Class X MATH
Chapter - 8 : Pair of Linear Equations in Two Variable
Questions & Answers - Exercise - 3.2 - NCERT Books

Q1. Solve the following pair of linear equations by the substitution method.

(i) $x + y = 14, x - y = 4$

(ii) $s - t = 3, \frac{s}{3} + \frac{t}{2} = 6$

(iii) $3x - y = 3, 9x - 3y = 9$

(iv) $0.2x + 0.3y = 1.3, 0.4x + 0.5y = 2.3$

(v) $\sqrt{2}x + \sqrt{3}y = 0, \sqrt{3}x - \sqrt{8}y = 0$

(vi) $\frac{3x}{2} - \frac{5y}{3} = -2, \frac{x}{3} + \frac{y}{2} = \frac{13}{6}$

Sol. (i) $x + y = 14$ ...(i)

$x - y = 4$ ...(ii)

From (ii) $y = x - 4$ ...(iii)

Substituting y from (iii) in (i), we get

$x + x - 4 = 14$

$\Rightarrow 2x = 18$

$\Rightarrow x = 9$

Substituting $x = 9$ in (iii), we get

$y = 9 - 4 = 5,$

i.e, $y = 5$

$x = 9, y = 5$

(ii) $s - t = 3$ ...(i)

$\frac{s}{3} + \frac{t}{2} = 6$ ...(ii)

From (i) $s = t + 3$ ...(iii)

Substituting s from (iii) in (ii), we get

$\frac{t+3}{3} + \frac{t}{2} = 6$

$\Rightarrow$ 2(t + 3) + 3t = 36
$\Rightarrow$ 5t + 6 = 36
$\Rightarrow$ t = 6
From (iii), s = 6 +3 = 9,
Hence, s = 9, t = 6

(iii) 3x – y = 3 .....(i)
9x – 3y = 9 .....(ii)
From (i) y = 3x – 3 .....(iii)
Substituting y from (iii) in (ii), we get
9x – 3(3x – 3) = 9
9x – 9x + 9 = 9
9 = 9
It means, equation have infinite solutions.

(iv) 0.2x + 0.3y = 1.3 .....(i)
0.4x + 0.5y = 2.3 .....(ii)

From (i) $y = \frac{1.3 - 0.2x}{0.3}$ .....(iii)

Substituting y from (iii) in (ii), we get

$0.4x + 0.5\left(\frac{1.3 - 0.2x}{0.3}\right) = 2.3$

$\Rightarrow 0.4x + \frac{13}{6} - \frac{x}{3} = 2.3$

$\Rightarrow \frac{2}{5}x - \frac{x}{3} = 2.3 - \frac{13}{6}$

$\Rightarrow \frac{x}{15} = \frac{4}{30}$

$\Rightarrow x = 2$

Substituting x = 2 in (iii)
y = 3 × 2 – 3
Hence, y = 3

(v) $\sqrt{2}x + \sqrt{3}y = 0$ .....(i)

$\sqrt{3}x - \sqrt{8}y = 0$ .....(ii)

From (ii) $y = \frac{\sqrt{3}x}{\sqrt{8}}$ .....(iii)

Substituting y from (iii) in (i), we get

$\sqrt{2}x + \sqrt{3} \times \frac{\sqrt{3}x}{\sqrt{8}} = 0$

$\Rightarrow \frac{4x + 3x}{\sqrt{8}} = 0 \Rightarrow 7x = 0$

$x = 0$

Substituting $x = 0$ in (iii)

Hence, $y = 0$

(vi) $\frac{3x}{2} - \frac{5y}{3} = -2$ .....(i)

$\frac{x}{3} + \frac{y}{2} = \frac{13}{6}$ .....(ii)

From (i) $y = \frac{\frac{3x}{2} + 2}{5/3} = \frac{9x + 12}{10}$ ....(iii)

Substituting y from (iii) in (ii), we get

$\frac{x}{3} + \frac{9x + 12}{10 \times 2} = \frac{13}{6}$

$\Rightarrow \frac{x}{3} + \frac{9x}{20} + \frac{3}{5} = \frac{13}{6}$

$\Rightarrow \frac{47x}{60} = \frac{47}{30}$

$x = 2$

Substituting $x = 2$ in (iii)

$y = \frac{9 \times 2 + 12}{10}$

Hence, $y = 3$.

