

# **NCERT Solutions for Class 10 Chapter 3- Pair of Linear Equations**

## **NCERT Solutions for Class 10 Maths Exercise 3.1 of Chapter 3 Linear Equations in Two Variables**

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**Q1.Aftab tells his daughter,"seven years ago I was seven times as old as you were then. Also three years from now,I shall be three times as old as you will be."(Isn't this be interesting?)Represent this situation algebraically and graphically.**

Ans. Let the age of Aftab is  $x$  and of his daughter is  $y$

According to first condition, seven years ago the age of Aftab =  $x - 7$  and of his daughter =  $y - 7$ ,further it is given that

Seven years back the age of Aftab =  $7 \times$  Seven years back his daughter's age

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

$$x - 7 = 7y - 49$$

$$x - 7y = -49 + 7$$

$$x - 7y = -42 \dots (i)$$

According to second condition, after 3 years the age of Aftab is  $x + 3$  and of his daughter's age is  $y + 3$ , further it is given that

After 3 years the age of Aftab =  $3 \times$  His daughter's age after 3 years

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

$$x + 3 = 3y + 9$$

$$x - 3y = 6 \dots (ii)$$

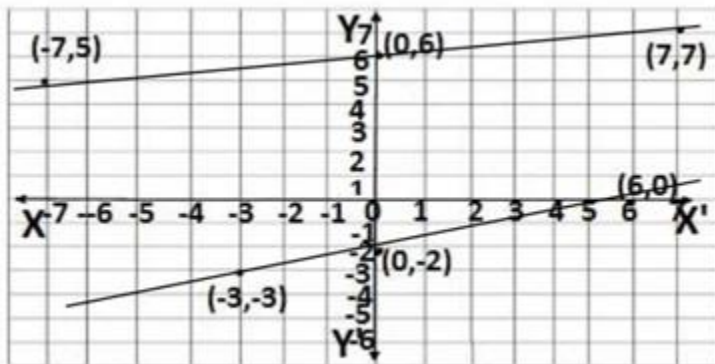
Solutions of the equation  $x - 7y = -42$

x	0	7	-7
y	6	7	5

Solutions of the equation  $x - 3y = 6$

x	0	6	-3
y	-2	0	-3

Graphical representation of both equations



**Q2.** The coach of a cricket team buys 3 bats and 6 balls for ₹ 3900. Later, she buys another bat and 3 more balls of the same kind for ₹ 1300. Represent this situation algebraically and geometrically.

Ans. Let the cost of 1 bat is  $x$  and of 1 ball is  $y$

According to first condition

$3 \times \text{cost of 1 bat} + 6 \times \text{cost of 1 ball} = \text{Rs } 3900$

$$3x + 6y = 3900 \dots (i)$$

According to second condition

$\text{Cost of 1 bat} + 3 \times \text{cost of 1 ball} = \text{Rs } 1300$

$$x + 3y = 1300 \dots (ii)$$

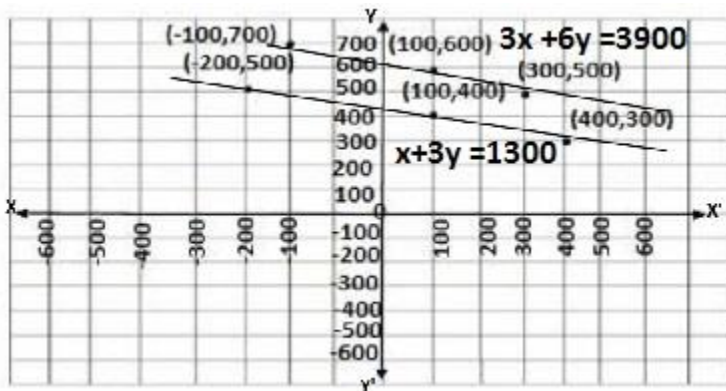
Solutions of equation (i)  $3x + 6y = 3900$

x	100	-100	300
y	600	700	500

Solutions of equation (ii)  $x + 3y = 1300$

x	100	400	-200
y	400	300	500

Graphical representation of both equations



**Q3.** The cost of 2 kg of apples and 1 kg of grapes on a day was found to be ₹160. After a month, the cost of 4 kg of apples and 2 kg of grapes is ₹300. Represent the situation algebraically and geometrically.

