

# NCERT SOLUTIONS

CLASS - 8TH



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Class : 8th  
Subject : Maths  
Chapter : 2

Chapter Name : Linear Equations in One Variable

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### Exercise 2.1

Q1 Solve the following equations.

1.1  $x - 2 = 7$

1.2  $y + 3 = 10$

1.3  $6 = z + 2$

1.4  $\frac{3}{7} + x = \frac{17}{7}$

1.5  $6x = 12$

1.6  $\frac{t}{5} = 10$

1.7  $\frac{2x}{3} = 18$

1.8  $1.6 = \frac{y}{1.5}$

1.9  $7x - 9 = 16$

1.10  $14y - 8 = 13$

1.11  $17 + 6p = 9$

1.12  $\frac{x}{3} + 1 = \frac{7}{15}$

Answer. 1.1

$$x - 2 = 7$$

Transposing 2 to R.H.S, we obtain

$$x = 7 + 2 = 9$$

1.2

$$y + 3 = 10$$

Transposing 3 to R.H.S, we obtain

$$y = 10 - 3 = 7$$

1.3

$$6 = z + 2$$

Transposing 2 to L.H.S, we obtain

$$6 - 2 = z$$

$$z = 4$$

1.4

$$\frac{3}{7} + x = \frac{17}{7}$$

Transposing  $\frac{3}{7}$  to R. H.S, we obtain

$$x = \frac{17}{7} - \frac{3}{7} = \frac{14}{7} = 2$$

1.5

$$6x = 12$$

Dividing both sides by 6, we obtain

$$\frac{6x}{6} = \frac{12}{6}$$

$$x = 2$$

1.6

$$\frac{t}{5} = 10$$

Multiplying both sides by 5, we obtain

$$\frac{t}{5} \times 5 = 10 \times 5$$

$$t = 50$$

1.7

$$\frac{2x}{3} = 18$$

Multiplying both sides by  $\frac{3}{2}$ , we obtain

$$\frac{2x}{3} \times \frac{3}{2} = 18 \times \frac{3}{2}$$

$$x = 27$$

1.8

$$1.6 = \frac{y}{1.5}$$

Multiplying both sides by 1.5, we obtain

$$1.6 \times 1.5 = \frac{y}{1.5} \times 1.5$$

$$2.4 = y$$

1.9

$$7x - 9 = 16$$

Transposing 9 to R.H.S, we obtain

$$7x = 16 + 9$$

$$7x = 25$$

Dividing both sides by 7, we obtain

$$\frac{7x}{7} = \frac{25}{7}$$

$$x = \frac{25}{7}$$

1.10

$$14y - 8 = 13$$

Transposing 8 to R.H.S, we obtain

$$14y = 13 + 8$$

$$14y = 21$$

Dividing both sides by 14, we obtain

$$\frac{14y}{14} = \frac{21}{14}$$

$$y = \frac{3}{2}$$

1.11

$$17 + 6p = 9$$

Transposing 17 to R.H.S, we obtain

$$6p = 9 - 17$$

$$6p = -8$$

Dividing both sides by 6, we obtain

$$\frac{6p}{6} = -\frac{8}{6}$$

$$p = -\frac{4}{3}$$

1.12

$$\frac{x}{3} + 1 = \frac{7}{15}$$

Transposing 1 to R.H.S, we obtain

$$\frac{x}{3} = \frac{7}{15} - 1$$

$$\frac{x}{3} = \frac{7-15}{15}$$

$$\frac{x}{3} = -\frac{8}{15}$$

Multiplying both sides by 3, we obtain

$$\frac{x}{3} \times 3 = -\frac{8}{15} \times 3$$

$$x = -\frac{8}{5}$$

Page : 23 , Block Name : Exercise 2.1

### Exercise 2.2

Q1 If you subtract  $\frac{1}{2}$  from a number and multiply the result by  $\frac{1}{2}$ , you get  $\frac{1}{2}$ . What is the number?

Answer.

Let the number be  $x$ . According to the question,

$$\left(x - \frac{1}{2}\right) \times \frac{1}{2} = \frac{1}{8}$$

On multiplying both sides by 2, we obtain

$$\left(x - \frac{1}{2}\right) \times \frac{1}{2} \times 2 = \frac{1}{8} \times 2$$

$$x - \frac{1}{2} = \frac{1}{4}$$

On transposing  $1/2$  to R.H.S, we obtain

$$\begin{aligned} x &= \frac{1}{4} + \frac{1}{2} \\ &= \frac{1+2}{4} = \frac{3}{4} \end{aligned}$$

Therefore, the number is  $\frac{3}{4}$

Page : 28 , Block Name : Exercise 2.2

Q2 The perimeter of a rectangular swimming pool is 154m. Its length is 2 m more than twice its breadth. What are the length and the breadth of the pool?

Answer. Let the breadth be  $x$  m. The length will be  $(2x + 2)$  m.

Perimeter of swimming pool =  $2(l + b) = 154$  m

$$2(2x + 2 + x) = 154$$

$$2(3x + 2) = 154$$

Dividing both sides by 2, we obtain

$$\frac{2(3x+2)}{2} = \frac{154}{2}$$

$$3x + 2 = 77$$

On transposing 2 to R.H .S, we obtain

$$3x = 77 - 2$$

$$3x = 75$$

$$\frac{3x}{3} = \frac{75}{3}$$

$$x = 25$$

$$2x + 2 = 2 \times 25 + 2 = 52$$

Hence, the breadth and length of the pool are 25 m and 52 m respectively. Q2 Which of the following numbers would have digit 6 at unit place.

