CHAPTER 8
LINEAR EQUATION IN ONE VARIABLE

Question 1.
Identify the algebraic linear equations from the given expressions.
(a) $x^2 + x = 2$
(b) $3x + 5 = 11$
(c) $5 + 7 = 12$
(d) $x + y^2 = 3$
Solution:
(a) $x^2 + x = 2$ is not a linear equation.
(b) $3x + 5 = 11$ is a linear equation.
(c) $5 + 7 = 12$ is not a linear equation as it does not contain variable.
(d) $x + y^2 = 3$ is not a linear equation.

Question 2.
Check whether the linear equation $3x + 5 = 11$ is true for $x = 2$.
Solution:
Given that $3x + 5 = 11$
For $x = 2$, we get
LHS $= 3 \times 2 + 5 = 6 + 5 = 11$
LHS = RHS = 11
Hence, the given equation is true for $x = 2$

Question 3.
Form a linear equation from the given statement: 'When 5 is added to twice a number, it gives 11.'
Solution:
As per the given statement we have
$2x + 5 = 11$ which is the required linear equation.

Question 4.
If $x = a$, then which of the following is not always true for an integer k. (NCERT Exemplar)
(a) $kx = ak$
(b) $x/k = a/k$
(c) $x - k = a - k$
(d) $x + k = a + k$
Solution:
Correct answer is (b).

Question 5.
Solve the following linear equations:
(a) $4x + 5 = 9$
(b) $x + 3/2 = 2x$

Solution:
(a) We have $4x + 5 = 9$
$\Rightarrow 4x = 9 - 5$ (Transposing 5 to RHS)
$\Rightarrow 4x = 4$
$\Rightarrow x = 1$ (Transposing 4 to RHS)
(b) We have $x + 32 = 2x$
$\Rightarrow 3/2 = 2x - x$
$\Rightarrow x = 3/2$

Question 6.
Verify that $x = 2$ is the solution of the equation $4.4x - 3.8 = 5$.
Solution:
We have $4.4x - 3.8 = 5$
Putting $x = 2$, we have
$4.4 \times 2 - 3.8 = 5$
$\Rightarrow 8.8 - 3.8 = 5$
$\Rightarrow 5 = 5$
L.H.S. = R.H.S.
Hence verified.

Question 7.
The sum of two numbers is 11 and their difference is 5. Find the numbers.
Solution:
Let one of the two numbers be x.
Other number = $11 - x$.
As per the conditions, we have
$x - (11 - x) = 5$
$\Rightarrow x - 11 + x = 5$ (Solving the bracket)
$\Rightarrow 2x - 11 = 5$
$\Rightarrow 2x = 5 + 11$ (Transposing 11 to RHS)
$\Rightarrow 2x = 16$
$\Rightarrow x = 8$
Hence the required numbers are 8 and $11 - 8 = 3$.

Question 8.
If the sum of two consecutive numbers is 11, find the numbers.
Solution:
Let the two consecutive numbers be x and $x + 1$.
As per the conditions, we have
$x + x + 1 = 11$
$\Rightarrow 2x + 1 = 11$
$\Rightarrow 2x = 11 - 1$ (Transposing 1 to RHS)
$\Rightarrow 2x = 10$

x = 5
Hence, the required numbers are 5 and 5 + 1 = 6.

Question 9.
The difference between two positive numbers is 40 and the ratio of these integers is 1 : 3. Find the integers.
Solution:
Let one integer be x.
Other integer = x – 40
As per the conditions, we have
$\frac{x-40}{x} = \frac{1}{3}$
⇒ 3(x – 40) = x
⇒ 3x – 120 = x
⇒ 3x – x = 120
⇒ 2x = 120
⇒ x = 2
Hence the integers are 60 and 60 – 40 = 20.

Question 10.
The sum of a two-digit number and the number obtained by reversing its digits is 121. Find the number if it's unit place digit is 5.
Solution:
Unit place digit is given as 5
Let x be the tens place digit
Number formed = 5 + 10x
Number obtained by reversing the digits = 5 × 10 + x = 50 + x
As per the conditions, we have
5 + 10x + 50 + x = 121
⇒ 11x + 55 = 121
⇒ 11x = 121 – 55 (Transposing 55 to RHS)
⇒ 11x = 66
⇒ x = 6
Thus, the tens place digit = 6
Hence the required number = 5 + 6 × 10 = 5 + 60 = 65

Question 11.
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/h, find the speed of the steamer in still water and the distance between the ports. (NCERT Exemplar)
Solution:
Let speed of steamer in still water = x km/h
Speed of stream = 2 km/h
Speed downstream = (x + 2) km/h

Speed upstream = (x – 2) km/h
Distance covered in 7 hours while downstream = 7(x + 2)
Distance covered in 8 hours while upstream = 8(x – 2)
According to the condition,
$7(x + 2) = 8(x – 2)$
$\Rightarrow 7x + 14 = 8x – 16$
$\Rightarrow x = 30$ km/h
Total Distance = $7(x + 2)$ km = $7(30 + 2)$ km = 7×32 km = 224 km.