MATHEMATICS

Class-VII

Topic-14

LINEAR EQUATION

LINEAR EQUATION

TERMINOLOGIES

Linear Equation, Transposition.

INTRODUCTION

An equation is a mathematical sentence involving an equal sign. Thus 5 + 5 = 10 is an equation.

It is like balanced scale. Just as you have 2 sides of an equation, so you have 2 pans in balance. Just as there is sign of equality, there is horizontal beam in balance. Just as two sides of an equation are equal, the weights in pans are equal.

In this chapter we will be dealing with one variable whose degree (maximum power) will be one.

14.1 LINEAR EQUATIONS

(a)   Linear equation in one variable

An equation involving only one literal number (variable) with the highest power one is called a linear equation in one variable.

Standard form of a linear equation in x is ax + b = 0, where a, b $\in$ R and a $\neq$ 0.

For example : $3x - 7 = 5$, $\dfrac{x}{4} + 5 = 3$, $3x - 2y = 7$ and $\dfrac{x}{2} + \dfrac{x}{3} = 4$ are linear equations.

(b)   Solution of a Linear equation

Any value of the variable which makes the equation a true statement is called the solution or root of the equation.

Illustration 14.1

Verify that x=3 is a root of the equation 2x + 5 = 11

Sol.   Substituting x=3 in the given equation, we get
LHS = 2 × 3 + 5 = 6 + 5 = 11 = RHS
$\therefore$ x = 3 is a solution of the equation 2x + 5 = 11

(c)   Rules for solving an equation

(i) Property : We can add the same number to both sides of the equation;

Illustration 14.2

Solve the equation x – 7 = – 2 and check the result.

Sol.   We have, x – 7 = – 2.
In order to solve this equation, we have to get x by itself on the L.H.S. to get x by itself on the L.H.S., We need to shift – 7. This can be done by adding 7 to both sides of the given equation. Thus,
x – 7 = – 2

$\Rightarrow$ $x - 7 + 7 = -2 + 7$ [Adding 7 to both sides]

$\Rightarrow$ $x + 0 = 5$ [$\because -7 + 7 = 0$ and $-2 + 7 = 5$]

$\Rightarrow$ $x = 5$

Thus, $x = 5$ is the solution of the given equation.

L.H.S. $= 5 - 7 = -2$ and R.H.S. $= -2$

Thus, when $x = 5$, we have L.H.S. = R.H.S.

(ii) Property : We can subtract the same number from both sides of the equation.

Illustration 14.3

Solve the equation $x + 4 = -2$ and check the result.

Sol.   In order to solve this equation, we have to obtain x by itself on L.H.S. To get x by itself on L.H.S., we need to shift 4. This can be done by subtracting 4 from both sides of the given equation.

Thus, $x + 4 = -2$

$\Rightarrow$ $x + 4 - 4 = -2 - 4$ [Subtracting 4 from both sides]

$\Rightarrow$ $x + 0 = -6$ [$\because 4 - 4 = 0$ and $-2 - 4 = -6$]

$\Rightarrow$ $x = -6$ Thus, $x = -6$ is the solution of the given equation.

(iii) Property : We can multiply both sides of the equation by the same non–zero number.

Illustration 14.4

Solve the equation $\dfrac{y}{12} = 48$ and check the result.

Sol.   In order to solve this equation, we have to get y by itself on L.H.S. To get y by itself on L.H.S., we have to remove 12 from L.H.S. This can be done by multiplying both sides of the equation by 12 thus,

we have $\dfrac{y}{12} = 48$

$\Rightarrow$ $\dfrac{y}{12} \times 12 = 48 \times 12$ [Multiplying both sides by 12]

$\Rightarrow$ $y = 576$

Check : Putting, $y = 576$ in the given equation, we get

L.H.S. $= \dfrac{576}{12} = 48$ and R.H.S. $= 48$.

Thus, for $y = 567$, we have L.H.S. = R.H.S

(iv) Property : We can divide both sides of the equation by the same non–zero number.

Illustration 14.5

Solve the equation $\dfrac{2}{3}x = 18$ and check the result.

Sol.   We have, $\dfrac{2}{3}x = 18$

Multiplying both sides by $\dfrac{3}{2} = 18 \times \dfrac{3}{2}$ $\Rightarrow$ $\dfrac{2}{3} \times \dfrac{3}{2} \times x = 27$ $\Rightarrow$ $x = 27$

Thus, $x = 27$ is the solution of the given equation.

Check Putting $x = 27$ in the given equation, we get

L.H.S. $= \dfrac{2}{3} \times 27 = 18$ and R.H.S. = 18

Thus, for $x = 27$, we have L.H.S. = R.H.S.

(v) Property : In an equation, we can drop a term from one side and put it on the other side with the opposite sign. This process is known as transposition.

Illustration 14.6

Solve : $3(x + 3) - 2 (x - 1) = 5 (x - 5)$.

Sol. We have,

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

$\Rightarrow$ $3x + 9 - 2x + 2 = 5x - 25$ [Expanding brackets on both side]

$\Rightarrow$ $3x - 2x + 9 + 2 = 5x - 25$

$\Rightarrow$ $x + 11 = 5x - 25$ [Simplifying L.H.S. and R.H.S. separately]

$\Rightarrow$ $-4x = -36$

$\therefore$ $x = 9$

Illustration 14.7

Solve : $4x - 3 = 2x + 5$.