(i)  $19^2$     (ii)  $24^2$     (iii)  $26^2$

(iv)  $36^2$     (v)  $34^2$

52 m respectively

Page : 28 , Block Name : Exercise 2.2

Q3 The base of an isosceles triangle is  $\frac{4}{3}$  cm . The perimeter of the triangle is  $4\frac{2}{15}$  cm . What is the length of either of the remaining equal sides?

Answer. Let the length of equal sides be  $x$  cm.

Perimeter =  $x$  cm +  $x$  cm + Base =  $4\frac{2}{15}$  cm

$$2x + \frac{4}{3} = \frac{62}{15}$$

On transposing  $\frac{4}{3}$  to R. H.S, we obtain

$$2x = \frac{62}{15} - \frac{4}{3}$$

$$2x = \frac{62-4 \times 5}{15} = \frac{62-20}{15}$$

$$2x = \frac{42}{15}$$

On dividing both sides by 2, we obtain

$$\frac{2x}{2} = \frac{42}{15} \times \frac{1}{2}$$

$$x = \frac{7}{5} = 1\frac{2}{5}$$

Therefore, the length of equal sides is  $1\frac{2}{5}$  cm

Page : 28 , Block Name : Exercise 2.2

Q4 Sum of two numbers is 95. If one exceeds the other by 15, find the numbers.

Answer. Let one number be  $x$ . Therefore, the other number will be  $x + 15$ .

According to the question,

$$x + x + 15 = 95$$

$$2x + 15 = 95$$

On transposing 15 to R.H.S, we obtain

$$2x = 95 - 15$$

$$2x = 80$$

On dividing both sides by 2, we obtain

$$\frac{2x}{2} = \frac{80}{2}$$

$$x = 40$$

$$x + 15 = 40 + 15 = 55$$

Hence, the numbers are 40 and 55.

Page : 28 , Block Name : Exercise 2.2

Q5 Two numbers are in the ratio 5:3. If they differ by 18, what are the numbers?

Answer. Let the common ratio between these numbers be  $x$ . Therefore, the numbers will be  $5x$  and  $3x$  respectively.

Difference between these numbers = 18

$$5x - 3x = 18$$

$$2x = 18$$

Dividing both sides by 2,

$$\frac{2x}{2} = \frac{18}{2}$$

$$x = 9$$

$$\text{First number} = 5x = 5 \times 9 = 45$$

$$\text{Second number} = 3x = 3 \times 9 = 27$$

Page : 28 , Block Name : Exercise 2.2

Q6 Three consecutive integers add up to 51. What are these integers?

Answer. Let three consecutive integers be  $x$ ,  $x + 1$ , and  $x + 2$ .

Sum of these numbers =  $x + x + 1 + x + 2 = 51$

$$3x + 3 = 51$$

On transposing both sides by 3, we obtain

$$\frac{3x}{3} = \frac{48}{3}$$

$$x = 16$$

$$x + 1 = 17$$

$$x + 2 = 18$$

Hence, the consecutive integers are 16, 17, and 18.

Page : 28 , Block Name : Exercise 2.2

Q7 The sum of three consecutive multiples of 8 is 888. Find the multiples.

Answer. Let the three consecutive multiples of 8 be  $8x$ ,  $8(x + 1)$  +  $8(x + 2)$ .

$$\text{Sum of these numbers} = 8x + 8(x + 1) + 8(x + 2) = 888$$

$$8(x + x + 1 + x + 2) = 888$$

$$8(3x + 3) = 888$$

On Dividing both sides by 8, we obtain

$$\frac{8(3x+3)}{8} = \frac{888}{8}$$

$$3x + 3 = 111$$

On transposing 3 to R. H. S, we obtain

$$3x = 111 - 3$$

$$3x = 108$$

On dividing both sides by 3, we obtain

$$\frac{3x}{3} = \frac{108}{3}$$

$$x = 36$$

$$\text{First multiple} = 8x = 8 \times 36 = 288$$

$$\text{Second multiple} = 8(x + 1) = 8 \times (36 + 1) = 8 \times 37 = 296$$

$$\text{Third multiple} = 8(x + 2) = 8 \times (36 + 2) = 8 \times 38 = 304$$

Hence, the required numbers are 288, 296, and 304 .

Page : 28 , Block Name : Exercise 2.2

Q8 Three consecutive integers are such that when they are taken in increasing order and multiplied by 2, 3 and 4 respectively, they add up to 74. Find these numbers.

Answer. Let three consecutive be  $x$ ,  $x+1$  ,  $x + 2$  . according to the question,

$$2x + 3(x + 1) + 4(x + 2) = 74$$

$$2x + 3x + 3 + 4x + 8 = 74$$

$$9x + 11 = 74$$

On transposing 11 to R.H.S, we obtain

$$9x = 74 - 11$$

$$9x = 63$$

On dividing both sides by 9, we obtain

$$\frac{9x}{9} = \frac{63}{9}$$

$$x = 7$$

$$x + 1 = 7 + 1 = 8$$

$$x + 2 = 7 + 2 = 9$$

Hence, the numbers are 7, 8, and 9.

Page : 28 , Block Name : Exercise 2.2

Q9 The ages of Rahul and Haroon are in the ratio 5:7. Four years later the sum of their ages will be 56 years. What are their present ages?

Answer. Let common ratio between Rahul's age and Haroon's age be  $x$ .

