Finding the Unknown Class 7 Notes Maths Part 2 Chapter 7

An equation states that two things are equal, using mathematical symbols. An equal sign (=) is used. A variable is something that can vary. It assumes different numerical values; its value is not fixed. These are usually denoted by letters of the English alphabet, such as x, y, z, l, m, n, p, etc. From variables, we form an expression by operating on addition, subtraction, multiplication, and division on them.

Solving Equations Systematically

For any balanced numerical equation, if we either:

- Add the same number to both sides,
- or subtract the same number from both sides,
- or multiply by the same number to both sides,
- Or divide by the same number on both its sides, and the balance is undisturbed.

More Equations Transposing means moving to the other side. It has the same effect as adding the same number to (or subtracting the same number from) both sides of the equation. When we transpose a number from one side of the equation to the other side, we change its sign.

Linear Equations

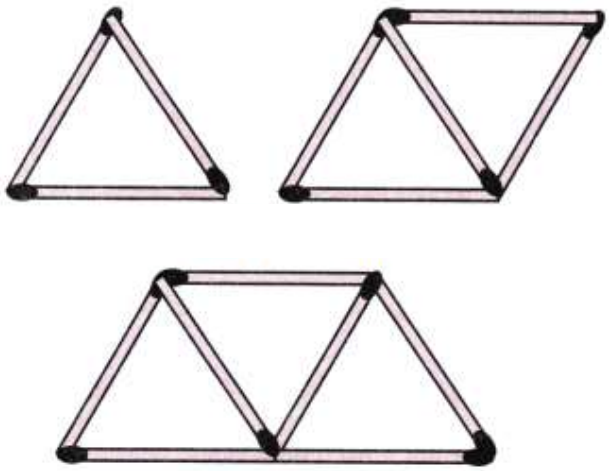
A. Trial and error method Example: Solve 2x + 3 = 9 For x = 1 LHS = 2 × 1 + 3 = 5 ≠ RHS For x = 2 LHS = 2 × 2 + 3 = 7 ≠ RHS For x = 3 LHS = 2 × 3 + 3 = 6 + 3 = 9 = RHS So x = 3 is a solution of the equation.

B. Balancing Equation Example: Solve 2x + 3 = 9 Subtract 3 from both sides 2x + 3 – 3 = 9 – 3 2x = 6 Divide both sides by 2 2x ÷ 2 = 6 ÷ 2 x = 3 So, x = 3 is a solution of the equation.

Rules for solving by transposing

Variable terms or unknown terms should be on one side and constants or numbers on the other side. For this, we may need to add or subtract the terms and constants. Example: 5x – 8 = 2x + 1 Subtract 2x from both sides (Bringing unknown terms to one side) 5x – 8 – 2x = 2x + 1 – 2x 3x – 8 = +1 Add 8 on both sides 3x – 8 + 8 = +1 + 8 3x = 9 To separate the coefficient from the unknown term, divide by the coefficient 3x ÷ 3 = 9 ÷ 3 x = 3 ∴ x = 3 is a solution of 5x – 8 = 2x + 1.

Matchstick Pattern



First pattern 3 matchsticks Second pattern 5 matchsticks Third pattern 7 matchsticks We note that 2 more matchsticks make the next pattern. So the pattern is observed as First pattern 3 = 1 + 2 Second pattern 5 = 1 + 2 + 2 Third pattern 7 = 1 + 2 + 2 + 2 . . . For nth position matchsticks needed = 1 + 2 + 2 + … (n times) = 1 + 2n Let 99 matchsticks be used for an n-pattern 2n + 1 = 99 Subtract 1 from both sides ⇒ 2n + 1 – 1 = 99 – 1 ⇒ 2n = 98 ⇒ n = 98 ÷ 2 ⇒ n = 49The 49th pattern has 99 matchsticks Let if possible y arrangements use 200 sticks. 2y + 1 = 200 Subtract 1 from both sides ⇒ 2y + 1 – 1 = 200 – 1 ⇒ 2y = 199 ⇒ y = 199 ÷ 2 ⇒ y = 99.5 As the number of arrangements cannot be in decimal, an exact 200 matchsticks cannot be used.

C. Transposition A term added on one side when transposed, i.e., shifted to the other side, will be subtracted. A term subtracted from one side when transposed will be added. A term multiplied on one side of the transposition will be divided, and vice versa.

