BOTH SIDES OF EQUATION

Simplify both sides of equation & get the variable on one side, so as to find its value and solve the equation.

ILLUSTRATION

6. Solve: $10a - 28 = 6 - 79$

Sol. $10a + 7a - 28 = 6$

$$17a = 6 + 28$$

$$17a = 34$$

$$a = \frac{34}{17}$$

$$a = 2$$

7. Solve: $7(m+3) = 10m + 3$

Sol. $7m + 21 = 10m + 3$

$$7m - 10m = 3 - 21$$

$$-3m = -18$$

$$m = \frac{18}{3} = 6$$

PRACTICE QUESTION - 3

1. Solve the following equation and check your answers.

a. $\frac{m-1}{2} - \frac{m-2}{3} = \frac{m-4}{7}$

b. $5(b-2) + (b-3) = 2(2b+1) - 9$

c. $6(n+2) = 7n + 4$

d. $\frac{1}{4}x + \frac{1}{6}x = x - 7$

e. $x + 7 - \frac{8x}{3} = \frac{17}{6} - \frac{5x}{8}$

f. $\frac{3t-2}{4} - \frac{2t+3}{3} = \frac{2}{3} - t$

g. $0.16(5x-2) = 0.4x + 7$

h. $\frac{2x+5}{3} = 3x-10$

SOLVING EQUATION BY CROSS – MULTIPLICATION

ILLUSTRATION

8. Solve the equation: $\frac{m-5}{2} \times \frac{2m+5}{7}$

Sol. $7(m-5) = 2(2m+5)$

$$7m - 35 = 4m + 10$$

$$7m - 4m = 10 + 35$$

$$3m = 10 + 35$$

$$m = \frac{45}{3} = 15.$$

9. Solve: $\frac{4x+8}{5x+8} \times \frac{5}{6}$

Sol. $6(4x+8) = 5(5x+8)$

$$24x + 48 = 25x + 40$$

$$24x - 25x = 40 - 48$$

$$-x = -8 \Rightarrow x = 8$$

PRACTICE QUESTION - 4

1. Solve the following equation and check your answers.

a. $\frac{7y+2}{5} = \frac{6y-5}{11}$

b. $\frac{3x+5}{2x+7} = 4$

c. $\frac{2x-3}{3x+2} = \frac{-2}{3}$

d. $\frac{x+b}{a-b} = \frac{x-b}{a+b}$

e. $\frac{2-4}{y+7} = \frac{3}{5}$

f. $\frac{9m-8}{4m+5} = \frac{5}{3}$

APPLICATIONS OF LINEAR EQUATION

Equation help us to solve problems which contain conditions as to the relation of two or more quantities.

ILLUSTRATION

10. The perimeter of a rectangle is 62 cm. If the length is 5 cm more than the breadth, find the length and breadth.

Sol. Let the breadth be x cm.

Then the length will be $(x + 5)$ cm.

$$\text{Perimeter} = 2(l + b)$$

$$\text{So, } 2[(x + 5) + x] = 62$$

→ {Equation}

$$2(2x + 5) = 62$$

$$4x + 10 = 62$$

$$4x = 62 - 10$$

$$4x = 52 \Rightarrow x = \frac{52}{4} = 13$$

So, $x + 5 = 13 + 5 = 18$. The breadth is 13 cm, length is 18 cm.

11. The angles of a triangle are in the ratio of 2 : 3 : 4. Find their measures.

Sol. Let one angle be $2x$.

The other two angles will be $3x$ and $4x$. We know that the sum of the angles of a triangle is always 180° .

$$\text{So, } 2x + 3x + 4x = 180^\circ$$

→ {Equation}

$$9x = 180^\circ \Rightarrow x = \frac{180^\circ}{9} = 20^\circ$$

$$\text{So, } 2x = 2 \times 20 = 40^\circ$$

$$3x = 3 \times 20 = 60^\circ$$

$$4x = 4 \times 20 = 80^\circ.$$

The three angles are 40° , 60° and 80° .