Therefore, age of Rahul and Haroon will be  $5x$  years and  $7x$  years respectively. After

4 years, the age of Rahul and Haroon will be  $(5x + 4)$  years and  $(7x + 4)$  years respectively.

According to the given question, after 4 years, the sum of the ages of Rahul and Haroon is 56 years.

$$(5x + 4 + 7x + 4) = 56$$

$$12x + 8 = 56$$

$$12x = 48$$

On dividing both sides 12, we obtain

$$\frac{12x}{12} = \frac{48}{12}$$

$$x = 4$$

$$\text{Rahul's age} = 5x \text{ years} = (5 \times 4) \text{ years} = 20 \text{ years}$$

$$\text{Haroon's age} = 7x \text{ years} = (7 \times 4) \text{ years} = 28 \text{ years}$$

Page : 28 , Block Name : Exercise 2.2

Q10 The number of boys and girls in a class are in the ratio 7:5. The number of boys is 8 more than the number of girls. What is the total class strength?

Answer. Let the common ratio between the number of boys and numbers of girls be  $x$ .

$$\text{Number of boys} = 7x$$

$$\text{Number of girls} = 5x$$

According to the given question,

$$\text{Number of boys} = \text{Number of girls} + 8$$

$$7x = 5x + 8$$

On transposing  $5x$  to L.H.S, we obtain

$$7x - 5x = 8,$$

$$2x = 8$$

On dividing both sides by 2, we obtain



$$\frac{2x}{2} = \frac{8}{2}$$

$$x = 4$$

$$\text{Number of boys} = 7x = 7 \times 4 = 28$$

$$\text{Number of girls} = 5x = 5 \times 4 = 20$$

$$\text{Hence, total class strength} = 28 + 20 = 48 \text{ students}$$

Page : 28 , Block Name : Exercise 2.2

Q11 Baichung's father is 26 years younger than Baichung's grandfather and 29 years older than Baichung. The sum of the ages of all the three is 135 years. What is the age of each one of them?

Answer. Let Baichung's father's age be  $x$  years. Therefore, Baichung's age and Baichung's grandfather's age will be  $(x - 29)$  years and  $(x + 26)$  years respectively.

According to the given question, the sum of the ages of these 3 people is 135 years

$$x + x - 29 + x + 26 = 135$$

$$3x - 3 = 135$$

On transposing 3 to R.H.S, we obtain

$$3x = 135 + 3$$

$$3x = 138$$

On dividing both sides by 3, we obtain

$$\frac{3x}{3} = \frac{138}{3}$$

$$x = 46$$

$$\text{Baichung's father's age} = x \text{ years} = 46 \text{ years}$$

$$\text{Baichung's age} = (x - 29) \text{ years} = (46 - 29) \text{ years} = 17 \text{ years}$$

$$\text{Baichung's grandfather's age} = (x + 26) \text{ years} = (46 + 26) \text{ years} = 72 \text{ years}$$

Page : 28 , Block Name : Exercise 2.2

Q12 Fifteen years from now Ravi's age will be four times his present age. What is Ravi's present age?

Answer. Let Ravi's present age be  $x$  years.

Fifteen years later, Ravi's age = 4 x His present age

$$x + 15 = 4x$$

On transposing  $x$  to R.H.S, we obtain

$$15 = 4x - x$$

$$15 = 3x$$

On dividing both sides by 3, we obtain

$$\frac{15}{3} = \frac{3x}{3}$$

$$5 = x$$

$$\text{Hence, Ravi's present age} = 5 \text{ years}$$

Page : 28 , Block Name : Exercise 2.2

Q13 A rational number is such that when you multiply it by  $\frac{5}{2}$  and add  $\frac{2}{3}$  to the product, you get  $-\frac{7}{12}$ . What is the number?

Answer. Let the number be  $x$ .

According to the given question,

$$\frac{5}{2}x + \frac{2}{3} = -\frac{7}{12}$$

On transposing  $\frac{2}{3}$  to R.H.S, we obtain

$$\frac{5}{2}x = -\frac{7}{12} - \frac{2}{3}$$

$$\frac{5}{2}x = \frac{-7-(2 \times 4)}{12}$$

$$\frac{5}{2}x = -\frac{15}{12}$$

On multiplying both sides by 5, we obtain

$$x = -\frac{15}{12} \times \frac{2}{5} = -\frac{1}{2}$$

Hence, the rational number is  $-\frac{1}{2}$ .

Page : 28 , Block Name : Exercise 2.2

Q14 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?

Answer. Let the common ratio between the numbers of notes of different denominations be  $x$ . Therefore, numbers of Rs 100 notes, Rs 50 notes, and Rs 10 notes will be  $2x$ ,  $3x$ , and  $5x$  respectively.

Amount of Rs 100 notes = Rs  $(100 \times 2x)$  = Rs  $200x$

Amount of Rs 50 notes = Rs  $(50 \times 3x)$  = Rs  $150x$

Amount of Rs 10 notes = Rs  $(10 \times 5x)$  = Rs  $50x$

It is given that total amount is Rs 400000.

$$200x + 150x + 50x = 400000$$

$$\Rightarrow 400x = 400000$$

On dividing both sides by 400, we obtain

$$x = 1000$$

Number of Rs 100 notes =  $2x = 2 \times 1000 = 2000$

Number of Rs 50 notes =  $3x = 3 \times 1000 = 3000$

Number of Rs 10 notes =  $5x = 5 \times 1000 = 5000$

Page : 28 , Block Name : Exercise 2.2

Q15 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?

