UNIT 4

LINEAR EQUATIONS IN ONE VARIABLE

(A) Main Concepts and Results

- An algebraic equation is an equality involving variables. It has an equality sign. The expression on the left of the equality sign is the Left Hand Side (LHS) and the expression on the right of the equality sign is the Right Hand Side (RHS).
- In an equation the values of the expressions on the LHS and RHS are equal for certain values of the variables. These values are the solutions of the equation.
- Equations where the expressions which form the equation contain only one variable and the highest power of the variable appearing in the equation is 1, are called linear equations in one variable.
- A linear equation may have linear expressions on both sides of the equality sign.
- To find the solution of an equation we perform the same mathematical operations on both sides of the equation, so that the balance between the LHS and RHS is not disturbed.
- A linear equation may have any rational number as its solution.
- In an equation, variables can be transposed from one side of the equation to the other.

(B) Solved Examples

In examples 1 and 2, there are four options given out of which one is correct. Choose the correct answer.

Example 1 : If $x = a$, then which of the following is not always true for an integer k.

(a) $kx = ak$ (b) $\frac{x}{k} = \frac{a}{k}$

(c) $x - k = a - k$ (d) $x + k = a + k$

Solution : Correct answer is (b).

Example 2 : If $3x - 4(64 - x) = 10$, then the value of x is

(a) –266 (b) 133 (c) 66.5 (d) 38

Solution: Correct answer is (d).

In examples 3 and 4, fill in the blanks to make the statements true.

Example 3 : Fifteen added to thrice a whole number gives 93. The number is _____.

Solution : Correct answer is 26.

Example 4 : If $\frac{1}{3} - x = -\frac{2}{3}$, then x is _____.

Solution : Correct answer is 1.

In examples 5 and 6, state whether the given statements are true (T) or false (F).

Example 5 : Three consecutive even numbers whose sum is 156 are 51, 52 and 53.

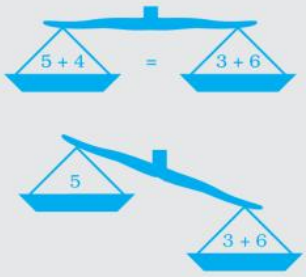
Solution : False.

You Have to Keep Equations Balanced

An equation is like a scale. The bit before the equals sign has the same value as the bit after the equals sign, so the scale is balanced.

When manipulating equations, you have to keep the scale balanced. You can't take 4 from one side and not from the other because then the two sides aren't equal.

The only way to keep the scale balanced is to always do the same thing to both sides.



Example 6 : $x = -12$ is the solution of the linear equation $5x - 3(2x + 1) = 21 + x$

Solution : True.

In examples 7 to 10 solve each of them.

Example 7 : Solve : $\frac{x}{2} + \frac{x}{4} + \frac{x}{5} + 10000 = x$

Solution : $\frac{x}{2} + \frac{x}{4} + \frac{x}{5} + 10000 = x$

$\frac{x}{2} + \frac{x}{4} + \frac{x}{5} - x = -10000$

$\frac{10x + 5x + 4x - 20x}{20} = -10000$

$\frac{19x - 20x}{20} = -10000$

$\frac{-x}{20} = -10000$

$x = 200000$

Example 8 : The present age of father is four times the age of his son. After 10 years, age of father will become three times the age of his son. Find their present ages.

Solution: Let the present age of son be x years

$\therefore$ the present age of father = $4x$ years

After 10 years

Age of son = $(x + 10)$ years

Age of father = $(4x + 10)$ years

According to the given condition

$4x + 10 = 3(x + 10)$

$4x + 10 = 3x + 30$

$4x - 3x = 30 - 10$

$x = 20$

$\therefore$ Present age of son = 20 years.

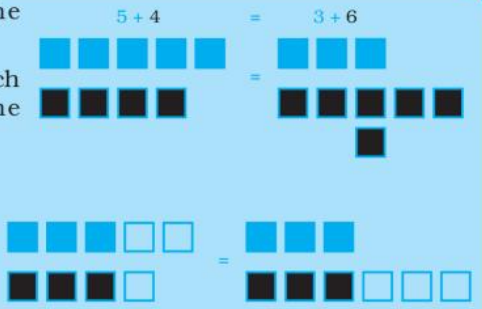
and present age of father = $4x = 4 \times 20 = 80$ years.