Q2. Solve $2x + 3y = 11$ and $2x - 4y = -24$ and hence find the value of 'm' for which $y = mx + 3$

Sol. $2x + 3y = 11$ .....(i)
$2x - 4y = -24$ .....(ii)
Subtract equation (ii) from (i), we get
$2x + 3y - 2x + 4y = 11 + 24$
$7y = 35$
$y = 5$
Substituting value of y in equation (i), we get
$2x + 3 \times 5 = 11$
$2x = 11 - 15$

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

Now, $x = -2$, $y = 5$
Puting value of x & y in $y = mx + 3$
$5 = -2m + 3$
$\Rightarrow 2 = -2m$
$\Rightarrow m = -1$

Q3. From the pair of linear equations for the following problems and find their solution by substitution method.
(i) The difference between two numbers is 26 and one number is three times the other. Find them.
(ii) The larger of two supplementary angles exceeds the smaller by 18 degrees. Find them.
(iii) The coach of a cricket team buys 7 bats and 6 balls for Rs. 3800. Later, she buys 3 bats and 5 balls for Rs. 1750. Find the cost of each bat and each ball.
(iv) The taxi charges in a city consist of a fixed charge together with the charge for the distance covered. For a distance of 10 km, the charge paid is Rs. 105 and for a journey of 15 km, the charge paid is Rs. 155. What are the fixed charges and the charge per kilometer? How much does a person have to pay for travelling a distance of 25 km?

(v) A fraction becomes $\frac{9}{11}$, if 2 is added to both the numerator and the denominator. If, 3 is added to both the numerator and the denominator it becomes $\frac{5}{6}$. Find the fraction.

(vi) Five years hence, the age of jacob will be three times that of his son. Five years ago, Jacob's age was seven times that of his son. What are their present ages?

Sol. (i) Let the two numbers be x and y (x > y). Then,

$x - y = 26$ ...(i)

$x = 3y$ ...(ii)

Substituting value of x from (ii) in (i)

$3y - y = 26$

$2y = 26$

$y = 13$

Substituting value of y in (ii) $x = 3 \times 13 = 39$

Thus, two numbers are 13 and 39.

(ii) Let the supplementary angles be x and y (x > y) Then,

$x + y = 180$ ...(i)

$x - y = 18$ ... (ii)

from (i) $x = 18 + y$ ...(iii)

Substituting value of x from (iii) in (i)

$18 + y + y = 180$

$2y = 180 - 18$

$y = \frac{162}{2} = 81$

from (iii) $x = 18 + 81 = 99$

Thus, the angles are 99° and 81

(iii) Let the cost price of 1 bat is Rs x
and the cost price of 1 ball is Rs y
$7x + 6y = 3800$ .....(i)
$3x + 5y = 1750$ .....(ii)
From (i)
$7x = 3800 - 6y$

$x = \frac{3800 - 6y}{7}$ ...(iii)

Substituting value of x from (iii) in (ii), we get

$3\left(\frac{3800 - 6y}{7}\right) + 5y = 1750$

$11400 - 18y + 35y = 12250$
$17y = 850$
$y = 50$

From (iii) $x = \frac{3800 - 300}{7} = 500$

Thus, cost price of 1 bat is Rs. 500 and 1 ball is Rs. 50

(iv) Let fixed charge be Rs x and charge per km be Rs y. Then,
$x + 10y = 105$ ...(i)
$x + 15y = 155$ ...(ii)
From equation (i)
$x = 105 - 10y$ ...(iii)
Substituting value of x from (iii) in (ii)
$105 - 10y + 15y = 155$
$105 + 5y = 155$
$5y = 50$
$y = 10$
from (iii) $x = 105 - 10 \times 10 = 5$
Thus, fixed charge is Rs. 10 and charge per km is Rs. 5

(v) Let $\frac{x}{y}$ be the fraction where x and y are positive integers.

$\frac{x+2}{y+2} = \frac{9}{11}$

$11x + 22 = 9y + 18$

$11x - 9y = -4$ ...(i)

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

$6x + 18 = 5y + 15$

$6x - 5y = -3$ ...(ii)

From (i)

$11x = 9y - 4$

$x = \frac{9y-4}{11}$ ...(iii)

Substituting value of x from (iii) in (ii)

$6\left(\frac{9y-4}{11}\right) - 5y = 3$

$54y - 24 - 55y = -33$

$y = 33 - 24$

$y = 9$

From (iii) $x = \frac{9 \times 9 - 4}{11} = 7$

Thus, fraction is 7/9.

(vi) Let x (in years) be the present age of Jacob's son and y (in years) be the present age of Jacob. Then,

$y + 5 = 3(x + 5)$

$3x - y = -10$ ...(i)

$y - 5 = 7(x - 5)$

$7x - y = 30$ ...(ii)

From (i) $y = 3x + 10$ ...(iii)

Substituting value of y from (iii) in (ii)

$7x - (3x + 10) = 30$

$4x = 40$

$x = 10$

From (iii) $y = 40$

Thus, Jacob's present age is 40 years and his son's the age is 10 years.