Answer. Let the number of Rs 5 coins be  $x$ .

Number of Rs 2 coins =  $3 \times$  Number of Rs 5 coins =  $3x$

Number of Rs 1 coins =  $160 - (\text{Number of coins of Rs 5 and of Rs 2})$   
 $= 160 - (3x + x) = 160 - 4x$

Amount of Re 1 coins = Rs  $[1 \times (160 - 4x)] = \text{Rs } (160 - 4x)$

Amount of Rs 2 coins = Rs  $(2 \times 3x) = \text{Rs } 6x$

Amount of Rs 5 coins = Rs  $(5 \times x) = \text{Rs } 5x$

It is given that the total amount is Rs 300.

$$160 - 4x + 6x + 5x = 300$$

$$160 + 7x = 300$$

On transposing 160 to R.H.S, we obtain

$$7x = 300 - 160$$

$$7x = 140$$

On dividing both sides by 7, we obtain

$$\frac{7x}{7} = \frac{140}{7}$$

$$x = 20$$

$$\text{Number of Re 1 coins} = 160 - 4x = 160 - 4 \times 20 = 160 - 80 = 80$$

$$\text{Number of Rs 2 coins} = 3x = 3 \times 20 = 60$$

$$\text{Number of Rs 5 coins} = x = 20$$

Page : 28 , Block Name : Exercise 2.2

Q16 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.

Answer. Let the number of winners be  $x$ . Therefore, the number of participants who did not win will be  $63 - x$ .

Amount given to the winners = Rs  $(100 \times x) = \text{Rs } 100x$

Amount given to the participants who did not win = Rs  $[25(63 - x)] = \text{Rs } (1575 - 25x)$

According to the given question,

$$100x + 1575 - 25x = 3000$$

On transposing 1575 to R.H.S, we obtain

$$75x = 3000 - 1575$$

$$75x = 1425$$

On dividing both sides by 75, we obtain

$$\frac{75x}{75} = \frac{1425}{75}$$

$$x = 19$$

Hence, number of winners = 19

Page : 28 , Block Name : Exercise 2.2

### Exercise 2.3

Q1 Solve the following equations and check your results.

1.1  $3x = 2x + 18$

1.2  $5t - 3 = 3t - 5$

1.3  $5x + 9 = 5 + 3x$

1.4  $4z + 3 = 6 + 2z$

1.5  $2x - 1 = 14 - x$

1.6  $8x + 4 = 3(x - 1) + 7$

1.7  $x = \frac{4}{5}(x + 10)$

1.8  $\frac{2x}{3} + 1 = \frac{7x}{15} + 3$

1.9  $2y + \frac{5}{3} = \frac{26}{3} - y$

1.10  $3m = 5m - \frac{8}{5}$

Answer. 1.1

$$3x = 2x + 18$$

On transposing  $2x$  to L.H.S, we obtain

$$3x - 2x = 18$$

$$x = 18$$

$$\text{L.H.S} = 3x = 3 \times 18 = 54$$

$$\text{R.H.S} = 2x + 18 = 2 \times 18 + 18 = 36 + 18 = 54$$

$$\text{L.H.S.} = \text{R.H.S.}$$

Hence, the result obtained above is correct.

1.2

$$5t - 3 = 3t - 5$$

On transposing  $3t$  to L. H. S and  $-3$  to R.H.S, we obtain

$$5t - 3t = -5 - (-3)$$

$$2t = -2$$

On dividing both sides by 2, we obtain

$$t = -1$$

$$\text{L.H.S} = 5t - 3 = 5 \times (-1) - 3 = -8$$

$$\text{R.H.S} = 3t - 5 = 3 \times (-1) - 5 = -3 - 5 = -8$$

$$\text{L.H.S.} = \text{R.H.S.}$$

Hence, the result obtained above is correct.

1.3

$$5x + 9 = 5 + 3x$$

On transposing  $3x$  to L.H.S and 9 to R.H.S, we obtain

$$5x - 3x = 5 - 9$$

$$2x = -4$$

On dividing both sides by 2, we obtain

$$x = -2$$

$$\text{L. H. S.} = 5x + 9 = 5 \times (-2) + 9 = -10 + 9 = -1$$

$$\text{R. H.S.} = 5 + 3x = 5 + 3 \times (-2) = 5 - 6 = -1$$

$$\text{L.H.S.} = \text{R.H.S.}$$

Hence, the result obtained above is correct.

1.4

$$4z + 3 = 6 + 2z$$

On transposing  $2z$  to L.H.S and  $3$  to R.H.S, we obtain

$$4z - 2z = 6 - 3$$

$$2z = 3$$

Dividing both sides by 2, we obtain

$$z = \frac{3}{2}$$

$$\text{L.H.S.} = 4z + 3 = 4 \times \left(\frac{3}{2}\right) + 3 = 6 + 3 = 9$$

$$\text{R.H.S.} = 6 + 2z = 6 + 2 \times \left(\frac{3}{2}\right) = 6 + 3 = 9$$

$$\text{L.H.S.} = \text{R.H.S.}$$

Hence, the result obtained above is correct.

1.5

$$2x - 1 = 14 - x$$

Transposing  $x$  to L.H.S and  $1$  to R.H.S, we obtain

$$2x + x = 14 + 1$$

$$3x = 15$$

Dividing both sides by 3, we obtain

$$x = 5$$

$$\text{L.H.S} = 2x - 1 = 2 \times (5) - 1 = 10 - 1 = 9$$

$$\text{R.H.S} = 14 - x = 14 - 5 = 9$$

$$\text{L.H.S.} = \text{R.H.S.}$$

Hence, the result obtained above is correct.