Sol. $4x - 3 = 2x + 5$

$\Rightarrow$ $4x - 2x = 5 + 3$

$\Rightarrow$ $2x = 8$

$\Rightarrow$ $x = \dfrac{8}{2}$

$\Rightarrow$ $x = 4$

Verification : Putting $x = 4$ in both sides, we get

L.H.S.

= $4x - 3$

= $4 \times 4 - 3$

= $16 - 3 = 13$

R.H.S.

= $2x + 5$

= $2 \times 4 + 5$

= $8 + 5$

= 13

Since R.H.S = L.H.S it shows that solution is correct.

Illustration 14.8

Solve : $\dfrac{3x - 1}{4} - \dfrac{2x + 5}{3} = \dfrac{5}{2} - 2x$.

Sol. $\dfrac{3x - 1}{4} - \dfrac{2x + 5}{3} = \dfrac{5}{2} - 2x$.

Multiplying both side of equation by 12 [L.C.M. of 4, 3, 2]

$\Rightarrow$ $3 (3x - 1) - 4 (2x + 5) = 12 \left(\dfrac{5}{2} - 2x \right)$

$\Rightarrow$ $9x - 3 - 8x - 20 = 30 - 24x$

$\Rightarrow$ $9x - 8x + 24x = 30 + 3 + 20$

$\Rightarrow$ $25x = 53$

$\Rightarrow$ $x = \dfrac{53}{25} = 2\dfrac{3}{25}$.

Illustration 14.9

Solve : $\dfrac{3x+5}{2x-1} = \dfrac{2}{5}$.

Sol. $\dfrac{3x+5}{2x-1} = \dfrac{2}{5}$

$\Rightarrow \qquad 5(3x+5) = 2(2x-1) \qquad\qquad$ [Cross multiplication]

$\Rightarrow \qquad 15x + 25 = 4x - 2$

$\Rightarrow \qquad 15x - 4x = -25 - 2$

$\Rightarrow \qquad 11x = -27$

$\Rightarrow \qquad x = \dfrac{-27}{11}$

$\Rightarrow \qquad x = -2\dfrac{5}{11}$.

Illustration 14.10

Solve : 0.5x + 0.4x = 0.09

Sol. $\dfrac{5x}{10} + \dfrac{4x}{10} = \dfrac{9}{100}$ [Multiplying each term by 100]

$\Rightarrow \qquad \dfrac{5}{10}x \times 100 + \dfrac{4x}{10} \times 100 = \dfrac{9}{100} \times 100$

$\Rightarrow \qquad 50x + 40x = 9 \qquad \Rightarrow \qquad 90x = 9$

$\Rightarrow \qquad x = \dfrac{9}{90} \qquad\qquad \Rightarrow \qquad x = \dfrac{1}{10} \qquad \Rightarrow \qquad x = 0.1$

Verification : L.H.S

= 0.5x + 0.4x

= 0.5 × 0.1 + 0.4 × 0.1

= 0.05 + 0.04

= 0.09

R.H.S. = 0.09

L.H.S. = R.H.S.

Hence verified solution x = 0.01 is correct.

Ask yourself

1. Solve the equation $\dfrac{2x}{4} - \dfrac{x}{5} = 1$.

2. Solve for x : $\dfrac{7x+2}{2} = 5 + \dfrac{x}{7}$

3. Find the value of x in the expression : $x - 3 = \dfrac{3-x}{4}$.

4. Find the value of x in $\dfrac{3}{x+1} = \dfrac{5}{7x+1}$

5. Solve for x : 3(2x+1) = 5(7x −2)

Answers

1. $\dfrac{10}{3}$ 2. $\dfrac{56}{47}$ 3. 3 4. $\dfrac{1}{8}$ 5. $\dfrac{13}{29}$

14.2 APPLICATIONS OF LINEAR EQUATION

Illustration 14.11

If 7 is subtracted from five times a number, the result is 63. Find the number.

Sol. Five times x = 5x

When 7 is subtracted from five times x, we get 5x – 7.

It is given that when 7 is subtracted from five times x, the result is 63. So, we obtain the following equation : 5x – 7 = 63.

We have,

$$5x - 7 = 63$$
$$\Rightarrow \quad 5x = 63 + 7 \qquad \text{[On transposing – 7 to R.H.S.]}$$
$$\Rightarrow \quad 5x = 70$$
$$\Rightarrow \quad \frac{5x}{5} = \frac{70}{5} \qquad \text{[Dividing both sides by 5]}$$
$$\therefore \quad x = 14.$$

Hence, the required number is 14.

Illustration 14.12

The sum of two consecutive numbers is 53. Find the numbers.

Sol. Let one number be x. Then, the next consecutive number is x + 1. It is given that the sum of two consecutive numbers is 53. So, we obtain the following equation :

$$x + (x + 1) = 53$$
$$\Rightarrow \quad 2x + 1 = 53$$
$$\Rightarrow \quad 2x = 53 - 1 \qquad \text{[On transposing 1 on R.H.S.]}$$
$$\Rightarrow \quad 2x = 52$$
$$\Rightarrow \quad \frac{2x}{2} = \frac{52}{2} \qquad \text{[Dividing both sides by 2]}$$
$$\Rightarrow \quad x = 26$$
$$\therefore \quad \text{One number} = 26$$

Another number = 26 + 1 = 27.

Illustration 14.13

The sum of the ages of father and son is 48 years. The quotient obtained by dividing the age of the son by the age of the father is $\frac{1}{5}$. Find their ages.