Example: Solve 6y + 7 = 4y + 21 Here, 6y + 7 = 4y + 21 +4y when transposed to the Left Hand Side (LHS) will become -4y. 6y + 7 – 4y = 21 2y + 7 = 21 +7 when transposed to Right right-hand side (RHS) will become -7. 2y = 21 – 7 2y = 14 2 multiplied on Left left-hand side (LHS) will divide when transposed y = 14 ÷ 2 y = 7

Example: 4u7 = 16
Divisor 7, when transposed, is multiplied
4u = 16 × 7
Multiplicand 4, when transposed, becomes the divisor
u = 16×74 u = 28

Mind The Mistake, Mend The Mistake

The following are some equations, along with the steps used to solve them to find the value of the letter-number. Review each solution and determine whether the steps are correct. If there is a mistake, describe the mistake, correct i,t and solve the equation.

1. 4x + 6 = 10 ⇒ 4x = 10 + 6 → Error ⇒ 4x = 16 ⇒ x = 4 Correction 4x + 6 = 10 Subtract 6 from both sides 4x + 6 – 6 = 10 – 6 ⇒ 4x = 10 – 6 ⇒ 4x = 4 ⇒ x = 1

2. 7 – 8z = 5 ⇒ 8z = 7 – 5 ⇒ 8z = 2 ⇒ z = 4 → Error Correction 7 – 8z = 5 ⇒ 8z = 7 – 5 ⇒ 8z = 2 Divide both sides by 8 8z8=28
⇒ z = 14

3. 2v – 4 = 6 ⇒ v – 4 = 6 – 2 → Error ⇒ v – 4 = 4 ⇒ v = 8 Correction 2v – 4 = 6 Add 4 to both sides 2v – 4 + 4 = 6 + 4 2v = 10 Divide both sides by 2 2v2=102 ⇒ v = 5

4. 5z + 2 = 3z – 4 ⇒ 5z + 3z = -4 + 2 → Error ⇒ 8z = -2 ⇒ z = −28 Correction 5z + 2 = 3z – 4 ⇒ 5z – 3z = -4 – 2 ⇒ 2z = -6 Divide both sides by 2 ⇒ z = -3

5. 15w – 4w = 26 ⇒ 15w = 26 + 4w → Error ⇒ 15w = 30 ⇒ w = 2 Correction 15w – 4w = 26 ⇒ 11w = 26 ⇒ w = 2611 = 2411

6. 3(x + 1) = -12 ⇒ x + 1 = -4 → Error ⇒ x = -5 Correction 3x + 1 = -12 ⇒ 3x = -12 – 1 ⇒ 3x = -13 ⇒ x = −133 = -413

7. 4(4q + 2) = 50 ⇒ 4(4q) = 50 – 2 → Error ⇒ 16q = 48 ⇒ q = 3 Correction 4(4q + 2) = 50 [Distributive Property] ⇒ 4(4q) + 4(2) = 50 ⇒ 16q + 8 = 50 ⇒ 16q = 50 – 8 ⇒ 16q = 42 ⇒ q = 4216
⇒ q = 218
⇒ q = 258

8. -2(3 – 4x) = 14 ⇒ -6 – 8x = 14 ⇒ -8x = 14 + 6 ⇒ -8x = 20 ⇒ x = −208
Correction
-2(3 – 4x) = 14
⇒ -6 + 8x = 14
⇒ 8x = 14 + 6
⇒ 8x = 20
⇒ x = 208
⇒ x = 52
⇒ x = 212

9. 3(7y + 4) = 9 + 5y ⇒ 7y + 4 = 93 + 5y → Error
⇒ 7y + 4 = 3 + 5y
⇒ 7y – 5y + 4 = 3
⇒ 2y = 4 – 3 → Error
⇒ y = 12
Correction
3(7y + 4) = 9 + 5y
⇒ 21y + 12 = 9 + 5y [Distributive Property]
⇒ 21y – 57 = 9 – 12
⇒ 16y = -3
⇒ y = −316

An algebraic equation is a mathematical statement that indicates the equality of two algebraic expressions. When the same operation is performed on both sides of an equation, equality is maintained. Finding a solution to an equation means finding the values of the unknowns in the expressions such that the LHS is equal to the RHS. Equations can often be solved by performing the same operation on both sides so that the value of the unknown becomes evident.