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Practice Set 5.1 Algebra 9th Std Maths Part 1 Answers Chapter 5 Linear Equations in Two Variables

Question 1.
By using variables x and y form any five linear equations in two variables.
Answer:
The general form of a linear equation in two variables x and y is ax + by + c = 0,
where a, b, c are real numbers and a ≠ 0, b ≠ 0.
Five linear equations in two variables are as follows:
i. 3x + 4y – 12 = 0
ii. 3x – 4y + 12 = 0
iii. 5x + 5y – 6 = 0
iv. 7x + 12y – 11 = 0
v. x – y + 5 = 0

Question 2.
Write five solutions of the equation x + y = 1.
Answer:
i. x = 1, y = 6
ii. x = -1, y = 8
iii. x = 5, y = 2
iv. x = 0, y = 7
v. x = 10, y = -3

Question 3.
Solve the following sets of simultaneous equations.
i. x + y = 4 ; 2x – 5y = 1
ii. 2x + y = 5 ; 3x – y = 5
iii. 3x – 5y = 16; x – 3y= 8
iv. 2y – x = 0; 10x + 15y = 105
v. 2x + 3y + 4 = 0; x – 5y = 11
vi. 2x – 7y = 7; 3x + y = 22
Solution:
i. Substitution Method:

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$x + y = 4$
$\therefore x = 4 - y$ ...(i)
$2x - 5y = 1$ .....(ii)
Substituting $x = 4 - y$ in equation (ii),
$2(4 - y) - 5y = 1$
$\therefore 8 - 2y - 5y = 1$
$\therefore 8 - 7y = 1$
$\therefore 8 - 1 = 7y$
$\therefore 7 = 7y$
$\therefore y = \frac{7}{7}$
$\therefore y = 1$
Substituting $y = 1$ in equation (i),
$x = 4 - 1 = 3$
$\therefore$ (3,1) is the solution of the given equations.
Alternate method:
Elimination Method:
$x + y = 4$ ...(i)
$2x - 5y = 1$ .....(ii)
Multiplying equation (i) by 5,
$5x + 5y = 20$ ... (iii)
Adding equations (ii) and (iii),
$2x - 5y = 1$
$+ 5x + 5y = 20$
$7 = 21$
$\therefore x = \frac{21}{7}$
$\therefore x = 3$
Substituting $x = 3$ in equation (i),
$3 + y = 4$
$\therefore y = 4 - 3 = 1$
(3,1) is the solution of the given equations.
ii. $2x + y = 5$ ...(i)
$3x - y = 5$ ...(ii)
Adding equations (i) and (ii),
$2x + y = 5$
$+ 3x - y = 5$
$5x = 10$
$\therefore x = \frac{10}{5}$

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∴ x = 2
Substituting x = 2 in equation (i),
2(2) + y = 5
4 + y = 5
∴ y = 5 – 4 = 1
∴ (2, 1) is the solution of the given equations.
iii. 3x – 5y = 16 ...(i)
x – 3y = 8
∴x = 8 + 3y .....(ii)
Substituting x = 8 + 3y in equation (i),
3(8 + 3y) – 5y = 16
24 + 9y- 5y = 16
∴4y= 16 – 24
∴ 4y = -8
∴ y = $\frac{-8}{4}$
y = -2
Substituting y = -2 in equation (ii),
x = 8 + 3 (-2)
∴ x = 8 – 6 = 2
∴ (2, -2) is the solution of the given equations.
iv. 2y – x = 0
∴ x = 2y ...(i)
10x + 15y = 105 ...(ii)
Substituting x = 2y in equation (ii),
10(2y) + 15y = 105
∴ 20y + 15y = 105
∴ 35y = 105
∴ y = $\frac{105}{35}$
∴ y = 3
Substituting y = 3 in equation (i),
x = 2y
∴ x = 2(3) = 6
∴ (6, 3) is the solution of the given equations.
v. 2x + 3y + 4 = 0 ...(i)
x – 5y = 11
∴x = 11 + 5y ...(ii)
Substituting x = 11 + 5y in equation (i),

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2(11 +5y) + 3y + 4 = 0
∴ 22 + 10y + 3y + 4 = 0
∴ 13y + 26 = 0
∴ 13y = -26
∴y = $-\frac{26}{13}$
∴ y = -2
Substituting y = -2 in equation (ii),
x = 11 + 5y
∴ x = 11 + 5(-2)
∴ x = 11 – 10 = 1
∴ (1, -2) is the solution of the given equations.
vi. 2x – 7y = 7 ...(i)
3x + y = 22
∴ y = 22 – 3x .....(ii)
Substituting y = 22 – 3x in equation (i),
2x – 7(22 – 3x) = 7
∴ 2x – 154 + 21x = 7
∴ 23x = 7 + 154
∴ 23x = 161
∴ x = $\frac{161}{23}$
∴ x = 7
Substituting x = 7 in equation (ii),
y = 22 – 3x
∴ y = 22 – 3(7)
∴ 7 = 22 -21= 1
∴ (7, 1) is the solution of the given equations.
Question 1.
Solve the following equations. (Textbook pg. no. 80)
i. m + 3 = 5
ii. 3y + 8 = 22
iii. $\frac{x}{3}$ = 2
iv. 2p = p + $\frac{4}{9}$
Solution:
i. m + 3 = 5
m = 5 – 3
∴m = 2

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ii. 3y + 8 = 22
∴ 3y = 22 – 8
∴ 3y = 14
∴ y = $\frac{14}{9}$
iii. $\frac{x}{3}$ = 2
∴ x = 2 × 3
∴ x = 6
iv. 2p = p + $\frac{4}{9}$
∴ 2p – p = $\frac{4}{9}$
∴ p = $\frac{4}{9}$

Question 2.
Which number should be added to 5 to obtain 14? (Textbook pg. no. 80)
Solution:
x + 5 = 14
∴ x = 14 – 5
x = 9
∴ 9 + 5 = 14

Question 3.
Which number should be subtracted from 8 to obtain 2? (Textbook pg. no. 80)
Solution:
8 – y = 2
∴ y = 8 – 2
∴ y = 6
∴ 8 – 6 = 2

Question 4.
x + y = 5 and 2x + 2y= 10 are two equations in two variables. Find live different solutions of x + y = 5, verify whether same solutions satisfy the equation 2x + 2y = 10 also. Observe both equations. Find the condition where two equations in two variables have all solutions in common. (Textbook pg. no. 82)
Solution:
Five solutions of x + y = 5 are given below:
(1,4), (2, 3), (3, 2), (4,1), (0, 5)
The above solutions also satisfy the equation 2x + 2y = 10.