Here's another way to show the balance in the equation.

There are a total of 9 boxes on each side of the equals sign – so the equation is balanced.

If you take any 3 boxes from the left-hand side, you also need to take 3 boxes from the right-hand side to keep the equation balanced.

You still have to keep both sides of an equation balanced when there are variables involved.



Both sides still have the same total number of coloured boxes.

Example 9 : A steamer goes downstream from one point to another in 7 hours. It covers the same distance upstream in 8 hours. If the speed of stream be 2 km/hr, find the speed of the steamer in still water and the distance between the ports.

Solution : Let speed of steamer in still water = x km/hr

Speed of stream = 2 km/hr

Speed downstream = $(x + 2)$ km/hr

Speed upstream = $(x - 2)$ km/hr

Distance covered in 7 hours while downstream = $7(x + 2)$

Distance covered in 8 hours while upstream = $8(x - 2)$

According to the condition,

$$7(x + 2) = 8(x - 2)$$

$$7x + 14 = 8x - 16$$

$$x = 30 \text{ km/hr}$$

Total Distance $= 7(x + 2)$ km

$= 7(30 + 2)$ km

$= 7 \times 32$ km

$= 224$ km

Example 10 : Distance between two stations A and B is 690 km. Two cars start simultaneously from A and B towards each other, and the distance between them after 6 hours is 30 km. If the speed of one car is less than the other by 10 km/hr, find the speed of each car.

Solution : Let speed of faster car = x km/hr

Then speed of other = $(x - 10)$ km/hr

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Let 1st one start from A and other from B.

M and N be their position after 6 hours.



AM = $6x$, BN = $6(x-10)$

According to condition,

$6x + 6x - 60 + 30 = 690$

$12x = 690 + 30$

$12x = 720$

$x = 60$ km/hr

Speed of other car = 50 km/hr.

Example 11 : Application on problem solving strategy

A home-owner is installing a fence around the square garden. The garden has a perimeter of 6480 cm. Write and solve the equation to find the garden's dimensions.

Solution : Understand and explore the problem

- What do you know?

  Perimeter of square garden = 6480 cm

To find: Side of garden?

Plan a strategy

- To visualise that fencing around a garden means fencing its perimeter.
- Recall that a square has four equal sides, say s each.

Solve

Fence around square garden = Perimeter of square garden

$s + s + s + s = 6480$ cm

$4s = 6480$ cm

$s = 1620$ cm

Thus, side of garden = 1620 cm

Check

Verify your answer by adopting some other plan.

e.g. Here in this problem instead of taking perimeter as sum of its sides, use the formula

$4s = 6480$ cm

$s = 1620$ cm Hence verified.

Think and Discuss

(i) What other values will be needed if instead of square it is a rectangular or circular garden?

(ii) What will happen if we have to level the grass inside it instead of fencing the garden?

(iii) What will happen if there is a path running inside it?

(C) Exercise

In questions 1 to 15 out of the four options only one is correct, write the correct answer.

1. The solution of which of the following equations is neither a fraction nor an integer.

(a) $3x + 2 = 5x + 2$ (b) $4x - 18 = 2$

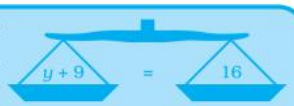
(c) $4x + 7 = x + 2$ (d) $5x - 8 = x + 4$

2. The solution of the equation $ax + b = 0$ is

(a) $x = \frac{a}{b}$ (b) $x = -b$

(c) $x = \frac{-b}{a}$ (d) $x = \frac{b}{a}$

An equation like $y + 9 = 16$ is balanced just like one with only numbers. To find the value of y, you need to get the variable alone on one side of the equals sign.



If the variable has something added to it, use subtraction to get it on its own. In $y + 9 = 16$, subtract 9 from both sides to get y on its own.



You can do exactly the same without drawing the scales.