12. Father's present age is 4 times Soham's age. After 5 years, father's age will be 3 times Soham's age. Find their present ages.

Sol. Let Soham's present age be x .

So, father's present age will be $4x$.

After 5 years, Soham's age will be $x + 5$ and Father's age will be $4x + 5$.

It is given that Father's age will be three times Soham's age then

$$\text{So, } 4x + 5 = 3(x + 5)$$

→ {Equation}

$$4x + 5 = 3x + 15$$

$$4x - 3x = 15 - 5$$

$$x = 10$$

$$\text{and } 4x = 4 \times 10 = 40$$

$$\therefore \text{ Soham age} = \frac{x}{4} = \frac{40}{4} = 10 \text{ years}$$

Soham's present age is 10 years and father's present age is 40 years.

13. Madhu was collecting money from the class for a picnic. She has requested her friends to give either notes of Rs 50 or Rs 20. She found she had four times more notes of Rs 50 than Rs 20. If the total amount collected is Rs 1100, how many notes of each kind does she have?

Sol. Let the number of Rs 20 notes be x .

So, number of Rs 50 notes will be $4x$.

Total value of Rs 20 notes is $20 \times x = 20x$

Total value of Rs 50 notes is $50 \times 4x = 200x$

$$\text{So, } 20x + 200x = 1100$$

→ {Equation}

$$\text{So, } 220x = 1100$$

$$x = \frac{1100}{220} = 5$$

$$x = 5$$

$$4x = 4 \times 5 = 20$$

There are 5 notes of Rs 20 each and 20 notes of Rs 50 each.

14. The sum of three consecutive multiples of 7 is 84. Find the three multiples.

Sol. Let one multiple be x .

So, the other two will be $x + 7$ and $(x + 7) + 7 = x + 14$

$$x + x + 7 + x + 14 = 84$$

→ {Equation}

$$\text{or } 3x + 7 + 14 = 84$$

$$3x + 21 = 84$$

$$3x = 84 - 21 = 63$$

$$x = \frac{63}{3} = 21$$

$$x = 21.$$

So, $x + 7 = 28$, $x + 14 = 35$. The multiples are 21, 28 and 35.

- 15.** The digits of a two digit number differ by 3. If the digits are interchanged and the two numbers are added. their sum is 77. Find the numbers.

Sol. Let the digit in the unit's place be x . Then the digit in the ten's place will be $x + 3$.

$$\text{Value of number will be } 10 \times (x + 3) + x = 10x + 30 + x = 11x + 30$$

If we reverse the digits, the digit in unit's place will be $(x + 3)$ and digit in ten's place will be x .

$$\text{Value of this number will be } 10 \times x + (x + 3) = 10x + x + 3 = 11x + 3$$

Sum of the two numbers is 77.

$$\text{So, } (11x + 30) + (11x + 3) = 77$$

→ {Equation}

$$\text{or } 11x + 11x + 30 + 3 = 77$$

$$22x + 33 = 77$$

$$22x = 77 - 33$$

$$22x = 44$$

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

$$x + 3 = 2 + 3 = 5$$

The two numbers are 52 and 25.

- 16.** The denominator of a fraction is 7 more than the numerator. If 1 is added to the numerator and 6 is added to the denominator the value of the fraction is $\frac{1}{2}$. Find the numerator and the denominator.

Sol. Let the numerator be x .

Then the denominator will be $x + 7$.

To the numerator, 1 is added i.e. $x + 1$.

To the denominator, 6 is added i.e. $(x + 7) + 6$.

$$\frac{x+1}{(x+7)+6} = \frac{1}{2}$$

→ {Equation}

$$\frac{x+1}{x+13} = \frac{1}{2}$$

Let us cross multiply.

$$\text{So, } 2(x + 1) = 1(x + 13)$$

$$2x + 2 = x + 13$$

$$2x - x = 13 - 2$$

$$x = 11. \text{ So, } x + 7 = 11 + 7 = 18$$

The fraction is $\frac{11}{18}$.