1.6

$$8x + 4 = 3(x - 1) + 7$$

$$8x + 4 = 3(x - 1) + 7$$

$$8x + 4 = 3x - 3 + 7$$

Transposing  $3x$  to L.H.S and  $4$  to R.H.S, we obtain

$$8x - 3x = -3 + 7 - 4$$

$$5x = -7 + 7$$

$$x = 0$$

$$\text{L.H.S} = 8x + 4 = 8 \times (0) + 4 = 4$$

$$\text{R.H.S} = 3(x-1) + 7 = 3(0-1) + 7 = -3 + 7 = 4$$

$$\text{L.H.S.} = \text{R.H.S.}$$

Hence, the result obtained above is correct.

1.7

$$x = \frac{4}{5}(x + 10)$$

Answer. Multiplying both sides by 5, we obtain

$$5x - 4x = 40$$

$$x = 40$$

$$\text{L.H.S} = x = 40$$

$$\text{R.H.S} = 5 \frac{4}{5}(x+10) = \frac{4}{5}(40 + 10) = \frac{4}{5} \times 50 = 40$$

$$\text{L.H.S.} = \text{R.H.S.}$$

Hence, the result obtained above is correct.

1.8

$$\frac{2x}{3} + 1 = \frac{7x}{15} + 3$$

Transposing  $\frac{7x}{15}$  to L.H.S and 1 to R.H.S, we obtain

$$\frac{2x}{3} - \frac{7x}{15} = 3 - 1$$

$$\frac{5 \times 2x - 7x}{15} = 2$$

$$\frac{3x}{15} = 2$$

$$\frac{x}{5} = 2$$

Multiplying both sides by 5, we obtain

$$x = 10, \frac{2x}{3} + 1 = \frac{2 \times 10}{3} + 1 = \frac{2 \times 10 + 1 \times 3}{3} = \frac{23}{3}$$

$$\frac{7x}{15} + 3 = \frac{7 \times 10}{15} + 3 = \frac{7 \times 2}{3} + 3 = \frac{14}{3} + 3 = \frac{14 + 3 \times 3}{3} = \frac{23}{3}$$

$$\text{L.H.S.} = \text{R.H.S.}$$

Hence, the result obtained above is correct.

1.9

$$2y + \frac{5}{3} = \frac{26}{3} - y$$

Transposing  $y$  to L.H.S and  $\frac{5}{3}$  to R.H.S, we obtain

$$2y + y = \frac{26}{3} - \frac{5}{3}$$

$$3y = \frac{21}{3} = 7$$

Dividing both sides by 3, we obtain

$$y = \frac{7}{3}$$

$$\text{L.H.S} = 2y + \frac{5}{3} = 2 \times \frac{7}{3} + \frac{5}{3} = \frac{14}{3} + \frac{5}{3} = \frac{19}{3}$$

$$\text{R.H.S} = \frac{26}{3} - y = \frac{26}{3} - \frac{7}{3} = \frac{19}{3}$$

$$\text{L.H.S.} = \text{R.H.S.}$$

Hence, the result obtained above is correct.

1.10

$$3m = 5m - \frac{8}{5}$$

Transposing  $5m$  to L.H.S, we obtain

$$3m - 5m = -\frac{8}{5}$$

$$-2m = -\frac{8}{5}$$

Dividing both sides by  $-2$ , we obtain

$$m = \frac{4}{5}$$

$$\text{L.H.S} = 3m = 3 \times \frac{4}{5} = \frac{12}{5}$$

$$\text{R.H.S} = 5m - \frac{8}{5} = 5 \times \frac{4}{5} - \frac{8}{5} = \frac{12}{5}$$

$$\text{L.H.S.} = \text{R. H. S.}$$

Hence, the result obtained above is correct.

Page : 30 , Block Name : Exercise 2.3

### Exercise 2.4

Q1 Amina thinks of a number and subtracts  $\frac{5}{2}$  from it. She multiplies the result by 8. The result now obtained is 3 times the same number she thought of. What is the number?

Answer. Let the number be  $x$ . <>

According to the given question,

$$8 \left( x - \frac{5}{2} \right)$$

$$8x - 20 = 3x$$

Transposing  $3x$  to L.H.S and  $-20$  to R.H.S, we obtain

$$8x - 3x = 20$$

$$5x - 3x = 20$$

Dividing both sides by 5, we obtain

$$x = 4$$

Hence, the number is 4 .

Page : 31 , Block Name : Exercise 2.4

Q2 A positive number is 5 times another number. If 21 is added to both the numbers, then one of the new numbers becomes twice the other new number. What are the Numbers?

Answer. Let the numbers be  $x$  and  $5x$ . According to the question,

$$21 + 5x = 2(x + 21)$$

$$21 + 5x = 2x + 42$$

Transposing  $2x$  to L.H.S and  $21$  to R.H.S, we obtain

$$5x - 2x = 42 - 21$$

$$3x = 21$$

Dividing both sides by  $3$ , we obtain

$$x = 7$$

$$5x = 5 \times 7 = 35$$

Hence, the numbers are  $7$  and  $35$  respectively.

Page :  $31$  , Block Name : Exercise 2.4

Q3 Sum of the digits of a two digit number is  $9$ . When we interchange the digits it is found that the resulting new number is greater than the original number by  $27$ . What is the two-digit number?