Sol. Let the age of son be x years.

$\therefore$ Age of father = 48 – x years.

A.T.Q. $\dfrac{x}{48 - x} = \dfrac{1}{5}$

$$\Rightarrow \quad 5 \times x = 1 \times (48 - x)$$
$$\Rightarrow \quad 5x + x = 48$$
$$\Rightarrow \quad 6x = 48$$
$$\Rightarrow \quad x = \frac{48}{6}$$
$$\Rightarrow \quad x = 8$$
$$\therefore \quad \text{Age of son 8 years.}$$

Age of father = 48 – 8 years = 40 years.

Ask yourself

1. The ages of Tarun and Gulshan are in Ratio 7 : 5. Ten years hence, the Ratio of their ages will be 9 : 7. Find their present ages.

2. Thrice a number when increased by 6 gives 24. Find the number.

3. The difference between two numbers is 16. If one third of the smaller number is greater than one seventh of the larger number by 4, then what are the two numbers.

4. Nine added to thrice a whole number gives 45. Find the number

5. A number is as much greater than 21 as it is less than 71 . Find the number.

Answers

1. 35, 29 **2.** 6 **3.** 33, 49 **4.** 12 **5.** 46

Add your knowledge

LINEAR EQUATION IN TWO VARIABLES

An equation of the form **ax + by + c = 0** where **a, b**, **c** are real numbers and a, b ≠ 0, and **x, y** are variables, is called a **linear equation in two variables**, here **'a'** is called **coefficient of x**, **'b'** is called **coefficient of y** and **'c'** is called **constant term**.
Any pair of values of x and y which satisfies the equation ax + by + c = 0, is called a solution of it.

Example.

Prove that x = 3, y = 2 is a solution of 3x – 2y = 5.

Sol. x = 3, y = 2 is a solution of 3x – 2y = 5, because L.H.S.= 3x – 2y = 3 × 3 – 2 × 2 = 9 – 4 = 5 = R.H.S.   i.e. x = 3, y = 2 satisfied the equation 3x – 2y = 5 .
It is a solution of the given equation.

Example.

If the point (–5, 6) lies on the linear equation by = 8x +14 , then find the value of b

Sol. x = –5 , y = 6 will lie on by = 8x +14 ,
by putting values , b × 6 = 8 × (– 5) +14 , and solving
we get b = $\dfrac{-26}{6}$

Concept Map

LINEAR EQUATION IN ONE VARIABLE

Standard Form

$ax + b = 0$, a , $b \,\varepsilon\, R$, $a \neq 0$

Solution

$x = \propto$ is solution
of $ax + b = 0$
If $a \propto + b = 0$

Transposition

Change of sign while change sides

$+ \rightarrow -$

$- \rightarrow +$

$\times \rightarrow \div$

$\div \;\rightarrow \times$

Ex : $ax + b = c$

$ax = c - b$

$x = \dfrac{c - b}{a}$

Summary

1. A statement of equality involving one or more variables (literals) is called an **equation**.

2. Standard form of a linear equation in x is $ax + b = 0$, where a, b $\in$ R and a $\neq$ 0.

3. Any value of the variable which makes the equation a true statement is called the solution or root of the equation.

4. We can add the same number to both sides of the equation.

5. We can subtract the same number from both sides of the equation.

6. We can multiply both sides of the equation by the same non–zero number.

7. We can divide both sides of the equation by the same non–zero number.

8. In an equation, we can drop a term from one side and put it on the other side with the opposite sign. This process is known as transposition.

EXERCISE » 01

SECTION –A (FIXED RESPONSE TYPE)
MULTIPLE CHOICE QUESTIONS

1. Solve : $2x + \dfrac{7}{2} = \dfrac{9}{2}$.

   (A) 1   (B) $\dfrac{1}{2}$ (C) 2   (D) 4

2. If $\dfrac{3}{4}x = -7 + x$, then the value of x is :

   (A) 4   (B) $-\dfrac{7}{3}$ (C) – 28   (D) 28

3. If $\dfrac{3x-5}{2} = \dfrac{5.005}{2.002}$, then x =

   (A) $\dfrac{5}{3}$ (B) $\dfrac{10}{3}$ (C) $\dfrac{12.5}{3}$ (D) 0

4. If $\dfrac{x}{4} - \dfrac{x-3}{6} = 1$, then x is equal to :

   (A) 12   (B) 6   (C) 3   (D) 4

5. Solve : $\dfrac{y-1}{3} - \dfrac{y-2}{4} = 1$.

   (A) 7   (B) 8   (C) 12   (D) 10

6. Solve : $\dfrac{x+b}{a-b} = \dfrac{x-b}{a+b}$.

   (A) a   (B) 2a   (C) – a   (D) – 2a

7. Solve for x : $0.5\,x + \dfrac{x}{3} = 0.25\,x + 7$

   (A) 12   (B) 14   (C) 21   (D) 82

8. If 3 (x + 5) + 16 = 5 (x + 14) – 21, then x =
   (A) x = – 8   (B) x = – 7   (C) x = – 6   (D) x = – 9

9. Three angles of a quadrilateral have the same measure. If the measure of the fourth angle is 150º. Find the measure of other angles.
   (A) 50º   (B) 70º   (C) 75º   (D) 65º

10. If twice a certain number is diminished by five, the result is equal to twelve added to the number. Find the number :
    (A) 18   (B) 16   (C) 15   (D) 17