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∴ x + y = 5 ...[Dividing both sides by 2]
∴ If the two equations are the same, then the two equations in two variables have all solutions common.

Question 5.
3x – 4y – 15 = 0 and y + x + 2 = 0. Can these equations be solved by eliminating x ? Is the solution same? (Textbook pg. no. 84)
Solution:
3x – 4y – 15 = 0
∴ 3x – 4y = 15 ...(i)
y + x + 2 = 0
∴ x + y = -2 .....(ii)
Multiplying equation (ii) by 3,
3x + 3y = -6 ...(iii)
Subtracting equation (iii) from (i),

$$\begin{array}{r} 3x - 4y = 15 \\ 3x + 3y = -6 \\ - \quad - \quad + \\ \hline -7y = 21 \end{array}$$

$$\therefore \quad y = \frac{-21}{7}$$

∴ y = -3
Substituting y = -3 in equation (ii),
∴ x – 3 = -2
∴ x = – 2 + 3
∴ x = 1
∴ (x, y) = (1, -3)
Yes, the given equations can be solved by eliminating x. Also, the solution will remain the same.

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Practice Set 5.2 Algebra 9th Std Maths Part 1 Answers Chapter 5 Linear Equations in Two Variables

Question 1.
In an envelope there are some ₹5 notes and some ₹10 notes. Total amount of these notes together is ₹350. Number of ₹5 notes are less by 10 than twice the number of ₹10 notes. Then find the number of ₹5 and ₹10 notes.
Solution:
Let the number of ₹5 notes be 'x' and the number of ₹10 notes be 'y'
Total amount of x notes of ₹ 5 = ₹ 5x
Total amount ofy notes of ₹ 10 = ₹ 10y
∴ Total amount = 5x + 10y
According to the first condition,
total amount of the notes together is ₹350.
∴ 5x + 10y = 350 ...(i)
According to the second condition,
Number of ₹ 5 notes are less by 10 than twice the number of ₹ 10 notes.
∴ x = 2y – 10
∴ x – 2y = -10 .....(ii)
Multiplying equation (ii) by 5,
5x – 10y = -50 ...(iii)
Adding equations (i) and (iii),
5x + 10y =350
+ 5x – 10y = -50
10x =300
∴ x = $\frac{300}{10}$
∴ x = 30
Substituting x = 30 in equation (ii),
x – 2y = -10
30 – 2y = -10
∴ 30 + 10 = 2y
∴ 40 = 2y
∴ y = $\frac{40}{2}$

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∴ y = 20

There are 30 notes of ₹ 5 and 20 notes of ₹ 10 in the envelope.

Question 2.

The denominator of a fraction is 1 less than twice its numerator. If 1 is added to numerator and denominator respectively, the ratio of numerator to denominator is 3 : 5. Find the fraction.

Solution:

Let the numerator of the fraction be 'x' and its denominator be 'y'.

Then, the required fraction is $\frac{x}{y}$.

According to the first condition,

the denominator is 1 less than twice its numerator.

∴ y = 2x – 1

∴ 2x – y = 1 ...(i)

According to the second condition,

if 1 is added to the numerator and the denominator, the ratio of numerator to denominator is 3 : 5.

∴ $\frac{x+1}{y+1} = \frac{3}{5}$

∴ y + 1 = 5

∴ 5(x + 1) = 3(y + 1)

∴ 5x + 5 = 3y + 3

∴ 5x – 3y = 3 – 5

∴ 5x – 3y = -2 .....(ii)

Multiplying equation (i) by 3,

6x – 3y = 3 ...(iii)

Subtracting equation (ii) from (iii),

$$\begin{array}{rrr} 6x - 3y = & 3 \\ 5x - 3y = & -2 \\ - \quad + & \quad + \\ \hline x \quad\quad = & 5 \end{array}$$

Substituting x = 5 in equation (i),

∴ 2x – y = 1

∴ 2(5) – y = 1

∴ 10 – y = 1

∴ y= 10 – 1 =9

∴ The required fraction is $\frac{5}{9}$.

Question 3.

The sum of ages of Priyanka and Deepika is 34 years. Priyanka is elder to

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Deepika by 6 years. Then find their present ages.
Solution:
Let the present age of Priyanka be 'x' years and that of Deepika be 'y' years.
According to the first condition,
Priyanka's age + Deepika's age = 34 years
∴ x + y = 34 ...(i)
According to the second condition,
Priyanka is elder to Deepika by 6 years.
∴ x =y + 6
∴ x – y = 6 .....(ii)
Adding equations (i) and (ii),

$$\begin{array}{rl} & x+y=34 \\ +\ & x-y=6 \\ \hline & 2x=40 \end{array}$$

∴ x = 20
Substituting x = 20 in equation (i),
x + y = 34
∴ 20 + y = 34
∴ y = 34 -20= 14
∴ The present age of Priyanka is 20 years and that of Deepika is 14 years.

Question 4.
The total number of lions and peacocks in a certain zoo is 50. The total number of their legs is 140. Then find the number of lions and peacocks in the zoo.
Solution:
Let the number of lions in the zoo be 'x' and the number of peacocks be 'y'.
According to the first condition,
the total number of lions and peacocks is 50.
∴ x + y = 50 ...(i)
Lion has 4 legs and Peacock has 2 legs.
According to the second condition,
the total number of their legs is 140.
∴ 4x + 2y = 140
Dividing both sides by 2,
2x + y = 70 ...(ii)
Subtracting equation (i) from (ii),

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$$\begin{array}{rcl} 2x + y = & 70 \\ x + y = & 50 \\ - \quad - & - \\ \hline x \quad = & 20 \end{array}$$

Substituting x = 20 in equation (i),
x + y = 50
∴ 20 + y = 50
∴ y = 50 – 20 = 30
∴ The number of lions and peacocks in the zoo are 20 and 30 respectively.