$y + 9 = 16$

$y + 9 - 9 = 16 - 9$ +9 and –9 cancel each other out.

$y = 7$

You can check that $y = 7$ is the correct solution by substituting it back into the original equation.

$7 + 9 = 16$ — this it true, so $y = 7$ is correct.

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3. If $8x - 3 = 25 + 17x$, then x is

(a) a fraction (b) an integer

(c) a rational number (d) cannot be solved

4. The shifting of a number from one side of an equation to other is called

(a) Transposition (b) Distributivity

(c) Commutativity (d) Associativity

5. If $\frac{5x}{3} - 4 = \frac{2x}{5}$, then the numerical value of $2x - 7$ is

(a) $\frac{19}{13}$ (b) $-\frac{13}{19}$ (c) 0 (d) $\frac{13}{19}$

6. The value of x for which the expressions $3x - 4$ and $2x + 1$ become equal is

(a) –3 (b) 0 (c) 5 (d) 1

7. If a and b are positive integers, then the solution of the equation $ax = b$ has to be always

(a) positive (b) negative (c) one (d) zero

8. Linear equation in one variable has

(a) only one variable with any power.

(b) only one term with a variable.

(c) only one variable with power 1.

(d) only constant term.

If a statement is a proportion, the cross-products of the terms are equal.

If $\frac{a}{b} = \frac{c}{d}$, then $ad = bc$.

To solve equations like $5t = -20$, you still need to get the variable t, on its own. The variable has been multiplied by a number, 5 — so you can get the variable on its own by dividing both sides by that numbers. In this case, you need to divide by 5.

$5t = -20$

$5t \div 5 = -20 \div 5$ Divide both sides by the same number by which the variable is multiplied.

$t = -20 \div 5$

$t = -4$

9. Which of the following is a linear expression:

(a) $x^2 + 1$ (b) $y + y^2$ (c) 4 (d) $1 + z$

10. A linear equation in one variable has

(a) Only one solution

(b) Two solutions

(c) More than two solutions

(d) No solution

11. Value of S in $\frac{1}{3} + S = \frac{2}{5}$

(a) $\frac{4}{5}$ (b) $\frac{1}{15}$ (c) 10 (d) 0

12. $\frac{-4}{3}y = -\frac{3}{4}$, then $y =$

(a) $-\left(\frac{3}{4}\right)^2$ (b) $-\left(\frac{4}{3}\right)^2$ (c) $\left(\frac{3}{4}\right)^2$ (d) $\left(\frac{4}{3}\right)^2$

13. The digit in the tens place of a two digit number is 3 more than the digit in the units place. Let the digit at units place be b. Then the number is

(a) $11b + 30$ (b) $10b + 30$ (c) $11b + 3$ (d) $10b + 3$

14. Arpita's present age is thrice of Shilpa. If Shilpa's age three years ago was x. Then Arpita's present age is

(a) $3(x - 3)$ (b) $3x + 3$

(c) $3x - 9$ (d) $3(x + 3)$

A one-step equation is one that can be solved in one step by either adding, subtracting, multiplying or dividing by one thing.

There are four main methods. For example:

(i) $a + 3 = 4.2$ — solve by **subtracting** 3 from both sides to get $a = 1.2$

(ii) $s - 7 = 12$ — solve by **adding** 7 to both sides to get $s = 19$

(iii) $9m = 27$ — solve by **dividing** both sides by 9 to get $m = 3$

(iv) $d \div 8 = 2$ — solve by **multiplying** both sides by 8 to get $d = 16$

Before you can solve an equation, you must be able to spot what kind of equation you have.

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15. The sum of three consecutive multiples of 7 is 357. Find the smallest multiple.

(a) 112 (b) 126

(c) 119 (d) 116

In questions 16 to 32, fill in the blanks to make each statement true.