11. "I am a number. Tell my identity. Take me twelve times over, and add a fifty ! To reach a double century, you still need thirty !" Who am I ?
    (A) 10   (B) 12   (C) 20   (D) 24

12. The sum of one half, one third and one fourth of a number exceed the number itself by 12. The number is:
    (A) 72   (B) 144   (C) 180   (D) 244

13. The sum of five consecutive odd numbers is 1185, what are the numbers ?
(A) 231, 233, 235, 237, 239   (B) 229, 231, 233, 235, 237
(C) 233, 235, 237, 239, 241   (D) None of these

14. The sum of seven consecutive natural numbers is 1617. How many of these numbers are not prime :
(A) 4   (B) 2   (C) 5   (D) 7

15. Find three consecutive integers such that four times the first plus one– half the second minus twice the third is equal to 24 :
(A) 11, 12 and 13   (B) 12, 13 and 14   (C) 13, 14 and 15   (D) 10, 11 and 12

16. 75% of a number is added to 75, the result is the number itself. Find the number.
(A) 300   (B) 75   (C) 150   (D) None of these

17. The denominator of a fraction is greater than numerator by 6. If 3 is added to numerator and 2 is subtracted from denominator, the fraction becomes $\dfrac{6}{7}$, then the equation so formed is :
(A) $\dfrac{x+4}{x+3} = \dfrac{6}{7}$ (B) $\dfrac{x+3}{x+4} = \dfrac{6}{7}$ (C) $\dfrac{x}{x+6} + \dfrac{3}{-2} = \dfrac{6}{7}$ (D) $\dfrac{x}{x+6} + \dfrac{-2}{3} = \dfrac{6}{7}$

18. Twelve years hence a man will be four times as he was twelve years ago, then his present age is :
(A) 20 years   (B) 25 years   (C) 28 years   (D) 30 years

19. After 12 years, Pravallika will be 3 times as old as she was 4 years ago. What is the present age of Pravallika ?
(A) 16 years   (B) 15 years   (C) 14 years   (D) 12 years

FILL IN THE BLANKS

1. A statement of equality involving one or more variables is called an _____

2. $\dfrac{3+y}{2} = 8$, then y =_____

3. $\dfrac{1}{6}x - 7 = 4$, then x = _____

4. 3(y–2) = 2(y–3),then y = _____

5. If 14 is added to a number , their sum becomes 35. then number is _____

6. Adding 15 to three times a certain number yields 105 then the number is _____.

7. After 23 years Mona will be 4 times as old as she was 4 years ago then the present age of mona is____.

TRUE / FALSE

1. There can be many solutions for the equation 3 + x = 10

2. 3x + 2 = 9 is a linear equation in one variable

3. The solution of the equation 2(x–6) = 20 is x = 4

4. In the equation, 3(x–5) = 2x + 7, RHS is 3(x–5)

5. The same number can be added, subtracted or multiplied on both the sides of the equation.

6. The perimeter of an isosceles triangle is 28 cm. If one side is 8 cm, then the length of equal side is 10 cm

7. An even number's three fourth equals to two third of its just next even number. The even number will be 16

MATCH THE COLUMN

1.

	Column–I			Column–II
(A)	9 Subtracted from no. is 15. The no. is		(p)	5
(B)	A no. multiplied by itself is 16, the no. is		(q)	3
(C)	$\dfrac{7-x}{14}=0$, then x is		(r)	24
(D)	7y = 35 , y is		(s)	4
(E)	Thrice a no. decreased by 7 gives 2, the no. is		(t)	7

SECTION –B (FREE RESPONSE TYPE)

VERY SHORT ANSWER TYPE

1. Solve the equation : $\dfrac{x}{4} - \dfrac{x}{5} = 1$.

2. Solve : 0.3x + 0.4 = 0.28x + 1.16

3. Find a number which when multiplied by 5 is increased by 80.

4. Rahim's father is three times as old as Rahim. If the sum of their ages is 56 years, find their ages.

5. The perimeter of a rectangle is 60 cm. If the length is twice the breadth, find the dimensions of the rectangle

6. In an isosceles triangle, the base angles are equal. The vertex angle is twice of either base angle. What are the angles of the triangle ?

SHORT ANSWER TYPE

7. If $\dfrac{x-1}{x+1} = \dfrac{7}{9}$, then find x.

8. If $\dfrac{x}{2} - 1 = \dfrac{x}{3} + 4$, then find x

9. Solve : $\dfrac{y-8}{3} = \dfrac{7-4y}{7}$ and check the result.

10. Mr. Joshi spends $\frac{1}{4}$ th of his leisure hours on reading and $\frac{2}{3}$ rd of the remaining watching the television. If he spends 2 hrs on watching the television. Find his leisure hours?

11. There are some number of coins on the table, one–fourth of which are showing heads. If I turn over two coins, one–third of them show heads. How many coins are there on the table ?

12. Ram's father is thrice as old as Ram was 2 years ago. Five years from now, Ram's father will be 6 years more than 2 times of Ram's age. What is Ram's present age ?

13. The population of town A is 4800 more than town B. If 3100 people move from town B to town A, the population of town A will be 11 times that of town B. Find the sum of the original population of the two towns.