Ans. Let the cost of 1 kg apple is = x and the cost of 1 kg grapes is = y

According to first condition of the question

$2 \times \text{cost of 1 kg apple} + \text{cost of 1 kg grapes} = \text{Rs } 160$

$$2x + y = 160 \dots (i)$$

According to second condition of the question

$$4 \times \text{cost of 1 kg apple} + 2 \times \text{cost of 1 kg grapes} = \text{Rs } 300$$

$$4x + 2y = 300 \dots (ii)$$

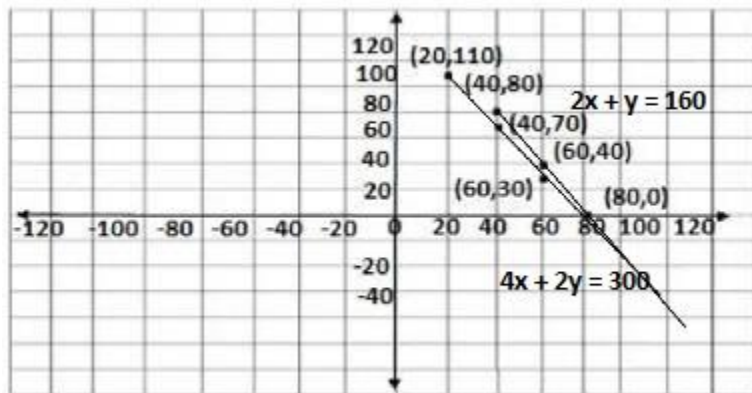
Solutions of the first equation  $2x + y = 160$

x	80	60	40
y	0	40	80

Solutions of the second equation  $4x + 2y = 300$

x	60	40	20
y	30	70	110

Graphical representation of both equations



## NCERT Solutions for Class 10 Maths Exercise 3.2 of Chapter 3 Linear Equations in Two Variables

**Q1. Form the pair of linear equations of the following problems and find their solutions graphically:**

**(i) 10 students of class X took part in a mathematics quiz. If the number of girls is 4 more than the number of boys, find the number of boys and girls who took part in the quiz.**

Ans. Let the number of girls is  $x$  and the number of boys is  $y$  who participated in the quiz.

It is given that total number of the students who took part in the quiz =10

$$x + y = 10 \dots\dots(i)$$

According to the second condition of question

Number of girls = 4 more than the number of boys =4 + Number of the boys

$$x = y + 4$$

Rearranging the equation

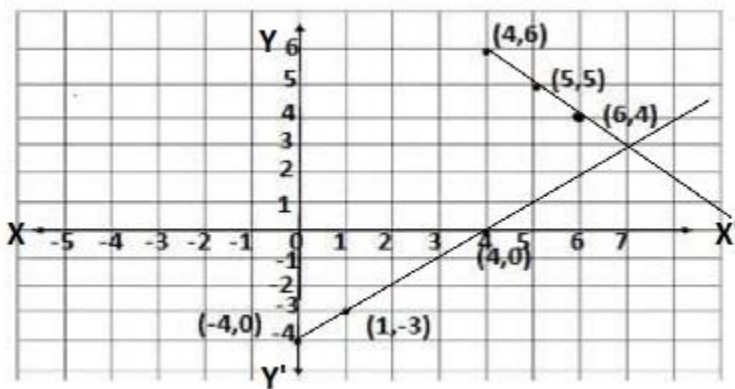
$$x - y = 4 \dots\dots(ii)$$

Solutions of the first equation  $x + y = 10$

x	4	5	6
y	6	5	4

Solutions of the second equation  $x - y = 4$

x	0	4	1
y	-4	0	-3



It is clear from the graph that both lines intersect at (7,3) there fore  $x = 7$  and  $y = 3$

Therefore number of girls 7 and number of boys 3 participated in the quiz.