17. The sum of two numbers is 3500. If 6% of one number is equal to 8% of the other, find the numbers.

Sol. Let one number be x .

Then the other number will be $(3500 - x)$.

[As sum is 3500]

$$6\% \text{ of } x = \frac{6}{100} \times x = \frac{6x}{100}$$

$$8\% \text{ of } (3500 - x) = \frac{8}{100} \times (3500 - x)$$

$$\frac{8 \times 3500}{100} - \frac{8x}{100} = 280 - \frac{8x}{100}$$

$$\frac{6x}{100} = 280 - \frac{8x}{100}$$

→ {Equation}

Multiply both sides by 100.

$$6x = 280 \times 100 - 8x \text{ or } 6x + 8x = 28000$$

$$14x = 28000$$

$$x = \frac{28000}{14} = 2000$$

$$3500 - x = 3500 - 2000 = 1500.$$

The numbers are 2000 and 1500

18. Two cars start from the same place at the same time but in opposite directions. Their speeds are 80 km/hr and 65 km/hr. After how long will they be 580 km apart?

Sol. Let the two cars be 580 km apart be after x hours.

First car's speed is 80 km/hr.

So, in x hours it travels $80 \times x$ km.

Second car's speed is 65 km/hr.

So, in x hours it has travelled $65 \times x$ km.

After x hrs they are 580 km apart.

$$\text{So, } (80 \times x) + (65 \times x) = 580$$

→ {Equation}

$$80x + 65x = 580$$

$$145x = 580$$

$$x = \frac{580}{145} = 4$$

They will be 580 km apart after 4 hours.

19. The total weight of 4 boxes is 74.5 kg. The weight of box A is 2.5 kg less than box B and weight of box C is 2.5 kg more than box B. The weight of box D is 2 kg more than box C. Find the weight of each box.

Sol. Let the weight of box A be x kg.

The weight of box B will be $(x + 2.5)$ kg

The weight of box C will be $(x + 2.5 + 2.5)$ kg = $(x + 5)$ kg

The weight of box D will be $(x + 5 + 2) = (x + 7)$ kg.

$$\text{So, } x + x + 2.5 + x + 5 + x + 7 = 74.5$$

→ {Equation}

$$4x + 2.5 + 5 + 7 = 74.5$$

$$4x + 14.5 = 74.5$$

$$4x = 74.5 - 14.5$$

$$4x = 60$$

$$\text{So, } x = \frac{60}{4} = 15$$

$$x = 15$$

$$x + 2.5 = 15 + 2.5 = 17.5$$

$$x + 5 = 15 + 5 = 20$$

$$x + 7 = 15 + 7 = 22$$

The weights of the boxes are 15 kg, 17.5 kg, 20 kg and 22 kg.

- 20.** The ratio of two numbers is 2 : 3. If both the numbers are increased by 8 their ratio becomes 10 : 13. Find the numbers.

Sol. As the ratio is 2 : 3, let the numbers be $2x$ and $3x$. Adding 8 to both, we get $2x + 8$ and $3x + 8$.

$$\frac{2x+8}{3x+8} = \frac{10}{13}$$

→ {Equation}

Let us cross multiply.

$$\text{So, } 13(2x + 8) = 10(3x + 8)$$

$$26x + 104 = 30x + 80$$

$$104 - 80 = 30x - 26x$$

$$24 = 4x$$

$$\text{So, } x = \frac{24}{4} = 6$$

$$2x = 6 \times 2 = 12$$

$$3x = 6 \times 3 = 18.$$

The two numbers are 12 and 18.

- 21.** Rs 2700 is to be divided among Asha, Babita and Simran such that Asha gets Rs 300 more than Babita and Simran gets half of what Asha gets.