LONG ANSWER TYPE

14. The value of x, in expression : $\dfrac{6x+7}{3x+2} = \dfrac{4x+5}{2x+3}$.

15. If $\dfrac{2x-3/4}{9x+4/7} = \dfrac{1}{4}$ then find the x = ?

16. Of the three numbers, second is twice the first and is also thrice the third. If the average of the three numbers is 44, the largest number will be ?

17. At a fair in shooting at a mark, a man receives 25 paise if he strikes it and loses 10 paise if he misses it. He has 40 shots and has to pay 50 paise. How many times did he hit the mark ?

18. A man's age is four times the sum of the ages of his three children. In 8 years he will be twice the sum of their ages. What is man's age ?

19. A purse has 25 paise coins and 50 paise coins. The number of 25 paise coins is thrice the number of 50 paise coins. If the total value of money in the purse is Rs.75, find the number of 25 paise and 50 paise coins in the purse.

EXERCISE ≫ 02

SECTION –A (COMPETITIVE EXAMINATION QUESTION)
MULTIPLE CHOICE QUESTIONS

1. If A = B(x + C) – Dx, where B ≠ D then x is equal to :

(A) $\dfrac{A-BC}{B-D}$ (B) $\dfrac{A-BC}{D-B}$ (C) $\dfrac{BC-A}{B+D}$ (D) $\dfrac{BC-A}{B-D}$

2. $x = \cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2}}}}$,then find the value of $2x + \dfrac{7}{4}$.

(A) 2   (B) 3   (C) 4   (D) $\dfrac{3}{2}$

3. If $\dfrac{4}{x+1} + \dfrac{5}{x+3} = \dfrac{9}{x+2}$ then the value of x is :

   (A) – 7   (B) 7/2   (C) 7   (D) – 14

4. If $2 + \dfrac{2x-3}{2x+3} = \dfrac{3x+4}{x+2}$ then the value of x is :

   (A) – 3   (B) – 2   (C) 3   (D) – 4

5. The value of x in $\dfrac{x+1}{2} + \left(x - \dfrac{x-1}{3} \right) = 2$, is :

   (A) 1   (B) 2   (C) 3   (D) 0

6. In a competition, 16 multiple choice questions were asked. Each correct answer gets 5 point while 2 points are deducted for each wrong answer. A boy answers all the questions and he gets 10 points. The number of correct answer he made is –

   (A) 6   (B) 8   (C) 9   (D) 7

7. Rama is 8 cm taller than Krishna. Hari is 12 cm shorter than Rama. If Krishna is 125 cm tall, how tall (in cm) is Hari ?

   (A) 129   (B) 121   (C) 105   (D) 113

8. If $\sqrt{x^2 - 4} = x - 2$, then the value of x is equal to :

   (A) 4   (B) – 4   (C) 2   (D) – 2

9. Two cats Billy and Kitty together catch sixty mice. If Billy catches three mice for every two caught by Kitty, the number of mice caught by Kitty is ?

   (A) 24   (B) 30   (C) 36   (D) 40

10. Michael is 6 years older than Sabrina. Five years ago, Michael was thrice as old as Sabrina, find Michael's present age.

    (A) 8 years   (B) 14 years   (C) 16 years   (D) 28 years

11. The difference between two numbers is 642. When the greater is divided by the smaller, the quotient is 8 and the remainder is 19. The numbers are :

    (A) 89 and 731   (B) 92 and 734   (C) 87 and 729   (D) 85 and 727

12. Length of a rectangle is 2 m more than twice its breadth. If the perimeter of the rectangle is 58 m. Find its length and breadth.

    (A) Length = 20 m and breadth = 9 m   (B) Length = 19 m, breadth = 10 m
    (C) Length = 17 m, breadth = 12 m   (D) Length = 18 m, breadth = 11 m

SECTION –B (TECHIE STUFF)

13. Determine whether x = 5, y = 4 is a solution of the equation .

    (A) x – 2y = – 3   (B) x + 2y = – 3   (C) x – 2y = 3   (D) 3x – 2y = – 3

14. Which of the following is the solution of 2y – 4x = 10

    (A) (–1,–1)   (B) (3,5)   (C) (2,4)   (D) (1,7)

15. Find the value of k if (3,4) is a solution of the equation 5x – 2y = k
(A) 6   (B) 7   (C) 8   (D) 9

16. If the point (– 3, 4) lies on the linear equation ay = 5x + 11, then find the value of a.
(A) 1   (B) –1   (C) 4   (D) –4

EXERCISE » 03

(PREVIOUS YEAR EXAMINATION QUESTIONS)

1. Mr. Khan had Rs 700 .He gave Rs 5h to his son and $\frac{1}{4}$ of remainder to his 4 daughters . He used the rest to buy some cakes. How much did the cake cost ? **[NSTSE 2010]**
(A) Rs $\frac{700-5h}{4}$ (B) Rs $\frac{3(700-5h)}{4}$ (C) Rs $\frac{(700-5h)}{16}$ (D) Rs $\frac{(700-5h)}{12}$

2. The solution of 3(x+2) – (x–8) = 3(x+8) is : **NSTSE 2010]**
(A) – 10   (B) 10   (C) 2   (D) –2

3. Amit counted the number of people in line for tickets at the movie theatre. Every time he saw 5 people, he added a tick mark on his counting sheet, as shown below. **[IMP–2010]**

✓✓✓✓✓✓✓✓✓✓✓✓✓✓

Amit saw 2 more people after he added his last tick mark. Which could be used to find p, the total number of people he saw?
(A) 14 = 2 + 5 = p   (B) 14 × 2 × 5 = p   (C) 14 × 5 + 2 = p   (D) 14 + 5 – 2 = p

4. Mr. X packs boxes for an appliance company. He can pack a large box in 10 minutes and a small box in 4 minutes. He needs to pack 10 large boxes and 20 small boxes. If 2.5 hours remain before closing time, will Mr. X have time to finish the work before closing time if he works without stopping? **[IMO–2010]**
(A) Yes, Mr. X will finish the work in 1.8 hours.
(B) No, it will take Mr. X 4 hours to finish.
(C) Yes, Mr. X will finish the work in 0.5 hour.
(D) No, it will take Mr. X 3 hours to finish.