16. In a linear equation, the _____ power of the variable appearing in the equation is one.

17. The solution of the equation $3x - 4 = 1 - 2x$ is _____.

18. The solution of the equation $2y = 5y - \frac{18}{5}$ is _____.

19. Any value of the variable which makes both sides of an equation equal is known as a _____ of the equation.

20. $9x -$ _____ $= -21$ has the solution (-2)

21. Three consecutive numbers whose sum is 12 are _____, _____ and _____.

22. The share of A when Rs 25 are divided between A and B so that A gets Rs. 8 more than B is _____.

23. A term of an equation can be transposed to the other side by changing its _____.

24. On subtracting 8 from x, the result is 2. The value of x is _____.

25. $\frac{x}{5} + 30 = 18$ has the solution as _____.

26. When a number is divided by 8, the result is -3. The number is _____.

27. 9 is subtracted from the product of p and 4, the result is 11. The value of p is _____.

28. If $\frac{2}{5}x - 2 = 5 - \frac{3}{5}x$, then $x =$ _____.

29. After 18 years, Swarnim will be 4 times as old as he is now. His present age is _____.

30. Convert the statement Adding 15 to 4 times x is 39 into an equation _____.

Application on Problem Solving Strategy



A family spent Rs. 52.00 for circus tickets. This cost included a Rs. 3.25 service fee for the order, with the cost of the circus tickets being Rs. 9.75 each. How many tickets did the family buy? Justify your answer.



Understand the problem

The answer is the number of tickets that family bought. List the important information– The service fee is Rs. 3.25 per order, the tickets cost Rs. 9.75 each, and the total cost is Rs. 52.

Let t represent the number of tickets bought.

Total cost	=	Tickets	+	Service Fee
52.00	=	$9.75t$	+	3.25



Make a Plan

Think: First the variable is multiplied by 9.75, and then 3.25 is added to the result. Work backward to solve the equation. Undo the operations in reverse order. First subtract 3.25 from both sides of the equation and then divide sides of the new equation by 9.75.



Solve

$52.00 = 9.75t + 3.25$

$-3.25 \quad -3.25$ *Subtract 3.25 from both sides.*

$48.75 = 9.75t$

$\frac{48.75}{9.75} = \frac{9.75t}{9.75}$ *Divide both sides by 9.75.*

$5 = t$ The family bought 5 tickets.



Look Back

You can use a table to decide whether your answer is reasonable.

Five tickets is a reasonable answer.

Tickets	Cost of Tickets	Service charge	Total cost
1	Rs. 9.75	Rs. 3.25	Rs. 13.00
2	Rs. 19.50	Rs. 3.25	Rs. 22.75
3	Rs. 29.25	Rs. 3.25	Rs. 32.50
4	Rs. 39.00	Rs. 3.25	Rs. 42.25
5	Rs. 48.75	Rs. 3.25	Rs. 52.00

Sometimes, a two-step equation contains a term or an expression with a denominator. In these cases, it is often easier to first multiply both sides of the equation by the denominator in order to remove it, and then work to isolate the variable.

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31. The denominator of a rational number is greater than the numerator by 10. If the numerator is increased by 1 the and denominator is decreased by 1, then expression for new denominator is _____.

32. The sum of two consecutive multiples of 10 is 210. The smaller multiple is _____.

In questions 33 to 48, state whether the statements are true (T) or false (F).

33. 3 years ago, the age of a boy was y years. His age 2 years ago was $(y - 2)$ years.

34. Shikha's present age is p years. Reemu's present age is 4 times the present age of Shikha. After 5 years Reemu's age will be $15p$ years.

35. In a 2 digit number, the units place digit is x. If the sum of digits be 9, then the number is $(10x - 9)$.

36. Sum of the ages of Anju and her mother is 65 years. If Anju's present age is y years then her mother's age before 5 years is $(60 - y)$ years.

37. The number of boys and girls in a class are in the ratio 5:4. If the number of boys is 9 more than the number of girls, then number of boys is 9.

38. A and B are together 90 years old. Five years ago A was thrice as old as B was. Hence, the ages of A and B five years back would be $(x - 5)$ years and $(85 - x)$ years respectively.