Sol. Let Babita's share be x .

Then Asha's share is $x + 300$.

And Simran's share is $\frac{x+300}{2}$.

$$\text{So, } x + x + 300 + \frac{x+300}{2} = 2700$$

→ {Equation}

$$\text{or } 2x + 300 + \frac{x+300}{2} = 2700$$

$$\frac{x+300}{2} = 2700 - 300 - 2x = 2400 - 2x$$

$$x + 300 = 2(2400 - 2x) = 4800 - 4x$$

$$x + 300 = 4800 - 4x$$

$$x + 4x = 4800 - 300$$

$$5x = 4500$$

$$x = \frac{4500}{5} = 900$$

$$x + 300 = 900 + 300 = 1200$$

$$\frac{x+300}{2} = \frac{1200}{2} = 600.$$

Asha gets Rs 1200, Babita gets Rs 900 and Simran gets Rs 600.

- 22.** A group of people were asked to choose their favourite fruit. One fourth chose apple, one third chose banana and two fifth chose orange and three people chose litchi. How many people were there in the group?

Sol. Let the number of people be x .

So, $\frac{x}{4}$ chose apple, $\frac{x}{3}$ chose banana, $\frac{2x}{5}$ chose orange and 3 chose litchi.

$$\text{So, } \frac{x}{4} + \frac{x}{3} + \frac{2x}{5} + 3 = x$$

→ {Equation}

$$\frac{15x + 20x + 24x}{60} = x - 3$$

$$15x + 20x + 24x = 60(x - 3)$$

$$59x = 60x - 180$$

$$180 = 60x - 59x = x$$

$$\text{So, } x = 180.$$

There were 180 people.

- 23.** The distance between two stations is 550 km. Two trains start at the same time from the two stations on parallel tracks to cross one another. The speed of one train is 10 km/hr more than the other. If after 3 hours the trains are 40 km apart, find their respective speed.

Sol. Let the speed of one train be x km/hr.

So the speed of second train will be $(x + 10)$ km/hr.

In 3 hours train one will travel $3 \times x$ km

In 3 hours train two will travel $3 \times (x + 10)$ km.

They are 40 km apart.

$$\text{So, } 3x + 3(x + 10) + 40 = 550$$

→ {Equation}

$$3x + 3x + 30 + 40 = 550$$

$$6x = 550 - 70 = 480$$

$$x = \frac{480}{6} = 80$$

$$x = 80 \Rightarrow x + 10 = 90$$

The speed of train one and two are 80 km/hr and 90 km/hr respectively.

EXERCISE**SECTION - A**

Solve each of the following equations and also verify your solutions:

1. $9\frac{1}{4} = y - 1\frac{1}{3}$

2. $\frac{5x}{3} + \frac{2}{5} = 1$

3. $\frac{x}{2} + \frac{x}{3} + \frac{x}{4} = 13$

4. $\frac{x}{2} + \frac{x}{8} = \frac{1}{8}$

5. $\frac{x}{2} - \frac{4}{5} + \frac{x}{5} + \frac{3x}{10} = \frac{1}{5}$

6. $\frac{2x-1}{3} - \frac{6x-2}{5} = \frac{1}{3}$

7. $13(y-4) - 3y - 5(y+4) = 0$

8. $\frac{2}{3}(x-5) - \frac{1}{4}(x-2) = \frac{9}{2}$

9. $\frac{x}{2} - \frac{1}{5} = \frac{x}{3} + \frac{1}{4}$

10. $x + 7 - \frac{8x}{3} = \frac{17}{6} - \frac{5x}{8}$

11. $\frac{3t-2}{4} - \frac{2t+3}{3} = \frac{2}{3} - t$

12. $\frac{x+2}{6} - \left(\frac{11-x}{3} - \frac{1}{4}\right) = \frac{3x-4}{12}$