Question 5.
Sanjay gets fixed monthly income. Every year there is a certain increment in his salary. After 4 years, his monthly salary was ₹ 4500 and after 10 years his monthly salary became ₹ 5400, then find his original salary and yearly increment.
Solution:
Let the original salary of Sanjay be ₹ 'x' and his yearly increment be ₹ 'y'.
According to the first condition, after 4 years his monthly salary was ₹ 4500
∴ x + 4y = 4500 .....(i)
According to the second condition,
after 10 years his monthly salary became ₹ 5400
∴ x + 10y = 5400 ...(ii)
Subtracting equation (i) from (ii),

$$\begin{array}{rcl} x + 10y = & 5400 \\ x + 4y = & 4500 \\ - \quad - & - \\ \hline 6y = & 900 \end{array}$$

$$\therefore \quad y = \frac{900}{6}$$

∴ y = 150
Substituting y = 150 in equation (i),
x + 4y = 4500
∴ x +4(150) = 4500
∴ x + 600 = 4500
∴ x = 4500 – 600 = 3900
∴ The original salary of Sanjay is ₹ 3900 and his yearly increment is ₹ 150.

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Question 6.
The price of 3 chairs and 2 tables is ₹ 4500 and price of 5 chairs and 3 tables is ₹ 7000, then find the price of 2 chairs and 2 tables.
Solution:
Let the price of one chair be ₹ 'x' and that of one table be ₹ 'y'.
According to the first condition,
the price of 3 chairs and 2 tables is ₹ 4500
∴ 3x + 2y = 4500 ,..(i)
According to the second condition, the price of 5 chairs and 3 tables is ? 7000
∴ 5x + 3y = 7000 ...(ii)
Multiplying equation (i) by 3,
9x + 6y = 13500 ....(iii)
Multiplying equation (ii) by 2,
10x + 6y= 14000 ...(iv)
Subtracting equation (iii) from (iv),

$$\begin{array}{rrr} 10x + 6y = 14000 \\ 9x + 6y = 13500 \\ \hline - \quad - \quad - \\ x \quad = 500 \end{array}$$

Substituting x = 500 in equation (i),
3x + 2y = 4500
∴ 3(500)+ 2y = 4500
∴ 1500 + 2y = 4500
∴ 2y = 4500- 1500
∴ 2y = 3000
∴ y = $\frac{3000}{2}$
∴ y = 1500
∴ Price of 2 chairs and 2 tables = 2x + 2y
= 2(500)+ 2(1500)
= 1000 + 3000 = ₹ 4000
∴ The price of 2 chairs and 2 tables is ₹ 4000.
Question 7.
The sum of the digits in a two-digit number is 9. The number obtained by interchanging the digits exceeds the original number by 27. Find the two-digit number.
Solution:
Let the digit in unit's place be 'x' and the digit in ten's place be 'y'.

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	Digit in tens place	Digit in units place	Number	Sum of the digits
Original number	y	x	$10y + x$	$y + x$
Number obtained by interchanging the digits	x	y	$10x + y$	$x + y$

According to the first condition.
the sum of the digits in a two-digit number is 9
x + y = 9 ...(i)
According to the second condition,
the number obtained by interchanging the digits exceeds the original number by 27
∴ 10x + y = 10y + x + 27
∴ 10x – x + y – 10y = 27
∴ 9x – 9y = 27
Dividing both sides by 9,
x – y = 3 .....(ii)
Adding equations (i) and (ii),

$$\begin{array}{r} x + y = 9 \\ +\ x - y = 3 \\ \hline 2x \quad = 12 \end{array}$$

$$\therefore \quad x = \frac{12}{2}$$

∴ x = 6
Substituting x = 6 in equation (i),
x + y = 9
∴ 6 + y = 9
∴ y = 9 – 6 = 3
∴ Original number = 10y + x = 10(3)+ 6
= 30 + 6 = 36
∴ The two digit number is 36.

Question 8.
In ΔABC, the measure of ∠A is equal to the sum of the measures of ∠B and ∠C. Also the ratio of measures of ∠B and ∠C is 4 : 5. Then find the measures

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of angles of the triangle.
Solution:
Let the measure of ∠B be 'x°' and that of ∠C be 'y°'.
According to the first condition,
m∠A = m∠B + m∠C
∴ m∠A = x° + y°
In AABC,
m∠A + m∠B + m∠C = 180° ...[Sum of the measures of the angles of a triangle is 180°]
∴ x + y + x + y = 180 ,
∴ 2x + 2y = 180
Dividing both sides by 2,
x + y = 90 ...(i)
According to the second condition,
the ratio of the measures of ∠B and ∠C is 4 : 5.
∴ $xy = 45$
∴ 5x = 4y
∴ 5x – 4y = 0 .....(ii)
Multiplying equation (i) by 4,
4x + 4y = 360 ...(iii)
Adding equations (ii) and (iii),

$$\begin{array}{rl} 5x - 4y = & 0 \\ + \ 4x + 4y = & 360 \\ \hline 9x \qquad = & 360 \end{array}$$

$$\therefore \quad x = \frac{360}{9}$$

∴ x = 40
Substituting x = 40 in equation (i),
x + y = 90
∴ 40 + y = 90
∴ y = 90 – 40
∴ y = 50
∴ m∠A = x° + y° = 40° + 50° = 90°
∴ The measures of ∠A, ∠B and ∠C are 90°, 40°, and 50° respectively.
Question 9.
Divide a rope of length 560 cm into 2 parts such that twice the length of the smaller part is equal to 13 of the larger part. Then find the length of the larger part.