39. Two different equations can never have the same answer.

40. In the equation $3x - 3 = 9$, transposing -3 to RHS, we get $3x = 9$.

41. In the equation $2x = 4 - x$, transposing $-x$ to LHS, we get $x = 4$.

42. If $\frac{15}{8} - 7x = 9$, then $-7x = 9 + \frac{15}{8}$

43. If $\frac{x}{3} + 1 = \frac{7}{15}$, then $\frac{x}{3} = \frac{6}{15}$

44. If $6x = 18$, then $18x = 54$

45. If $\frac{x}{11} = 15$, then $x = \frac{11}{15}$

46. If x is an even number, then the next even number is $2(x + 1)$.

47. If the sum of two consecutive numbers is 93 and one of them is x, then the other number is $93 - x$.

48. Two numbers differ by 40, when each number is increased by 8, the bigger becomes thrice the lesser number. If one number is x, then the other number is $(40 - x)$.

Solve the following:

49. $\frac{3x-8}{2x}=1$

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

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

52. $\frac{8}{x}=\frac{5}{x-1}$

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

54. $\frac{0.2x+5}{3.5x-3}=\frac{2}{5}$

55. $\frac{y-(4-3y)}{2y-(3+4y)}=\frac{1}{5}$

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

57. $0.4(3x-1) = 0.5x + 1$

58. $8x - 7 - 3x = 6x - 2x - 3$

59. $10x - 5 - 7x = 5x + 15 - 8$

60. $4t - 3 - (3t + 1) = 5t - 4$

61. $5(x - 1) - 2(x + 8) = 0$

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

63. $\frac{1}{2}(x+1)+\frac{1}{3}(x-1)=\frac{5}{12}(x-2)$

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

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

66. $1-(x-2)-[(x-3)-(x-1)]=0$

67. $3x-\frac{x-2}{3}=4-\frac{x-1}{4}$

68. $\frac{3t+5}{4}-1=\frac{4t-3}{5}$

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

70. $0.25\,(4x-5)=0.75x+8$

71. $\frac{9-3y}{1-9y}=\frac{8}{5}$

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

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

74. $\frac{3t-2}{3}+\frac{2t+3}{2}=t+\frac{7}{6}$

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

76. $4\,(3p+2)-5(6p-1)=2(p-8)-6(7p-4)$

77. $3\,(5x-7)+2(9x-11)=4(8x-7)-111$

78. $0.16\,(5x-2)=0.4x+7$

79. Radha takes some flowers in a basket and visits three temples one by one. At each temple, she offers one half of the flowers from the basket. If she is left with 3 flowers at the end, find the number of flowers she had in the beginning.

80. Rs. 13500 are to be distributed among Salma, Kiran and Jenifer in such a way that Salma gets Rs. 1000 more than Kiran and Jenifer gets Rs. 500 more than Kiran. Find the money received by Jenifer.

81. The volume of water in a tank is twice of that in the other. If we draw out 25 litres from the first and add it to the other, the volumes of the water in each tank will be the same. Find the volume of water in each tank.

82. Anushka and Aarushi are friends. They have equal amount of money in their pockets. Anushka gave $\frac{1}{3}$ of her money to Aarushi as her birthday gift. Then Aarushi gave a party at a restaurant and cleared the bill by paying half of the total money with her. If the remaining money in Aarushi's pocket is Rs.1600, find the sum gifted by Anushka.

83. Kaustubh had 60 flowers. He offered some flowers in a temple and found that the ratio of the number of remaining flowers to that of flowers in the beginning is 3:5. Find the number of flowers offered by him in the temple.

84. The sum of three consecutive even natural numbers is 48. Find the greatest of these numbers.

85. The sum of three consecutive odd natural numbers is 69. Find the prime number out of these numbers.

86. The sum of three consecutive numbers is 156. Find the number which is a multiple of 13 out of these numbers.

87. Find a number whose fifth part increased by 30 is equal to its fourth part decreased by 30.

88. Divide 54 into two parts such that one part is $\frac{2}{7}$ of the other.

89. Sum of the digits of a two-digit number is 11. The given number is less than the number obtained by interchanging the digits by 9. Find the number.

90. Two equal sides of a triangle are each 4m less than three times the third side. Find the dimensions of the triangle, if its perimeter is 55m.

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91. After 12 years, Kanwar shall be 3 times as old as he was 4 years ago. Find his present age.