13. $0.16(5x-2) = 0.4x + 7$

14. $\frac{x+2}{3} - \frac{x+1}{5} = \frac{x-3}{4} - 1$

15. $\frac{2x+5}{3} = 3x - 10$

16. $\frac{a-8}{3} = \frac{a-3}{2}$

17. $\frac{7y+2}{5} = \frac{6y-5}{11}$

18. $x - 2x + 2 - x + 5 = 3 - \frac{7}{2}x$

19. $\frac{3}{4}x + 4x = \frac{7}{8} + 6x - 6$

20. $\frac{7}{2}x - \frac{5}{2}x = \frac{20}{3}x + 10$

21. $\frac{6x+1}{2} + 1 = \frac{7x-3}{3}$

22. $\frac{3a-2}{3} + \frac{2a+3}{2} = a + \frac{7}{6}$

23. $x - \frac{(x-1)}{2} = 1 - \frac{(x-2)}{3}$

24. $\frac{3x}{4} - \frac{(x-1)}{2} = \frac{(x-2)}{3}$

25. $\frac{5x}{3} - \frac{(x-1)}{4} = \frac{(x-3)}{5}$

26. $0.18(5x-4) = 0.5x + 0.8$

27. $\frac{4x}{9} + \frac{1}{3} + \frac{13}{108}x = \frac{8x+19}{18}$

28. $\frac{2x+1}{3x-2} = \frac{9}{10}$

29. $\frac{3x+5}{2x+7} = 4$

30. $\frac{2x-3}{3x+2} = -\frac{2}{3}$

31. $\frac{2-y}{y+7} = \frac{3}{5}$

32. $\frac{5x-7}{3x} = 2$

33. $\frac{4x+8}{5x+8} = \frac{5}{6}$

34. $\frac{2y+5}{y+4} = 1$

35. $\frac{2x+1}{3x-2} = \frac{5}{9}$

36. $\frac{2}{3}(4x-1) - \left(2x - \frac{1+x}{3}\right) = \frac{1}{3}x + \frac{4}{3}$

37. $\frac{15(2-y) - 5(y+6)}{1-3y} = 10$

38. $(2x+3)^2 + (2x-3)^2 = (8x+6)(x-1) + 22$

39. $\frac{x+b}{a-b} = \frac{x-b}{a+b}$

40. $\frac{17(2-x) - 5(x+12)}{1-7x} = 8$

41. $[(2x+3)+(x+5)]^2 + [(2x+3)-(x+5)]^2 = 10x^2 + 92$

SECTION – B (WORD PROBLEMS)

Type I : Number Problems

- Two numbers are in the ratio 8 : 3. If the sum of the numbers is 143, find the numbers.
- Two numbers are such that the ratio between them is 3 : 5. If each is increased by 10, the ratio between the new numbers so formed is 5 : 7. Find the original numbers.
- $\frac{2}{3}$ of a number is 20 less than the original number. Find the number.
- Four-fifths of a number is 10 more than two-thirds of the number. Find the numbers.
- Two numbers are in the ratio 5 : 8. If the sum of the numbers is 195, find the numbers.
- The sum of a certain even number and the fourth even number after it is 48. Find the number.
- Find three consecutive odd numbers whose sum is 147.
- Find three consecutive even numbers whose sum is 234.
- What are three consecutive integers whose sum is -54 ?
- The sum of four consecutive multiples of 7 is 126. Find the four multiples.
- The sum of 5 consecutive odd numbers is 135. Find the numbers.
- The sum of three consecutive multiples of 11 is 363, find these multiples.
- Three consecutive integers add up to 51. What are these integers?
- The sum of three consecutive multiples of 8 is 888. Find the multiples.
- A positive number is 5 times another number. If 21 is added to both the numbers, then one of the numbers becomes twice the other new number. What are the numbers?
- Two numbers are such that the ratio between them is 3:5. If each is decreased by 20, the ratio between the new numbers so formed is 5:7. Find original numbers.