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Solution:
Let the length of the smaller part of the rope be ‘x’ cm and that of the larger part be ‘y’ cm.
According to the first condition,
total length of the rope is 560 cm.
∴ x + y = 560 ...(i)
Twice the length of the smaller part = 2x
$\frac{1}{3}$rd length of the larger part = $\frac{1}{3}$y
According to the second condition,
2x = $\frac{1}{3}$ 3
∴ 6x = y
∴ 6x – y = 0 .....(ii)
Adding equations (i) and (ii),

$$\begin{array}{r} x + y = 560 \\ +\ 6x - y = 0 \\ \hline 7x \quad = 560 \end{array}$$

$$\therefore \quad x = \frac{560}{7}$$

∴ x = 80
Substituting x = 80 in equation (ii),
6x – y = 0
∴ 6(80) – y = 0
∴ 480 – y = 0
∴ y = 480
∴ The length of the larger part of the rope is 480 cm.
Question 10.
In a competitive examination, there were 60 questions. The correct answer would carry 2 marks, and for incorrect answer 1 mark would be subtracted. Yashwant had attempted all the questions and he got total 90 marks. Then how many questions he got wrong?
Solution:
Let us suppose that Yashwant got ‘x’ questions right and ‘y’ questions wrong.
According to the first condition, total number of questions in the examination are 60.
∴ x + y = 60 ...(i)
Yashwant got 2 marks for each correct answer and 1 mark was deducted for each wrong answer.

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∴ He got 2x – y marks.
According to the second condition,
he got 90 marks.
2x – y = 90 … (ii)
Adding equations (i) and (ii),

$$\begin{array}{rl} & x + y = 60 \\ + & 2x - y = 90 \\ \hline & 3x = 150 \end{array}$$

$$\therefore \quad x = \frac{150}{3}$$

∴ x = 50
Substituting x = 50 in equation (i),
50 + y = 60
∴ y = 60 – 50 = 10
∴ Yashwant got 10 questions wrong.

Maharashtra Board Class 9 Maths Chapter 5 Linear Equations in Two Variables Practice Set 5.2 Intext Questions and Activities

Question 1.
The population of a certain town was 50,000. In a year, male population was increased by 5% and female population was increased by 3%. Now the population became 52020. Then what was the number of males and females in the previous year? (Textbook pg. no. 89)
Solution:
Step 1: Read the given word problem carefully and try to understand it.

Step 2: Make assumptions using two variables x and y.
Let the number of males in previous year be
'x' and the number of females be 'y'.

Step 3: From the given information, form mathematical statements using the above variables.
According to the first condition,
the total population of town was 50,000.
∴ x + y = 50000 …(i)
Male population increased by 5%.
∴ Number of males = x + 5% of x , 5

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$$= x + x \times \frac{5}{100}$$

$$= \frac{100x + 5x}{100}$$

$$= \mathbf{\frac{105}{100}}\, x$$

Female population increased by 3%.
∴ Number of females = y + 3% of y

$$= y + y \times \frac{3}{100}$$

$$= \frac{100y + 3y}{100}$$

$$= \mathbf{\frac{103}{100}}\, y$$

According to the second condition,
in a year population became 52020
∴ $105100x+103100y=52020$
∴ 105 x + 103 y = 5202000 ...(ii)
Multiplying equation (i) by 103,
103 x + 103 y = 5150000 ...(iii)
Step 4: Here, we use elimination method.
Subtracting equation (iii) from (ii),

$$\begin{array}{rrr} 105\,x + 103\,y = 5202000 \\ 103\,x + 103\,y = 5150000 \\ \hline - \quad - \quad - \\ 2x \qquad\quad = 52000 \end{array}$$

$$\therefore \quad x = \frac{52000}{2}$$

∴ x = 26000
Substituting x = 26000 in equation (i),
∴ 26000 + y = 50000
∴ y = 50000 – 26000
∴ y = 24000
∴ Number of males = x = 26000
∴ Number of females = y = 24000

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Step 5: Write the answer.

The number of males and females in the previous year were 26,000 and 24,000 respectively.

Step 6: Verify your result using smart check.

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Problem Set 5 Algebra 9th Std Maths Part 1 Answers Chapter 5 Linear Equations in Two Variables

Question 1.
Choose the correct alternative answers for the following questions.

i. If 3x + 5y = 9 and 5x + 3y = 7, then what is the value of x + y ?
(A) 2
(B) 16
(C) 9
(D) 7
Answer:
(A) 2

ii. 'When 5 is subtracted from length and breadth of the rectangle, the perimeter becomes 26'. What is the mathematical form of the statement ?
(A) x – y = 8
(B) x + y = 8
(C) x + y = 23
(D) 2x + y = 21
Answer:
(C) x + y = 23

iii. Ajay is younger than Vijay by 5 years. Sum of their ages is 25 years. What is Ajay's age?
(A) 20 years
(B) 15 years
(C) 10 years
(D) 5 years
Answer:
(C) 10 years

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Hints:
i. Adding the given equations,
3x+ 5y = 9
5x + 3y = 7
8x + 8y = 16
∴ x + y = 2 .. [Dividing both sides by 8]

ii. Let the length of the rectangle be 'x' and that of breadth be 'y'.
Perimeter of rectangle = 2[(x – 5) + (y – 5)]
∴ 26 = 2(x + y – 10)
∴ x + y – 10 = 13
∴ x + y = 23

iii. Let the age of Ajay bex years.
∴ x + (x + 5) = 25
∴ 2x = 20
∴ x = 10 years

Question 2.
Solve the following simultaneous equations.
i. 2x + y = 5 ; 3x – y = 5
ii. x – 2y = -1 ; 2x – y = 7
iii. x + y = 11 ; 2x – 3y = 7
iv. 2x + y = -2 ; 3x – y = 7
V. 2x – y = 5 ; 3x + 2y = 11
vi. x – 2y – 2 ; x + 2y = 10
Solution:
ii. 2x + y = 5 ...(i)
3x – y = 5 ...(ii)
Adding equations (i) and (ii),
2x + y = 5
+ 3x – y = 5
5x = 10
∴ x = 10/5
∴ x = 2
Substituting x = 2 in equation (i),
2(2) + y = 5

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4 + y = 5
∴ y = 5 – 4 = 1
∴ (2, 1) is the solution of the given equations.

ii. x – 2y = -1
∴x = 2y – 1 … .(i)
∴ 2x – y = 7 ….(ii)
Substituting x = 2y – 1 in equation (ii),
2(2y – 1) – y = 7
∴ 4y – 2 – y = 7
∴ 3y = 7 + 2
∴ 3y = 9
∴ y = 9/3
∴ y = 3
Substituting y = 3 in equation (i),
x = 2y – 1
∴ x = 2(3) – 1
∴ x = 6 – 1 = 5
∴ (5, 3) is the solution of the given equations.