92. Anima left one-half of her property to her daughter, one-third to her son and donated the rest to an educational institute. If the donation was worth Rs. 1,00,000, how much money did Anima have?

93. If $\frac{1}{2}$ is subtracted from a number and the difference is multiplied by 4, the result is 5. What is the number?

94. The sum of four consecutive integers is 266. What are the integers?

95. Hamid has three boxes of different fruits. Box A weighs $2\frac{1}{2}$ kg more than Box B and Box C weighs $10\frac{1}{4}$ kg more than Box B. The total weight of the three boxes is $48\frac{3}{4}$ kg. How many kilograms (kg) does Box A weigh?

96. The perimeter of a rectangle is 240 cm. If its length is increased by 10% and its breadth is decreased by 20%, we get the same perimeter. Find the length and breadth of the rectangle.

97. The age of A is five years more than that of B. 5 years ago, the ratio of their ages was 3:2. Find their present ages.

98. If numerator is 2 less than denominator of a rational number and when 1 is subtracted from numerator and denominator both, the rational number in its simplest form is $\frac{1}{2}$. What is the rational number?

99. In a two digit number, digit in units place is twice the digit in tens place. If 27 is added to it, digits are reversed. Find the number.

100. A man was engaged as typist for the month of February in 2009. He was paid Rs. 500 per day but Rs. 100 per day were deducted for the days he remained absent. He received Rs. 9,100 as salary for the month. For how many days did he work?

101. A steamer goes downstream and covers the distance between two ports in 3 hours. It covers the same distance in 5 hours when it goes upstream. If the stream flows at 3 km/hr, then find what is the speed of the steamer upstream?

102. A lady went to a bank with Rs. 1,00,000. She asked the cashier to give her Rs. 500 and Rs. 1,000 currency notes in return. She got 175 currency notes in all. Find the number of each kind of currency notes.

103. There are 40 passengers in a bus, some with Rs. 3 tickets and remaining with Rs.10 tickets. The total collection from these passengers is Rs. 295. Find how many passengers have tickets worth Rs. 3?

104. Denominator of a number is 4 less than its numerator. If 6 is added to the numerator it becomes thrice the denominator. Find the fraction.

105. An employee works in a company on a contract of 30 days on the condition that he will receive Rs. 120 for each day he works and he will be fined Rs. 10 for each day he is absent. If he receives Rs. 2300 in all, for how many days did he remain absent?

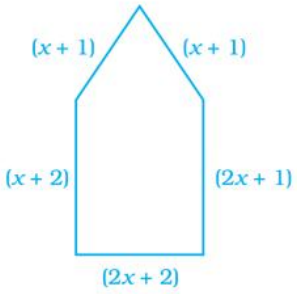
106. Kusum buys some chocolates at the rate of Rs. 10 per chocolate. She also buys an equal number of candies at the rate of Rs. 5 per candy. She makes a 20% profit on chocolates and 8% profit on candies. At the end of the day, all chocolates and candies are sold out and her profit is Rs. 240. Find the number of chocolates purchased.

107. A steamer goes downstream and covers the distance between two ports in 5 hours while it covers the same distance upstream in 6 hours. If the speed of the stream is 1 km/hr, find the speed of the steamer in still water.

108. Distance between two places A and B is 210 km. Two cars start simultaneously from A and B in opposite direction and distance between them after 3 hours is 54 km. If speed of one car is less than that of other by 8 km/hr, find the speed of each.

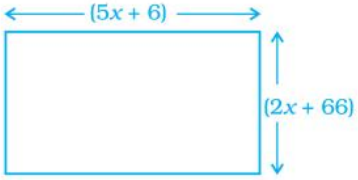
109. A carpenter charged Rs. 2500 for making a bed. The cost of materials used is Rs. 1100 and the labour charges are Rs. 200/hr. For how many hours did the carpenter work?

110. For what value of x is the perimeter of shape 77 cm?



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111. For what value of x is the perimeter of shape 186 cm?



112. On dividing Rs. 200 between A and B such that twice of A's share is less than 3 times B's share by 200, B's share is?