Type II : Age Problems

- Kanwar is three years older than Anima. Six years ago, Kanwar's age was four times Anima's age. Find the ages of Kanwar and Anima.
- After 12 years I shall be 3 times as old as I was 4 years ago. Find my present age.
- The ages (in years) of Ramesh and Rahim are in the ratio 5 : 7. If Ramesh were 9 years older and

Rahim 9 years younger, the age of Ramesh would have been twice the age of Rahim. Find their ages.

- The ratio of Reema's age to Sadhna's age is 6 : 7. After 12 years the ratio of their ages will be 12 : 13. Find the their present ages.
- The present ages of Sahil's mother is three times the present age of Sahil. After 5 years their ages will add to 66 years. Find their present ages.
- The ages of Rahul and Harsh are in the ratio 5 : 7. Four years later the sum of their ages will be 56 years. What are their present ages?
- Baichung's father is 26 years younger than Baichung's grand father and 29 year's older than Baichung. The sum of the ages of all the three is 135 years, what is the age of each one of them?
- Shashi's mother's present age is six times Shashi's present age. Shashi's age five years from now will be one third of his mother's present age. What are their present agest?
- A grand father is ten times older than his grand daughter. He is also 54 years older than her. Find their present ages.
- Aman's age is three times his son's age. Ten years ago he was five times his son's age. Find their present ages?
- Present ages of Anu and Raj are in the ratio 4 : 5. Eight year's from now the ratio of their ages will be 5 : 6. Find their present ages.
- The ages of Hari and Harry are in the ratio 5 : 7, four years from now the ratio of their ages will be 3 : 4. Find their present ages.
- Raja's age is one fifth his father's age. After 6 years, his age will be one third his father's age. How old are they now?

Type III : Fraction Problems

- The denominator of a rational number is greater than its numerator by 8. If the numerator is increased by 17 and the denominator is decreased by 1, the number obtained is $\frac{3}{2}$. Find the rational number
- The numerator of a fraction is 6 less than two times the denominator. If 3 is added to the numerator, the fraction is equal to $\frac{2}{3}$. What is the original fraction?
- The denominator of a rational number is greater than its numerator by 3. If 3 is subtracted from the numerator & 2 is added to its denominator, the new number becomes 1.5. Find the original number.
- The denominator of a fraction is 7 more than the numerator. If 1 is added to the numerator and 6 is

added to denominator the value of the fraction is $\frac{1}{2}$. Find the fraction.

34. The numerator of a fraction is 7 less than the denominator. If 3 is added to the numerator and 2 is added to the denominator, the value of the fraction become $\frac{2}{3}$. Find the original fraction.

Type IV : Two – Digit Number Problems

35. The digit at the ten's place of a two digit number is three times the digit at one's place. If the sum of this number and the number formed by reversing its digits is 88, find the number.
36. The sum of the digits of a two digit number is 15. If the number formed by reversing the digits is less than the original number by 27, find the original number.
37. The sum of the digits of a two digit number is 12. If the number formed by reversing the digits is greater than the original number by 54, find the original number.
38. The digit at the ten's place of a two digit number is three times the digit at one's place. If the digits are reversed, the new number will be 36 less than the original number. Find the number.
39. The digit of a two-digit number differ by 3. If the digit are interchanged, and the resulting number is added to the original number we get 143. What can be the original number?

Type V : Money Denominations Problems

40. Deveshi has a total of Rs. 590 as currency notes in the denominations of Rs. 50, Rs. 20 and Rs. 10. The ratio of the number of Rs. 50 notes and Rs. 20 notes is 3 : 5. If she has a total of 25 notes how many notes of each denomination she has?
41. Lakshmi is a cashier in a bank. She has currency notes of denominations Rs. 100, Rs. 50 and Rs. 10 respectively. The ratio of the number of these notes is 2 : 3 : 5. The total cash with Lakshmi is Rs. 4,00,000. How many notes of each denomination does she have?
42. Manu has Rs. 90 in his piggy bank in Re 1 and 50 paise coins. If the number of Re 1 coins is twice that of 50 paise coins, how many coins of each kind are there?
43. Madhu was collecting money from the class for a picnic. She had requested her friends to give her either notes of Rs. 50 or Rs. 20. She found she had four times more notes of Rs. 50 than Rs. 20. If the total amount collected is Rs. 1100, how many notes of each kind does she have money?