iii. x + y = 11
∴ x = 11 – y …(i)
2x – 3y = 7 …….(ii)
Substituting x = 11 -y in equation (ii),
2(11 – y) – 3y = 7
∴ 22 – 2y – 3y = 1
∴ 22 – 5y = 7
∴ 22 – 7 = 5y
∴ 15 = 5y
∴ y = 155
∴ y = 3
Substituting y = 3 in equation (i),
x = 11 – y
∴ x = 11 – 3 = 8
∴ (8, 3) is the solution of the given equations.
iv. 2x + y = -2 …(i)
3x – y = 7 …(ii)

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Adding equations (i) and (ii),
2x + y = -2
+ 3x – y = l
5x = 5
∴ x = $\frac{5}{5}$
∴ x = 1
Substituting x = 1 in equation (i),
2x + y = -2
∴ 2(1) +y = -2
2 + y = -2
∴ y = – 2 – 2
∴ y = -4
∴ (1, -4) is the solution of the given equations.
v. 2x – y = 5
∴ -y = 5 – 2x
∴ y = 2x – 5 ...(i)
3x + 2y = 11 .....(ii)
Substituting y = 2x – 5 in equation (ii),
3x + 2(2x – 5) = 11
∴ 3x + 4x- 10= 11
∴ 7x = 11 + 10
∴ 7x = 21
∴ x = $\frac{21}{7}$
∴ x = 3
Substituting x = 3 in equation (i),
y = 2x – 5
∴ y = 2(3) – 5
∴ y = 6 – 5 = 1
∴(3,1) is the solution of the given equations.
vi. x – 2y = -2
∴ x = 2y – 2 ...(i)
x + 2y = 10 .....(ii)
Substituting x = 2y – 2 in equation (ii),
2y – 2 + 2y = 10
∴ 4y = 10 + 2
∴ 4y= 12
∴ y = $\frac{12}{7}$

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∴ y = 3
Substituting y = 3 in equation (i),
x = 2y – 2
∴ x = 2(3) – 2
∴ x = 6 – 2 = 4
∴ (4, 3) is the solution of the given equations.
Question 3.
By equating coefficients of variables, solve the following equations. [3 Marks each]
i. 3x – 4y = 7 ; 5x + 2y = 3
ii. 5x + ly= 17 ; 3x – 2y = 4
iii. x – 2y = -10 ; 3x – 3y = -12
iv. 4x+y = 34 ; x + 4y = 16
Solution:
i. 3x – 4y = 7 ...(i)
5x + 2y = 3 ....(ii)
Multiplying equation (ii) by 2,
10x + 4y = 6 ...(iii)
Adding equations (i) and (iii),

$$\begin{array}{rr} 3x & -4y = 7 \\ +\,10x & +4y = 6 \\ \hline 13x & = 13 \end{array}$$

$$\therefore \quad x = \frac{13}{13}$$

∴ x = 1
Substituting x = 1 in equation (i),
3x – 4y = 7
∴ 3(1) – 4y = 7
∴ 3 – 4y = 7
∴ 3 – 7 = 4y
∴ -4 = 4y
∴ y = $\frac{-4}{4}$
∴ y = -1
∴ (1, -1) is the solution of the given equations.
ii. 5x + 7y = 17 ...(i)
3x – 2y = 4 ....(ii)
Multiplying equation (i) by 2,
10x + 14y = 34 ...(iii)

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Multiplying equation (ii) by 7,
21x – 14y = 28 .....(iv)
Adding equations (iii) and (iv),

$$\begin{array}{r} 10x + 14y = 34 \\ +\ 21x - 14y = 28 \\ \hline 31x \qquad = 62 \end{array}$$

$$\therefore \quad x = \frac{62}{31}$$

∴ x = 2
Substituting x = 2 in equation (ii),
3x – 2y = 4
∴ 3(2) – 2y = 4
∴ 6 – 2y = 4
∴ 6 – 4 = 2y
∴ 2 = 2y
∴ y = 22
∴ y = 1
∴ (2,1) is the solution of the given equations.
iii. x – 2y = -10 ....(i)
3x – 5y = -12 .....(ii)
Multiplying equation (i) by 3,
3x – 6y = -30 ...(iii)
Subtracting equation (ii) from (iii),

$$\begin{array}{r} 3x - 6y = -30 \\ 3x - 5y = -12 \\ - \quad + \quad + \\ \hline -y = -18 \end{array}$$

∴ y = 18
Substituting y = 18 in equation (i),
x – 2y = -10
∴ x – 2(18) = -10
∴ x – 36 = -10
∴ x = -10 + 36 = 26
∴ (26, 18) is the solution of the given equations.

iv. 4x + y = 34 ...(i)
x + 4y = 16 ..... (ii)
Multiplying equation (i) by 4,

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16x + 4y = 136 ...(iii)

Subtracting equation (ii) from (iii),

$$\begin{array}{r} 16x + 4y = 136 \\ x + 4y = 16 \\ - \quad - \quad - \\ \hline 15x \quad = 120 \end{array}$$

$$\therefore \quad x = \frac{120}{15}$$

x = 8

Substituting x = 8 in equation (i),

4x + y = 34

∴ 4(8) + y = 34

∴ 32 + y = 34

∴ y = 34 – 32 = 2

∴ (8, 2) is the solution of the given equations.

Question 4.