113. Madhulika thought of a number, doubled it and added 20 to it. On dividing the resulting number by 25, she gets 4. What is the number?

(D) Applications, Games and Puzzles

1. Ranika wanted her friend Radhika's mobile number. But Radhika played a trick. She gave her the number as

   9 X Y Z P 1 Q 2 R 3

   and told her to decode it with the help of following equations :

   (a) $16 - 35 = 7 - 8$

   (b) $\frac{6Y-7}{3Y+9}=\frac{1}{3}$

   (c) $\frac{Z^2-9}{5+Z^2}=\frac{-5}{9}$

   (d) $P + \frac{3}{10}P = \frac{13}{10}$

   (e) $4(Q+4) = 5(Q+2)$

   (f) $3(R+10) + 200 = 236$

2. Determine the missing value in the puzzle below :



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3. Game : Who will be the Lakhpati ???

Rohit and Saurabh are playing a game. The one who solves the following equations will be a winner. Find out if you were at their place would you have been be a winner. Till what money did you reach successfully?

Rules of the game

(a) You can only move to the next problem if the previous answer is correct.

(b) Winning amount slab

Question Number	Amount Won
1	Rs. 1,000
2	Rs. 2,000
3	Rs. 3,000
4	Rs. 4,000
5	Rs. 10,000
6	Rs. 12,000
7	Rs. 14,000
8	Rs. 20,000
9	Rs. 40,000
10	Rs. 1,00,000

(c) Problems:

(i) $\frac{x+1}{2x+7} = \frac{3}{8}$

(ii) $\frac{1}{(x-1)} + \frac{2}{(x+1)} = 2$

(iii) $\frac{6x+1}{3} + 1 = \frac{x-3}{6}$

(iv) $3m = 7m - \frac{8}{7}$

(v) $-x = \frac{-6}{5}(x-10)$

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(vi) $5x + \frac{7}{2} = \frac{3}{2}x - 14$

(vii) $\frac{x}{3} + 1 = \frac{8}{15}$

(viii) $\frac{x}{2} + \frac{3x}{4} - \frac{5x}{6} = 2$

(ix) $\frac{50}{x} + 4 = 14$

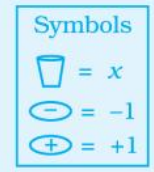
(x) $x + \frac{2}{3}x + \frac{x}{7} = 97 - \frac{x}{2}$

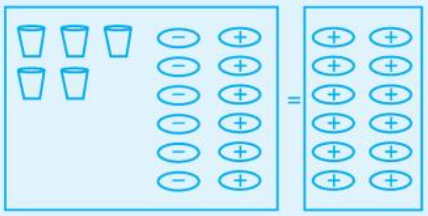
4. Work with a partner.

Modelling the Equation

Material Required : Glasses and containers, Equation met

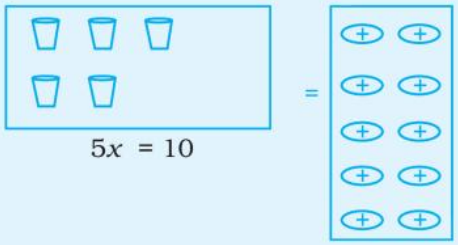






Add 6 positive containers to each side of the equal and then remove the zero pairs.

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



Arrange the glasses and containers into five equal groups.

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Each Cup is matched with 2 positive contents. So, $x = 2$.

Model the following equations:

(i) $3x - 3 = 12$

(ii) $12x + 4 = 24$

(iii) $7y + 14 = 7$

5. Cross word puzzle.

Solve the given crossword and then fill up the given boxes. Clues are given below for across as well as downward filling. Also, for across and down clues, clue number is written at the corner of the boxes. Answers of clues have to be filled up in their respective boxes.