Answer. Let the digits at tens place and ones place be  $x$  and  $9 - x$  respectively.

Therefore, new number after interchanging the digits =  $10(9 - x) + x$

$$= 90 - 10x + x$$

$$= 90 - 9x$$

According to the given question,

New number Original number +  $27$

$$90 - 9x = 9x + 9 + 27$$

$$90 - 9x = 9x + 36$$

Transposing  $9x$  to R.H.S and  $36$  to L.H.S, we obtain

$$90 - 36 = 18x$$

$$54 = 18x$$

Dividing both sides by  $18$ , we obtain

$$3 = x \text{ and } 9 - x = 6$$

Hence, the digits at tens place and ones place of the numbers are  $3$  and  $6$  respectively.

Therefore, the two-digits number is  $9x + 9 = 9 \times 3 + 9 = 36$

Page :  $31$  , Block Name : Exercise 2.4

Q4 One of the two digits of a two digit number is three times the other digit. If you interchange the digit of this two-digit number and add the resulting number to the original number, you get  $88$ . What is the original number?

Answer. Let the digits at tens and ones place be  $x$  and  $3x$  respectively.

Therefore, original number =  $10x + 3x = 13x$

On interchanging the digits, the digits at ones place and tens place will be  $x$  and  $3x$  respectively.

According to the given question,

Original number + New number =  $88$

$$13x + 31x = 88$$

$$44x = 88$$

Dividing both sides by  $44$ , we obtain



$$x = 2$$

Therefore, original number =  $13x = 13 \times 2 = 26$

By considering the tens place and ones place as  $3x$  and  $x$  respectively, the two-digit number obtained is 62.

Therefore, the two-digits number may be 26 or 62.

Page : 31 , Block Name : Exercise 2.4

Q5 Shobo's mother's present age is six times Shobo's present age. Shobo's age five years from now will be one third of this mother's present age. What are their present ages?

Answer. Let Shobo's age be  $x$  years. Therefore, his mother's age will be  $6x$  years.

According to the given question,

$$\text{After 5 years, Shobo's age} = \frac{\text{Shobo's mother's present age}}{3}$$

$$x + 5 = \frac{6x}{3}$$

$$x + 5 = 2x$$

Transposing  $x$  to R.H.S, we obtain

$$5 = 2x - x$$

$$5 = x$$

$$6x = 6 \times 5 = 30$$

Therefore, the present ages of Shobo and Shobo's mother will be 5 years and 30 years respectively.

Page : 31 , Block Name : Exercise 2.4

Q6 There is a narrow rectangular plot, reserved for a school, in Mahuli village. The length and breadth of the plot are in the ratio 11:4. At the rate Rs 100 per metre it will cost the village panchayat Rs 75, 000 to fence the plot. What are the dimensions of the plot?

Answer. Let the common ratio between the length and breadth of the rectangular plot be  $x$ .

Hence, the length and breadth of the rectangular plot will be  $11x$  m and  $4x$  m respectively.

$$\text{Perimeter of the plot} = 2(\text{Length} + \text{Breadth}) = [2(11x + 4x)]\text{m} = 30xm$$

It is given that the cost of fencing the plot at the rate of Rs 100 per metre is Rs 75, 000.

$$\therefore 100 \times \text{Perimeter} = 75000$$

$$100 \times 30x = 75000$$

$$3000x = 75000$$

Dividing both sides by 3000, we obtain

$$x = 25$$

$$\text{Length} = 11x \text{ m} = (11 \times 25) \text{ m} = 275 \text{ m}$$

$$\text{Breadth} = 4x \text{ m} = (4 \times 25) \text{ m} = 100 \text{ m}$$

Hence, the dimensions of the plot are 275 m and 100 m respectively.

Page : 31 , Block Name : Exercise 2.4

Q7 Hasan buys two kinds of cloth materials for school uniforms, shirt material that costs him Rs 50 per metre and trouser material that costs him Rs 90 per metre. For every 2 meters of the trouser material he buys 3 metres of the shirt material. He sells the materials at 12% and 10% profit respectively. His total sale is Rs 36660. How much trouser material did he buy?

Answer. Let  $2x$  m of trouser material and  $3x$  m of shirt material be bought by him.

Per metre selling price of trouser material = Rs  $\left(90 + \frac{90 \times 12}{100}\right) = \text{Rs } 100.80$

Per metre selling price of shirt material Rs  $\left(50 + \frac{50 \times 10}{100}\right) = \text{Rs } 55$

Given that, total amount Of selling = Rs 36660

$$100.80 \times (2x) + 55 \times (3x) = 36660$$

$$201.60x + 165x = 36660$$

$$366.60x = 36660$$

Dividing both sides by 366.60, we obtain

$$x = 100$$

$$\text{Trouser material} = 2x \text{ m} = (2 \times 100) \text{ m} = 200 \text{ m}$$

Page : 31 , Block Name : Exercise 2.4

Q8 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.

Answer. Let the number of deer be  $x$ .

Number of deer grazing in the field =  $\frac{x}{2}$

Number of deer playing nearby =  $\frac{3}{4} \times \text{Number of remaining deer}$

$$= \frac{3}{4} \times \left(x - \frac{x}{2}\right) = \frac{3}{4} \times \frac{x}{2} = \frac{3x}{8}$$

Number of deer drinking water from the pond = 9

$$x - \left(\frac{x}{2} + \frac{3x}{8}\right) = 9$$

$$x - \left(\frac{4x+3x}{8}\right) = 9$$

$$x - \frac{7x}{8} = 9$$

$$\frac{x}{8} = 9$$

Multiplying both sides by 8, we obtain

$$x = 72$$

Hence, the total number Of deer in the herd is 72.