44. I have a total of Rs. 300 in coins of denomination Rs. 1, Rs. 2 and Rs. 5. The number of Rs. 2 coins is 3 times the number of Rs. 5 coins. The total number of coins is 160. How many coins of each denomination are with me?

Type VI : Miscellenous Problems

45. The length of a room is two and half times its width. If the perimeter of the floor of the room is 70 m, find the length and width of the room.
46. Of the three angles of a triangle, the second is one-third the first and the third is 26° more than the first. How many degrees are there in each angle ?
47. Divide Rs. 1380 among Ahmed, John and Babita so that the amount Ahmed receives is 5 times as much as Babita's share and is 3 times as much as John's share.
48. An altitude of a triangle is five-thirds, the length of its corresponding base. If the altitude is increased by 4cm and the base is decreased by 2 cm, the area of the triangle remains the same. Find the base and altitude of the triangle.
49. Three prizes are to be distributed in a quiz contest. The value of the second prize is five-sixth of the first prize and the value of the third prize is four-fifth of the second prize. If the total value of the three prizes is Rs. 330, find the value of each prize.
50. The angles of a triangle are $2x^\circ$, $(3x-30)^\circ$ & $(4x-60)^\circ$. Find the angles. What kind of triangle is it?
51. Aman buys tables and chairs that cost him Rs. 250 and Rs. 200, respectively. For every 3 tables he buys 6 chairs. He sells the furniture at 20% and 25% profit respectively. The total sale is Rs.48,000. How many tables and chair did he buy?
52. The sides of a triangular garden are in the ratio 3:4: 5. At the rate Rs. 175 per metre it will cost the owner Rs. 84000 to fence the garden. What are the dimension of the garden?
53. Rs. 3900 is to be distributed between A, B and C as, A gets double of C and B gets Rs. 300 more than C. Find the share of A, B and C.
54. The weight of four boxes together is 66.5 kg. The weight of box B is 2kg less than box A and the weight of box C is 1.5 kg more than box A. If the weight of box D is 1.5 kg more than box C, find the weight of each box.
55. A group of people were asked to name their favourite colour. Half the people said white, one fourth said black, one eighth said red and 5 said blue. How many people were there in the group?
56. From sections A and B put together, half the

students opted for Karate, One fourth opted for basketball, one eighth opted for football, one tenth opted for taekwondo and 2 students opted for horse riding. How many students are there in section A of Class VIII, if both sections have the same number of students?

57. In a class the number of girls is $(\frac{3}{4})^{\text{th}}$ the numbers of boys. If the total number is 35, find the number of girls and boys.
58. Hasan buys two kinds of cloth materials for school uniforms; shirt material that costs him Rs. 50 per meter and trouser material that costs him Rs. 90 per meter. For every 2 meters of the trouser

material he buys 3 meters of the shirt material. He sells the materials at 12% and 10% profit respectively. His total sale is Rs. 36,600. How much trouser material did he buy?

59. The organisers of an essay competition decide that a winner in the competition gets a prize of Rs. 100 and a participant who does not win gets a prize of Rs. 25. The total prize money distributed is Rs. 3,000. Find the number of winners, if the total number of participants is 63.
60. Half of a herd of deer are grazing in the field and three fourths of the remaining are playing nearby. The rest 9 are drinking water from the pond. Find the number of deer in the herd.