Solve the following simultaneous equations.

i. $\frac{x}{3}+\frac{y}{4}=4\ ;\ \frac{x}{2}-\frac{y}{4}=1$

ii. $\frac{x}{3}+5y=13\ ;\ 2x+\frac{y}{2}=19$

iii. $\frac{2}{x}+\frac{3}{y}=13\ ;\ \frac{5}{x}-\frac{4}{y}=-2$

Solution:

i. $\frac{x}{3}+\frac{y}{4}=4$

Multiplying both sides by 12,

4x + 3y = 48 ...(i)

$\frac{x}{2}-\frac{y}{4}=1$

Multiplying both sides by 8,

4x – 2y = 8 .....(ii)

Subtracting equation (ii) from (i),

$$\begin{array}{r} 4x + 3y = 48 \\ 4x - 2y = 8 \\ - \quad + \quad - \\ \hline 5y = 40 \end{array}$$

$$\therefore \quad y = \frac{40}{5}$$

∴ y = 8

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- *Arjun*

Substituting y = 8 in equation (ii),
4x – 2y = 8
∴ 4x – 2(8) = 8
∴ 4x – 16 = 8
∴ 4x = 8+ 16
∴ 4x = 24
∴ x = $\frac{24}{4}$
∴ x = 6
∴ (6, 8) is the solution of the given equations.
ii. $\frac{x}{3}$ + 5y = 13
Multiplying both sides by 3,
x + 15y = 39 ...(i)
2x + $\frac{y}{2}$ =19
Multiplying both sides by 2,
4x + y = 38 .....(ii)
Multiplying equation (i) by 4,
4x + 60y = 156 ...(iii)
Subtracting equation (ii) from (iii),
4x + 60y =156 4x + y= 38

$$\begin{array}{r} 4x + 60y = 156 \\ 4x + y = 38 \\ - \quad - \quad\ - \\ \hline 59y = 118 \end{array}$$

$$\therefore \quad y = \frac{118}{59}$$

∴ y = 2
Substituting y = 2 in equation (i),
x + 15y = 39
∴ x+ 15(2) = 39
∴ x + 30 = 39
∴ x = 39 – 30 = 9
∴ (9,2) is the solution of the given equations.
iii. $\frac{2x}{3}$ + $\frac{y}{3}$ = 13
Multiplying both sides by 5,

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$$\frac{10}{x} + \frac{15}{y} = 65$$

$\therefore$ $\frac{10}{x} = 65 - \frac{15}{y}$ ...(i)

$$\frac{5}{x} - \frac{4}{y} = -2$$

Multiplying both sides by 2,

$$\frac{10}{x} - \frac{8}{y} = -4$$

$\therefore$ $\frac{10}{x} = \frac{8}{y} - 4$ ...(ii)

$\therefore$ $65 - \frac{15}{y} = \frac{8}{y} - 4$ ...[From (i) and (ii)]

$\therefore$ $65 + 4 = \frac{8}{y} + \frac{15}{y}$

$\therefore$ $69 = \frac{23}{y}$

$\therefore$ $y = \frac{23}{69}$

$\therefore$ $y = \frac{1}{3}$

Substituting $y = \frac{1}{3}$ in equation (ii),

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Substituting $y = \frac{1}{3}$ in equation (ii),

$$\frac{10}{x} = \frac{8}{y} - 4$$

$$\therefore \quad \frac{10}{x} = \frac{8}{\left(\frac{1}{3}\right)} - 4$$

$$\therefore \quad \frac{10}{x} = 8 \times 3 - 4$$

$$\therefore \quad \frac{10}{x} = 24 - 4$$

$$\therefore \quad \frac{10}{x} = 20$$

$$\therefore \quad \frac{10}{20} = x$$

$$\therefore \quad x = \frac{1}{2}$$

$$\therefore \quad \left(\frac{1}{2}, \frac{1}{3}\right)$$ **is the solution of the given equations.**

Question 5.
A two digit number is 3 more than 4 times the sum of its digits. If 18 is added to this number, the sum is equal to the number obtained by interchanging the digits. Find the number.
Solution:
Let the digit in unit's place be 'x' and the digit in ten's place be 'y'.

	Digit in tens place	Digit in units place	Number	Sum of the digits
Original number	y	x	$10y + x$	$y + x$
Number obtained by interchanging the digits	x	y	$10x + y$	$x + y$

According to the first condition,
a two digit number is 3 more than 4 times the sum of its digits.
10y + x = 4(x + y) + 3
∴ 10y + x = 4x + 4y + 3

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∴ x – 4x + 10y – 4y = 3
∴ – 3x + 6y = 3
Dividing both sides by -3,
x – 2y = -1 ...(i)
According to the second condition,
if 18 is added to the number, the sum is equal to the number obtained by interchanging the digits.
10y + x + 18= 10x + y
∴ x – 10x + 10y – y = -18
∴ – 9x + 9y = -18
Dividing both sides by – 9,
x – y = 2 .....(ii)
Subtracting equation (ii) from (i),

$$\begin{array}{r} x-2y=-1 \\ x-y=2 \\ -\quad +\quad\ - \\ \hline -y=-3 \end{array}$$

∴ y = 3
Substituting y = 3 in equation (ii),
x – y = 2
∴ x – 3 = 2
∴ x = 2 + 3 = 5
∴ Original number = 10y + x
= 10(3) + 5
= 30 + 5
= 35
The required number is 35.

Question 6.
The total cost of 8 books and 5 pens is ₹ 420 and the total cost of 5 books and 8 pens is ₹321. Find the cost of 1 book and 2 pens.
Solution:
Let the cost of one book be ₹ x and the cost of one pen be ₹ y.
According to the first condition,
the total cost of 8 books and 5 pens is ₹ 420.
∴ 8x + 5y = 420 ...(i)
According to the second condition, the total cost of 5 books and 8 pens is ₹ 321.

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5x + 8y = 321 ....(ii)
Multiplying equation (i) by 5,
40x + 25y = 2100 ...(iii)
Multiplying equation (ii) by 8,
40x + 64y = 2568 ... (iv)
Subtracting equation (iii) from (iv),

$$\begin{array}{r} 40x + 64y = 2568 \\ 40x + 25y = 2100 \\ - \quad - \quad - \\ \hline 39y = 468 \end{array}$$

$$\therefore \quad y = \frac{468}{39}$$

∴ y = 12
Substituting y = 12 in equation (i),
8x + 5y = 420
∴ 8x + 5(12) = 420
∴ 8x + 60 = 420
∴ 8x = 420 – 60
∴ 8x = 360
∴ x = 3608
∴ x = 45
Cost of 1 book and 2 pens = x + 2y
= 45 + 2(12)
= 45 + 24
= ₹69
∴ The cost of 1 book and 2 pens is ₹69.
Question 7.
The ratio of incomes of two persons is 9 : 7. The ratio of their expenses is 4 : 3. Every person saves ₹ 200, find the income of each.
Solution:
Let the income of first person be ₹ x and that of second person be ₹ y.
According to the first condition,
the ratio of their incomes is 9 : 7.
∴ xy = 97
∴ 7x = 9y
∴ 7x – 9y = 0 .....(i)
Each person saves ₹ 200.
Expenses of first person = Income – Saving = x – 200