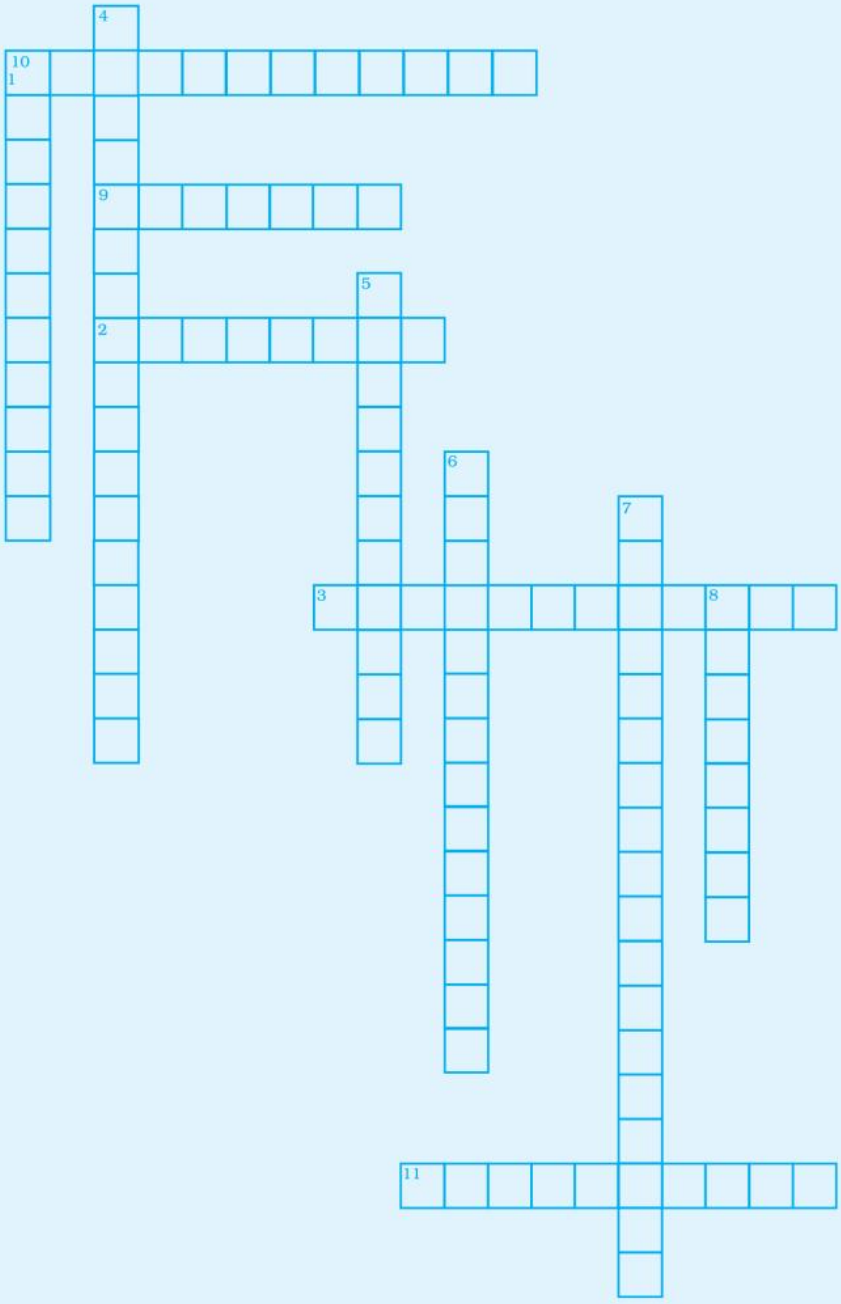
Down

1. Inverse of addition.
4. A symbolic form made up of constants, variables and operation (other than algebraic expressions).
5. If a term of an expression consists of a number multiplied by one or more variables, this number is the _____ of the term.
6. Inverse of division.
7. Equations that have the same solution.
8. An _____ in an equality which is true for all values of the variable in the equality.

Across

2. A statement formed when an equal sign in placed between two expressions.
3. $2(x+5) = 2x+10$. This is an example of what property.
9. Branch of mathematics concerned with operation by symbolic numbers.
10. A linear equation of the form $Ax + By = C$ when A and B both are not zero is in the _____.
11. An expression is _____ if it has no grouping symbols and all the like terms have been combined.

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4
10
1
9
5
2
6
7
3
8
11

Rough Work

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Rough Work

Rough Work