Page : 32 , Block Name : Exercise 2.4

Q9 A grandfather is ten times older than his granddaughter. He is also 54 years older than her. Find their present ages

Answer. Let the granddaughter's age be  $x$  years. Therefore, grandfather's age will be  $10x$  years.

According to the question,

Grandfather's age = Granddaughter's age + 54 years

$$10x = x + 54$$

Transposing  $x$  to L.H.S, we obtain

$$10x - x = 54$$

$$9x = 54$$

$$x = 6$$

Granddaughter's age =  $x$  years = 6 years

Page : 32 , Block Name : Exercise 2.4

Q10 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.

Answer. Let Aman's son's age be  $x$  years. Therefore, Aman's age will be  $3x$  years. Ten years ago, their age was  $(x - 10)$  years and  $(3x - 10)$  years respectively.

According to the question,

10 years ago, Aman's age = 5 × Aman's son's age 10 years ago

$$3x - 10 = 5(x - 10)$$

$$3x - 10 = 5x - 50$$

Transposing  $3x$  to R.H.S and 50 to L.H.S, we obtain

$$50 - 10 = 5x - 3x$$

$$40 = 2x$$

Dividing both sides by 2, we obtain

$$20 = x$$

Aman's son's age =  $x$  years = 20 years

Aman's age =  $3x$  years =  $(3 \times 20)$  years = 60 years

Page : 32 , Block Name : Exercise 2.4

### Exercise 2.5

Q1 Solve the following linear equations.

$$1.1 \frac{x}{2} - \frac{1}{5} = \frac{x}{3} + \frac{1}{4} \quad 1.2 \frac{n}{2} - \frac{3n}{4} + \frac{5n}{6} = 21 \quad 1.3 x + 7 - \frac{8x}{3} = \frac{17}{6} - \frac{5x}{2}$$

$$1.4 \frac{x-5}{3} = \frac{x-3}{5} \quad 1.5 \frac{3t-2}{4} - \frac{2t+3}{3} = \frac{2}{3} - t \quad 1.6 m - \frac{m-1}{2} = 1 - \frac{m-2}{3}$$

$$1.7 \quad 3(t - 3) = 5(2t + 1) \quad 1.8 \quad 15(y - 4) - 2(y - 9) + 5(y + 6) = 0$$

$$1.9 \quad 3(5z - 7) - 2(9z - 11) = 4(8z - 13) - 17$$

$$1.10 \quad 0.25(4f - 3) = 0.05(10f - 9)$$

Answer. 1.1

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

L.C.M. of the denominators, 2, 3, 4, and 5, is 60 .

Multiplying both sides by 60, we obtain

$$60 \left( \frac{x}{2} - \frac{1}{5} \right) = 60 \left( \frac{x}{3} + \frac{1}{4} \right)$$

$$\Rightarrow 30x - 12 = 20x + 15 \text{ (Opening the brackets)}$$

$$\Rightarrow 10x - 20x = 15 + 12$$

$$x = \frac{27}{10}$$

1.2

$$\frac{n}{2} - \frac{3n}{4} + \frac{5n}{6} = 21$$

L.C.M. of the denominators, 2, 4, and 6, is 12 .

Multiplying both sides by 12, we obtain

$$6n - 9n + 10n = 252$$

$$\Rightarrow 7n = 252$$

$$\Rightarrow n = \frac{252}{7}$$

$$\Rightarrow n = 36$$

1.3

$$x + 7 - \frac{8x}{3} = \frac{17}{6} - \frac{5x}{2}$$

L.C.M. of the denominators, 2, 3, and 6, is 6 .

Multiplying both sides by 6, we obtain

$$6x + 42 - 16x = 17 - 15x$$

$$\Rightarrow 6x - 16x + 15x = 17 - 42$$

$$\Rightarrow 5x = -25$$

$$\Rightarrow x = \frac{-25}{5}$$

$$\Rightarrow x = -5$$

1.4

$$\frac{x-5}{3} = \frac{x-3}{5}$$

L.C.M. of the denominators, 3 and 5, is 15 .

Multiplying both sides by 15, we obtain

$$5(x - 5) = 3(x - 3)$$

$$\Rightarrow 5x - 25 = 3x - 9 \text{ (Opening the brackets)}$$

$$\Rightarrow 2x - 3x = 25 - 9$$

$$\Rightarrow x = \frac{16}{2}$$

$$x = 8$$

1.5

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

L.C.M. of the denominators, 3 and 4, is 12 .

Multiplying both sides by 12, we obtain

$$3(3t - 2) - 4(2t + 3) = 8 - 12t$$

$$\Rightarrow 9t - 6 - 8t - 12 = 8 - 12t \text{ (Opening the brackets)}$$

$$\Rightarrow 13t - 8t + 12t = 8 + 6 + 12$$

$$\Rightarrow 13t = 26$$

$$\Rightarrow t = \frac{26}{13}$$

$$\Rightarrow t = 2$$

1.6

$$m - \frac{m-1}{2} = 1 - \frac{m-2}{3}$$

L.C.M. of the denominators, 2 and 3, is 6 .