5. Arun can run 100 metres in 20 seconds. If he competes in the 400–metres race, about how many seconds will it take him to run the race? **[IMO–2010]**
(A) 50 secs   (B) 40 secs   (C) 80 secs   (D) 20 secs

6. It took Abhilasha 15 minutes to apply a coat of paint to a piece of pottery. After each coat she waited close to 60 minutes for the paint to dry. Which is a reasonable amount of time it could have taken for Abhilasha to have applied 3 coats of paint and for the pottery to be completely dry? **[IMO–2010]**
(A) 105 minutes   (B) 225 minutes   (C) 195 minutes   (D) 903 minutes

7. Tarana has 4 old coins: W, X, Y and Z. Coin Y is worth Rs.2. Coin Z is worth 3 times the value of coin Y. Coin X is worth 4 times the value of coin Y. The 4 coins are worth Rs.30 altogether. What is the value of Coin W? **[IMO–2010]**
(A) Rs.14   (B) Rs.18   (C) Rs.9   (D) Rs.19

8. Solve for x : $\dfrac{6x-2}{9} + \dfrac{3x+5}{18} = \dfrac{1}{3}$ **[IMO–2011]**

   (A) $\dfrac{1}{3}$ (B) $\dfrac{2}{3}$ (C) $\dfrac{3}{5}$ (D) $\dfrac{8}{3}$

9. The value of 'm' in the equation $\dfrac{7}{10} + \dfrac{3}{1000} + \dfrac{9}{m} = 0.712$ is :   **[NSTSE 2011]**

   (A) 10   (B) 100   (C) 1000   (D) 10,000

10. Aman's mother was 21 years old when his sister was born. His father is 8 years older than his mother. Now Aman is 17 years old and his sister is 3 years older than him. What is the present age of Aman's father?   **[IMO–2011]**
    (A) 50 years   (B) 47 years   (C) 46 years   (D) 49 years

11. I was sitting alone in park. After a while there came an old man followed by an old lady. They were followed by two couples who were accompanied by a child each. What was the number of total persons present in the park?   **[IMO–2011]**
    (A) 10   (B) 9   (C) 11   (D) 8

12. When Sarvesh travelled 33 km he found that $\dfrac{2}{3}$rd of the entire journey was still left. The length of the total journey is   **[IMO–2011]**
    (A) 66 km   (B) 132 km   (C) 99 km   (D) 100 km

13. John is n years older than his sister. His sister's age is 12. What is their total age after 4 years?   **[IMO–2012]**
    (A) 28n years   (B) 24n years   (C) (32 + n) years   (D) (28 + n) years

14. Jasmine and Sonia had 60 phonecards. Jasmine had thrice as many phonecards as Sonia. How many phonecards did Jasmine have?   **[IMO–2012]**
    (A) 15   (B) 20   (C) 30   (D) 45

15. A bus travelled 18 km in 20 minutes. How far could it travel in 1 hr 20 minutes?   **[IMO–2012]**

    (A) 72 km   (B) 118 km   (C) 360 km   (D) 108 km

16. Solve for x: 15(x – 9) – 2 (x – 12) + 5 (x + 6) = 0   **[IMO–2012]**

    (A) 1   (B) $\dfrac{9}{2}$ (C) $-\dfrac{5}{8}$ (D) 12

17. Latika is 6 m years old. She is thrice as old as her sister. What will their total ages after six years?   **[IMO–2012]**
    (A) 8m + 6   (B) 8m + 12   (C) 24m + 6   (D) 24m + 12

18. Select the INCORRECT step in simplification of 2(x – 1) = 3(2x – 2)   **[IMO–2012]**
    Step–1: 2x + 2 = 6x – 6 (open brackets)
    Step–2: 6x – 2x = 2 + 6 (combining like terms)
    Step–3: 4x = 8
    Step–4: x = 2 (multiplying by 4 both sides)
    (A) Step – 2   (B) Step – 4   (C) Step – 3   (D) Step – 1

19. Which rule represents the relation shown in the table? **[IMO–2012]**

x	y
2	1
3	3
4	5
5	7
6	9

(A) y = x – 1   (B) y = x + 3   (C) y = 2x – 3   (D) y = 2x + 3

20. Ishika and her grandfather both had birthdays last week. The sum of their ages is 100 years. Her grandfather's age is 4 times Ishika's age. How old is Ishika? **[IMO–2012]**
(A) 16 years   (B) 20 years   (C) 22 years   (D) 25 years

21. Three consecutive even numbers are such that the difference between six times the smallest number and four times the largest number is equal to the middle number . What is the middle number ? **[NSTSE 2013]**
(A) 18   (B) 16   (C) 20   (D) 22