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Expenses of second person = y – 200
According to the second condition,
the ratio of their expenses is 4 : 3
∴ $\frac{x-200}{y-200} = \frac{4}{3}$
∴ 3(x – 200) = 4(y – 200)
∴ 3x – 600 = 4y – 800
∴ 3x – 4y = – 800 + 600
∴ 3x – 4y = -200 ...(ii)
Multiplying equation (i) by 4,
28x-36y =0 ...(iii)
Multiplying equation (ii) by 9,
27x-36y = -1800 ...(iv)
Subtracting equation (iv) from (iii),

$$\begin{array}{rrr} 28x - 36y & = 0 \\ 27x - 36y & = -1800 \\ - \quad + & \quad + \\ \hline x & = 1800 \end{array}$$

Substituting x = 1800 in equation (i),
7x – 9y = 0
∴ 7(1800) – 9y = 0
∴ 9y = 7 x 1800
∴ y = $\frac{7 \times 1800}{9}$
y = 7 x 200
∴ y = 1400
∴ The income of first person is ₹ 1800 and that of second person is ₹ 1400.
Question 8.
If the length of a rectangle is reduced by 5 units and its breadth is increased by 3 units, then the area of the rectangle is reduced by 9 square units. If length is reduced by 3 units and breadth is increased by 2 units, then the area of rectangle will increase by 67 square units. Then find the length and breadth of the rectangle.
Solution:
Let the length of the rectangle be 'x' units and the breadth of the rectangle be 'y' units.
Area of the rectangle = xy sq. units
length of the rectangle is reduced by 5 units
∴ length = x – 5
breadth of the rectangle is increased by 3 units

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∴ breadth = y + 3
area of the rectangle is reduced by 9 square units
∴ area of the rectangle = xy – 9
According to the first condition,
(x – 5)(y + 3) = xy – 9
∴ xy + 3x – 5y – 15 = xy – 9
∴ 3x – 5y = -9 + 15
∴ 3x – 5y = 6 ...(i)
length of the rectangle is reduced by 3 units
∴ length = x – 3
breadth of the rectangle is increased by 2 units
∴ breadth = y + 2
area of the rectangle is increased by 67 square units
∴ area of the rectangle = xy + 61
According to the second condition,
(x – 3)(y + 2) = xy + 67
∴ xy + 2x – 3y – 6 = xy + 67
∴ 2x – 3y = 67 + 6
∴ 2x – 3y = 73 ...(ii)
Multiplying equation (i) by 3,
9x – 15y = 18 . ..(iii)
Multiplying equation (ii) by 5,
10x – 15y = 365 ...(iv)
Subtracting equation (iii) from (iv), 10x- 15y= 365 9x-15y= 18

$$\begin{array}{rrr} 10x - 15y = & 365 \\ 9x - 15y = & 18 \\ - \quad + & - \\ \hline x \qquad & = 347 \end{array}$$

Substituting x = 347 in equation (ii),
2x – 3y = 73
∴ 2(347) – 3y = 73
∴ 694 – 73 = 3y
∴ 621 = 3y
∴ y = 6213
∴ y = 207
∴ The length and breadth of rectangle are 347 units and 207 units respectively.

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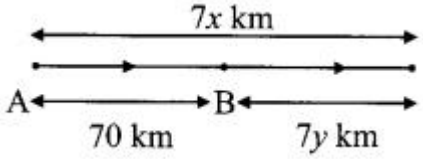
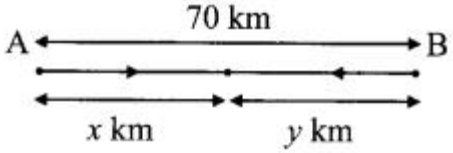
Question 9.
The distance between two places A and B on a road is 70 kilometres. A car starts from A and the other from B. If they travel in the same direction, they will meet in 7 hours. If they travel towards each other they will meet in 1 hour, then find their speeds.
Solution:
Let the speed of the car starting from A (first car) be 'x' km/hr and that starting from B (second car) be 'y' km/hr. (x > y)
According to the first condition,
Distance covered by the first car in 7 hours = 7x km
Distance covered by the second car in 7 hours = 7y km



If the cars are travelling in the same direction, 7x – 7y = 70
Dividing both sides by 7,
x – y = 10 ...(i)
According to the second condition,
Distance covered by the first car in
1 hour = x km
Distance covered by the second car in 1 hour = y km



If the cars are travelling in the opposite direction
x + y = 70 ...(ii)
Adding equations (i) and (ii),

$$\begin{array}{rl} & x - y = 10 \\ + & x + y = 70 \\ \hline & 2x \quad = 80 \end{array}$$

$$\therefore \quad x = \frac{80}{2}$$

∴ x = 40
Substituting x = 40 in equation (ii), x + y = 70
∴ 40 +y = 70
∴ y = 70 – 40 = 30

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∴ The speed of the cars starting from places A and B are 40 km/hr and 30 km/hr respectively.

Question 10.
The sum of a two digit number and the number obtained by interchanging its digits is 99. Find the number.
Solution:
Let the digit in unit's place be 'x' and the digit in ten's place be 'y'.

	Digit in tens place	Digit in units place	Number	Sum of the digits
Original number	y	x	$10y + x$	$y + x$
Number obtained by interchanging the digits	x	y	$10x + y$	$x + y$

According to the given condition,
the sum of a two digit number and the number obtained by interchanging its digits is 99.
∴ 10y + x + 10x +y = 99
∴ 11x + 11y = 99
Dividing both sides by 11,
x + y = 9
If y = 1, then x = 8
If y = 2, then x = 7
If y = 3, then x = 6 and so on.
∴ The number can be 18, 27, 36, … etc.