Multiplying both sides by 6, we obtain

$$6m - 3(m - 1) = 6 - 2(m - 2)$$

$$\Rightarrow 6m - 3m + 3 = 6 - 2m + 4 \text{ (Opening the brackets)}$$

$$\Rightarrow 6m - 3m + 2m = 6 + 4 - 3$$

$$\Rightarrow 5m = 7$$

$$m = \frac{7}{5}$$

1.7

$$3(t - 3) = 5(2t + 1)$$

$$\Rightarrow 3t - 9 = 10t + 5 \text{ (Opening the brackets)}$$

$$\Rightarrow -9 - 5 = 10t - 3t$$

$$\Rightarrow -14 = 7t$$

$$\Rightarrow t = \frac{-14}{7}$$

$$\Rightarrow t = -2$$

1.8

$$15(y - 4) - 2(y - 9) + 5(y + 6) = 0$$

$$\Rightarrow 15y - 60 - 2y + 18 + 5y + 30 = 0 \text{ (Opening the brackets)}$$

$$\Rightarrow 18y - 12 = 0$$

$$\Rightarrow 18y = 12$$

$$y = \frac{12}{18} = \frac{2}{3}$$

1.10

$$0.25(4f - 3) = 0.05(10f - 9)$$

$$\frac{1}{4}(4f - 3) = \frac{1}{20}(10f - 9)$$

Multiplying both sides by 20, we obtain

$$5(4f - 3) = 10f - 9$$

$$\Rightarrow 20f - 15 = 10f - 9 \text{ (Opening the brackets)}$$

$$20f - 10f = -9 + 15$$

$$10f = 6$$

$$f = \frac{3}{5} = 0.6$$

Page : 33 , Block Name : Exercise 2.5

### Exercise 2.6

Q1 Solve the following equations.

$$1.1 \frac{8x-3}{3x} = 2 \quad 1.2 \frac{9x}{7-6x} = 15 \quad 1.3 \frac{z}{z+15} = \frac{4}{9}$$

$$1.4 \frac{3y+4}{2-6y} = \frac{-2}{5} \quad 1.5 \frac{7y+4}{y+2} = \frac{-4}{3}$$

Answer. 1.1

$$\frac{8x-3}{3x} = 2$$

On multiplying both sides by  $3x$ , we obtain

$$8x - 3 = 6x$$

$$\Rightarrow 8x - 6x = 3$$

$$\Rightarrow 2x = 3$$

$$x = \frac{3}{2}$$

1.2

$$\frac{9x}{7-6x} = 15$$

On multiplying both sides by  $7 - 6x$ , we obtain

$$9x = 15(7 - 6x)$$

$$\Rightarrow 9x = 105 - 90x$$

$$\Rightarrow 9x + 90x = 105$$

$$\Rightarrow 99x = 105$$

$$x = \frac{105}{99} = \frac{35}{33}$$

1.3

$$\frac{z}{z+15} = \frac{4}{9}$$

On multiplying both sides by  $9(z + 15)$ , we obtain

$$9z = 4(z + 15)$$

$$\Rightarrow 9z = 4z + 60$$

$$\Rightarrow 9z - 4z = 60$$

$$\Rightarrow 5z = 60$$

$$\Rightarrow z = 12$$

1.4

$$\frac{3y+4}{2-6y} = -\frac{2}{5}$$

On multiplying both sides by  $5(2 - 6y)$ , we obtain

$$5(3y + 4) = -2(2 - 6y)$$

$$\Rightarrow 15y + 20 = -4 + 12y$$

$$\Rightarrow 15y - 12y = -4 + 12y$$

$$\Rightarrow 3y = -24$$

$$\Rightarrow y = -8$$

1.5

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

On multiplying both sides by  $3(y + 2)$ , we obtain

$$3(7y + 4) = -4(y + 2)$$

$$\Rightarrow 21y + 12 = -4y - 8$$

$$\Rightarrow 21y + 4y = -8 - 12$$

$$\Rightarrow 25y = -20$$

$$y = -\frac{4}{5}$$

Page : 35 , Block Name : Exercise 2.6

Q6 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.

Answer. Let the common ratio between their ages be  $x$ . Therefore, Hari's age and Harry's age will be  $5x$  years and  $7x$  years respectively and four years later, their ages will be  $(5 + 4)$  years and  $(7x + 4)$  years respectively.

According to the situation given in the question,

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

$$\Rightarrow 4(5x + 4) = 3(7x + 4)$$

$$\Rightarrow 20x + 16 = 21x + 12$$

$$\Rightarrow 16 - 12 = 21x - 20x$$

$$\Rightarrow 4 = x$$

Hari's age =  $5x$  years =  $(5 \times 4)$  years = 20 years

Harry's age =  $7x$  years =  $(7 \times 4)$  years = 28 years

Therefore, Hari's age and Harry's age are 20 years and 28 years respectively.

Page : 35 , Block Name : Exercise 2.6

Q7 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.

Answer. Let the numerator of the rational number be  $x$ . Therefore, its denominator will

be  $x + 8$ .

The rational number will be  $\frac{x}{x+8}$ . According to the question,

$$\frac{x+17}{x+8-1} = \frac{3}{2}$$

$$\Rightarrow \frac{x+17}{x+7} = \frac{3}{2}$$

$$\Rightarrow 2(x + 17) = 3(x + 7)$$

$$\Rightarrow 2x + 34 = 3x + 21$$

$$\Rightarrow 34 - 21 = 3x - 2x$$

$$\Rightarrow 13 = x$$

Numerator of the rational number =  $x = 13$

Denominator of the rational number =  $x + 8 = 13 + 8 = 21$

Rational Number =  $\frac{13}{21}$

Page : 35 , Block Name : Exercise 2.6

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