22. Pankaj has 96 marbles and arun has 63 marbles . How many marbles should arun gave to pankaj so that pankaj will have twice as many marbles as arun ? **[NSTSE 2013]**
(A) 9   (B) 12   (C) 7   (D) 10

23. Solve for $x : \dfrac{1}{5}(x-8) + \dfrac{4+x}{4} + \dfrac{x-1}{7} = 7 - \dfrac{23-x}{5}$ **[IMO–2013]**
(A) 7   (B) 8   (D) 5   (D) 9

24. Form an equation of the form ax + b = c, where a, b and c are constants, such that the solution of the equation is x = 4. **[IMO–2013]**
(A) 2x + 5 = 15   (B) 7x + 2 = 10   (C) 5x + 4 = 16   (D) 3x + 4 = 16

25. Which of the following statement do not hold in the process of solving the equation 15 + 3x = 3? **[IMO–2013]**
(A) 3x = 3 – 15   (B) 15 – 3 = –3x   (C) $15 + \dfrac{3x}{3} = 3$ (D) $\dfrac{15}{3} + \dfrac{3x}{3} = \dfrac{3}{3}$
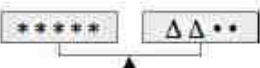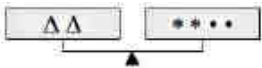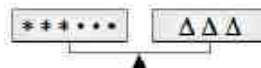
26. In the given figure, the given lengths of ΔPQR are in centimeters. If PQ = PR. find the length of QR. **[IMO–2013]**
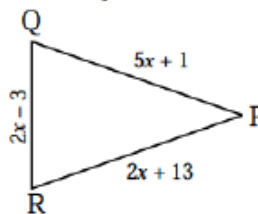
(A) 3 cm   (B) 4 cm   (C) 7 cm   (D) 6 cm

27. The price of a watch is Rs.50 more than twice the price of a gold ring. Let the price of the ring be x. If the price of the watch is 208. find the price of the ring. **[IMO–2013]**
(A) Rs.85   (B) Rs.79   (C) Rs.88   (D) Rs.75

28. The price of a table is Rs.100 less than 6 times the price of a chair. A similar set of one table and 4 chairs is priced at Rs.1400. Find the price of a chair. **[IMO–2013]**
(A) Rs.140 (B) Rs.150 (C) Rs.148 (D) Rs.145

29. A bag contains an equal number of one rupees, 50 paise and 25 paise coins respectively. If the total value is Rs.35, how many coins of each type are there? **[IMO–2013]**
(A) 20 (B) 15 (C) 25 (D) 18

30. A car is moving at an average speed of $3\frac{1}{9}$ km/hr. How much distance will it cover in $5\frac{1}{7}$ hours? **[IMO–2013]**
(A) 15 km (B) 16 km (C) 17 km (D) 18 km

31. Mrs. Kapoor has certain sum of money to buy fruits. She can buy n mangoes at Rs.1.60 each and have Rs.0.80 left. Alternatively she can buy (n + 10) apples at Rs.0.70 each and have Rs.0.10 left.
If Mrs. Kapoor buys 3 mangoes and uses the rest of the money to buy apples, then
(a) Find the value of n.
(b) How much money does Mrs. Kapoor have for buying fruits? **[IMO–2013]**

	a	b
(A)	10	Rs.10.02
(B)	10	Rs.14.20
(C)	6	Rs.14
(D)	7	Rs.12

32. A father is 26 years older than his son . In 3 years time the son age will be one third his father's age . What is the present age the of the son ? **[NSTSE 2014]**
(A) 29 years (B) 13 years (C) 39 years (D)10 years

33. When a number is reduced by 4, it becomes 80 % of itself. Find the number. **[NSTSE 2014]**
(A) 20 (B) 30 (C) 40 (D) 50

34. $\frac{1}{2}$ is subtracted from a number and the difference is multiplied by 4. If 25 is added to the product and the sum is divided by 3 , the result is equal to 10. Find the number . **[NSTSE 2014]**
(A) $\frac{3}{5}$ (B) $1\frac{3}{4}$ (C) $\frac{6}{7}$ (D) $\frac{2}{3}$

35. The three scales below are perfectly balanced if • = 3. What are the values of $\triangle$ and * respectively? **[IMO–2014]**

(i) [*****] [$\triangle\triangle$ ••]　**(ii)** [$\triangle\triangle$] [*••••]　**(iii)** [***••••] [$\triangle\triangle\triangle$]

(A) 4, 7 (B) 6,3 (C) 7,4 (D) 3, 6

36. In a test Abha gets twice the marks as that of Palak. Two times Abha's marks and three times Palak's marks make 280. The marks obtained by Abha are_____ **[IMO–2014]**
(A) 40 (B) 60 (C) 80 (D) 90

37. Supriya got Rs.27480 as her monthly salary and over–time. Her salary exceeds the over-time by Rs.8000. How much did she earn in a year (except overtime)?   **[IMO–2014]**
(A) Rs.212880   (B) Rs.156430   (C) Rs.243820   (D) Rs.198460

38. In a colony of 100 blocks of flats numbering 1 to 100. a school van stops at every sixth block while a school bus stops at every tenth block. On which stops will both of them stop if they start from the entrance of the colony?   **[IMO–2014]**
(A) 30, 60, 90   (B) 20, 40, 80   (C) 30, 60, 80   (D) 40, 80,100

39. Sum of two numbers is 45. One is twice the other.
(a) If smaller nunber is l. find the other number
(b) Find the equation formed.
(c) Find the numbers.