PRACTICE ANSWERS

PRACTICE QUESTION - 1

1. a. $5\frac{1}{2}$ b. 12 c. 10 d. 8 e. $-\frac{2}{5}$
f. 3 g. 6 h. $-\frac{1}{2}$ i. $8\frac{8}{5}$

PRACTICE QUESTION - 2

1. a. $12\frac{7}{12}$ b. $8\frac{8}{5}$ c. $\frac{1}{5}$ d. $\frac{1}{5}$ e. 1 f. 3

PRACTICE QUESTION - 3

1. a. -31 b. 3 c. 8 d. 12 e. -4
f. 1 g. 18.3 h. -5

PRACTICE QUESTION - 4

1. a. 1 b. $\frac{23}{5}$ c. $\frac{12}{5}$ d. 29 e. $-\frac{31}{3}$ f. 7

EXERCISE ANSWERS

SECTION-A

1. $\frac{127}{12}$ 2. $\frac{9}{25}$ 3. 12 4. $\frac{1}{5}$ 5. 7
6. $-\frac{1}{2}$ 7. $7\frac{2}{5}$ 8. $\frac{88}{5}$ 9. $\frac{27}{10}$ 10. 4
11. 2 12. 11 13. 18.3 14. 19 15. 5
16. -7 17. -1 18. $8\frac{3}{5}$ 19. $4\frac{1}{10}$
20. $-\frac{30}{17}$ 21. $-\frac{15}{4}$ 22. $\frac{1}{3}$ 23. $\frac{7}{5}$ 24. -14
25. $-\frac{51}{73}$ 26. 3.8 27. 6 28. 4 29. $-\frac{23}{5}$
30. $\frac{5}{12}$ 31. $-\frac{11}{8}$ 32. -7 33. 8 34. -1
35. $-\frac{19}{3}$ 36. $x = 2\frac{1}{2}$ 37. $y = 1$ 38. $x = -1$
39. $x = -a$ 40. $x = 1$ 41. $x = \frac{6}{11}$

SECTION-B

1. 104, 39 2. 15&25 3. 60 4. 75
5. 75,120 6. 20 7. 47,49,51 8. 76, 78, 80
9. -19,-18,-17 10. 21, 28, 35, 42
11. 23,25,27,29,31 12. 110,121 & 132
13. 16, 17&18 14. 268, 296 & 304
15. 7, 35 16. 15 & 25 17. 7 yrs, 10 yrs
18. 12 yrs 19. 15yrs, 21 yrs
20. 12 yrs, 14 yrs 21. 14 years, 42 years
22. Rahul = 20 years, Harsh = 28 years
23. 17 years, 46 years and 72 years
24. 5 years, 30 years 25. 6 years, 60 years
26. 60 years, 20 years
27. Anu=32years, Raj=40 years
28. Hari = 20 years, Harry = 28 years
29. Father's age: 30 years, Raja's: 6 years
30. $\frac{13}{21}$ 31. $\frac{1}{3}$ 32. $\frac{5}{8}$ 33. $\frac{11}{18}$
34. $\frac{9}{16}$ 35. 62 36. 96 37. 39 38. 62 39. 85
40. Rs.50 notes=6, Rs.20 notes=10, Rs.10 notes=9
41. Rs.100→2000 notes, Rs.50→300 notes, Rs.0→5000 notes
42. 36, 72 43. Rs. 20 notes = 5, Rs. 50 notes = 20
44. Re 1 coins=80, Rs. 2 coins = 60, Rs. 5 coins = 20
45. 25 m, 10 m 46. 66° , 22° & 92°
47. Babita's=Rs.180, Ahmed's=Rs.900, John's=Rs.300
48. base=12; alt = 20 cm^2 49. Rs. 132, Rs. 110, Rs. 88
50. 60° , 60° , 60° , Equilateral angles
51. 60 tables, 120 chairs 52. 120 m, 160 m, 200 m
53. 1800, 1200, 900 54. 16, 14, 17.5, 19
55. 40 56. 40 students 57. 15, 20
58. 200 m 59. 19 60. 72