Maharashtra Board Class 9 Maths Chapter 5 Linear Equations in Two Variables Practice Set 5 Intext Questions and Activities

Question 1.
On the glasses of following spectacles, write numbers such that (Textbook pg. no. 82)

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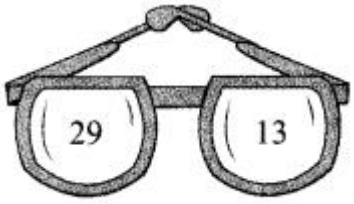
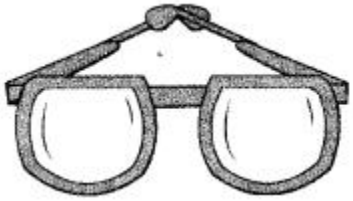
i. Their sum is 42 and difference is 16.



ii. Their sum is 37 and difference is 11.

iii. Their sum is 54 and difference is 20.



iv. Their sum is … and difference is … .

Answer:

ii. $x + y = 37$ and $x – y = 11$

$\therefore x = 24, y = 13$

iii. $x + y = 54$ and $x – y = 20$

$\therefore x = 37, y = 17$

Question 2.

There are instructions written near the arrows in the following diagram. From this information form suitable equations and write in the boxes indicated by arrows. Select any two equations from these boxes and find their solutions. Also verify the solutions. By taking one pair of equations at a time, how many pairs can be formed ? Discuss the solutions for these

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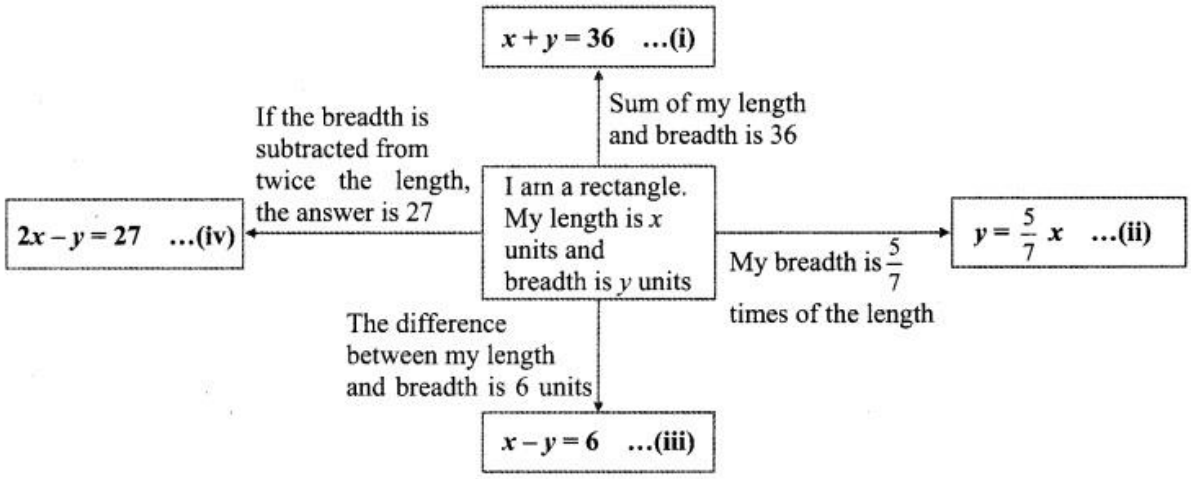
pairs. (Textbook pg. no. 92)

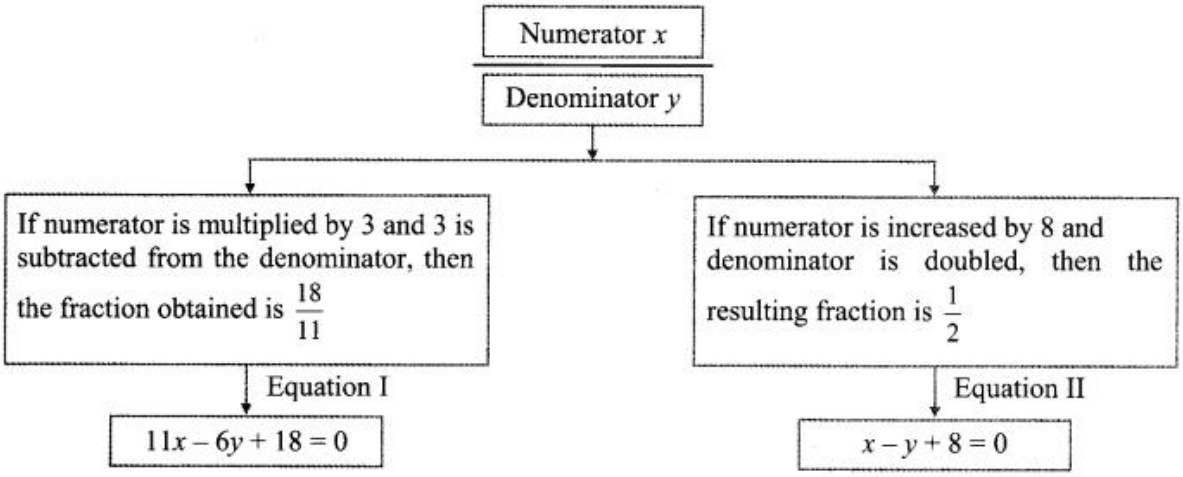


Answer:
Here, if we take a pair of any two equations, we get following 6 pairs.

1. equation (i) and (ii)
2. equation (i) and (iii)
3. equation (i) and (iv)
4. equation (ii) and (iii)
5. equation (ii) and (iv)
6. equation (iii) and (iv)

Solution of each pair given above is (21, 15).
Here, all four equations are of same rectangle. By solving any two equations simultaneously, we get length and breadth of the rectangle.

Question 3.
Find the function.



∴ Given function = 614

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Verify the answer obtained. (Textbook pg. no. 92)

Answer:

For the fraction$\frac{6}{14}$, if the numerator is multiplied by 3 and 3 is subtracted from the denominator, we get fraction $\frac{18}{11}$.

Similarly, for the fraction $\frac{6}{14}$, if the numerator is increased by 8 and the denominator is doubled, we get fraction $\frac{1}{2}$.

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