	(a)	(b)	(c)	
				[IMO–2014]
(A)	2ℓ	$\ell + 2\ell = 45$	10, 35	
(B)	2ℓ	$\ell + 2\ell = 45$	15, 30	
(C)	$\ell + 2$	$45 + \ell + 2 = \ell$	15, 30	
(D)	$\ell/2$	$45 + \ell/2 - \ell = 0$	25, 20	

40. There are four containers that are arranged in the ascending order of their heights. If the height of the smallest container given in the figure is expressed as $\dfrac{3}{29}x = 16.5$ cm . Find the height of I, II and IV container.   **[IMO–2014]**
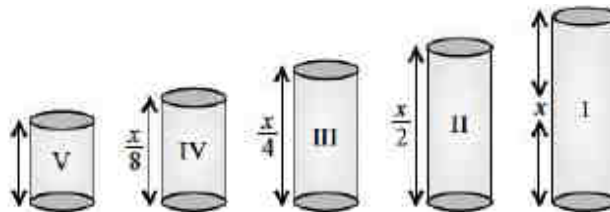
(A) 159.5 cm 79.75 cm 39.88 cm   (B) 156.5 cm 76.65 cm 19.94 cm
(C) 159.5 cm 79.75 cm 19.94 cm   (D) 162.75 cm 86.5 cm 22.34 cm

41. If 9 is added to four times a number, it becomes the same as 3 is subtracted from five times the same number. This fact can be represented as   **[IMO–2014]**
(A) 5x + 9 = 4x + 3   (B) 9x + 4 = 3x – 5   (C) 9 + 4x = 3 –5x   (D) 4x + 9 = 5x – 3

42. In a quiz. 40 prizes consisting of 1st and 2nd prizes only are to be given. 1st and 2nd prizes are worth Rs.2500 and Rs.1500 respectively. If the total prize money is Rs.85,000 then
   [IMO–2014]
(i) The equation formed is   (ii) The number of 1st prizes are
(iii) The number of 2nd prizes are

	(i)	(ii)	(iii)
(A)	2500x + 1500(40 – x) = 85000	25	15
(B)	2500x – 1500(40 – x) = 85000	36	4
(C)	2500x × 1500(x – 40) = 85000	20	20
(D)	2500x –1500(x – 40) = 85000	15	25

43. Two pens and three pencils cost Rs.86. Four pens and a pencil cost Rs.112. Find the cost of a pen and pencil respectively. **[IMO–2014]**

(A) Rs.15, Rs.8   (B) Rs.25.Rs,12   (C) Rs.30, Rs.28   (D) Rs.20.Rs.21

44. A multi storey building has 35 floors above the ground level each of height 7.5 m. It also has 3 floors in the basement each of height 5 m. A lift in building moves at a rate of 1 m/s. If a man starts from 50 m above the ground, how long will it take him to reach at 3rd floor of basement? **[IMO–2014]**

(A) 40 sec   (B) 65 sec   (C) 68 sec   (D) 32 sec

45. In a quiz, Priya gets half the marks as that of Riya. Two times Priya's marks and three times Riya's marks make 320. How many marks Priya obtained? **[IMO–2014]**

(A) 34   (B) 90   (C) 80   (D) 40

ANSWER KEY »

EXERCISE » 01

SECTION –A (FIXED RESPONSE TYPE)

MULTIPLE CHOICE QUESTIONS

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	B	D	B	B	D	C	A	D	B	D	A	B	C	C	A
Ques.	16	17	18	19											
Ans.	A	B	A	D											

FILL IN THE BLANKS

1. equation   **2.** 13   **3.** 66   **4.** 0   **5.** 21

6. 30   **7.** 13 years

TRUE / FALSE

1. False   **2.** True   **3.** False   **4.** False   **5.** True

6. True   **7.** True

MATCH THE COLUMN

1. (A) → r, (B) → s, (C) → t, (D) → p, (E) → q

SECTION –B (FREE RESPONSE TYPE)

VERY SHORT ANSWER TYPE

1. 20   **2.** 38   **3.** 20.   **4.** 42 years and 14 years

5. 10 cm and 20 cm   **6.** 45º, 45º and 90º.

SHORT ANSWER TYPE

7. 8   **8.** 30   **9.** $y = \dfrac{77}{19}$ **10.** 4 hrs.   **11.** 24.

12. 17 yrs.   **13.** 13200

LONG ANSWER TYPE

14. $\dfrac{-11}{9}$ **15.** $-\dfrac{25}{7}$ **16.** 72   **17.** 10 times   **18.** 80 years

19. 180, 60

EXERCISE ≫ 02

SECTION –A (COMPETITIVE EXAMINATION QUESTION)
MULTIPLE CHOICE QUESTIONS

Ques.	1	2	3	4	5	6	7	8	9	10	11	12
Ans.	A	B	C	A	A	A	B	C	A	B	A	A

SECTION –B (TECHIE STUFF)

Ques.	13	14	15	16
Ans.	A	D	B	B

EXERCISE ≫ 03

(PREVIOUS YEAR EXAMINATION QUESTIONS)

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	B	A	C	D	C	B	A	A	C	D	B	C	C	D	A
Ques.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	B	B	D	C	B	C	D	B	D	C	C	B	B	A	B
Ques.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	D	D	A	B	C	C	A	A	B	C	D	A	B	B	D