**(ii) 5 pencils and 7 pens together cost ₹50, whereas 7 pencils and 5 pens together cost ₹46. Find the cost of one pencil and that of one pen.**

Ans. Let the cost of one pen is  $x$  and of one pencil is  $y$

According to first condition

$$\text{The cost of one pencil} \times 5 + \text{The cost of one pen} \times 7 = \text{Rs } 50$$



$$5x + 7y = 50 \dots (i)$$

According to the second condition

The cost of one pencil  $\times 7$  + The cost of one pen  $\times 5 = \text{Rs } 50$

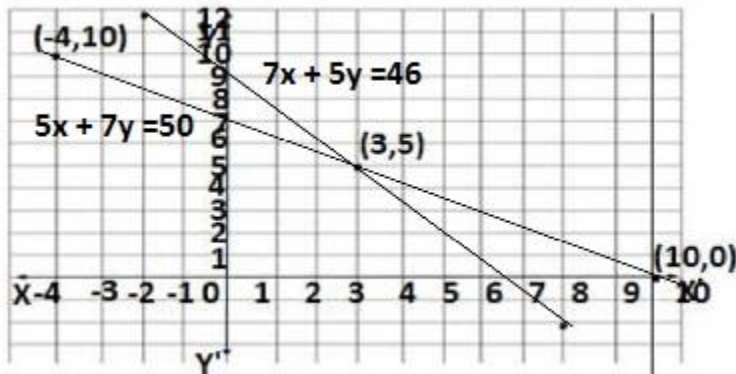
$$7x + 5y = 46 \dots (ii)$$

Solutions of the first equation  $5x + 7y = 50$

x	3	-4	10
y	5	10	0

Solutions of the second equation  $7x + 5y = 46$

x	3	-2	8
y	5	12	-2



Both of the lines intersect at  $(3, 5)$ ,  $x = 3$  and  $y = 5$ , therefore cost of one pencil is Rs 3 and cost of one pen is Rs 5.

**Q2. On comparing the ratios  $a_1/a_2$ ,  $b_1/b_2$  and  $c_1/c_2$ , find out whether the lines representing the following pairs of linear equations intersect at a point, are parallel or coincident:**

(i)  $5x - 4y + 8 = 0, 7x + 6y - 9 = 0$

(ii)  $9x + 3y + 12 = 0, 18x + 6y + 24 = 0$

(iii)  $6x - 3y + 10 = 0, 2x - y + 9 = 0$

Ans. The given pair of linear equations is  $5x - 4y + 8 = 0, 7x + 6y - 9 = 0$

Comparing the given pair of linear equations with standard pair of linear equations  $a_1x + b_1y + c_1 = 0$  and  $a_2x + b_2y + c_2 = 0$

$$a_1 = 5, b_1 = -4, c_1 = 8, a_2 = 7, b_2 = 6, c_2 = -9$$

$$a_1/a_2 = 5/7, b_1/b_2 = -4/6 = -2/3, c_1/c_2 = 8/-9 = -8/9$$

Here  $a_1/a_2 \neq b_1/b_2$

Therefore both lines intersect at a point.

(ii) The given pair of linear equations is  $9x + 3y + 12 = 0, 18x + 6y + 24 = 0$

Comparing the given pair of linear equations with standard pair of linear equations  $a_1x + b_1y + c_1 = 0$  and  $a_2x + b_2y + c_2 = 0$

$$a_1 = 9, b_1 = 3, c_1 = 12, a_2 = 18, b_2 = 6, c_2 = 24$$

$$a_1/a_2 = 9/18 = 1/2, b_1/b_2 = 3/6 = 1/2, c_1/c_2 = 12/24 = 1/2$$

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

Therefore the given pair of linear equations are coincident

(iii) The given pair of linear equations is  $6x - 3y + 10 = 0, 2x - y + 9 = 0$

Comparing the given pair of linear equations with standard pair of linear equations  $a_1x + b_1y + c_1 = 0, a_2x + b_2y + c_2 = 0$

$$a_1 = 6, b_1 = -3, c_1 = 10, a_2 = 2, b_2 = -1, c_2 = 9$$

$$\frac{a_1}{a_2} = \frac{6}{2} = 3, \frac{b_1}{b_2} = \frac{-3}{-1} = 3, \frac{c_1}{c_2} = \frac{10}{9}$$

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

Therefore the given linear equations are parallel to each other

**Q3. On comparing the ratios  $a_1/a_2, b_1/b_2$  and  $c_1/c_2$ , find out whether the following pairs of linear equations consistent or inconsistent .**

(i)  $3x + 2y = 5, 2x - 3y = 7$

(ii)  $2x - 3y = 8, 4x - 6y = 9$

(iii)  $3x/2 + 5y/3 = 7, 9x - 10y = 14$

Ans.

(i) Rearranging the given pair of linear equation is  $3x + 2y - 5 = 0$ ,  $2x - 3y - 7 = 0$

Comparing the given pair of linear equations with standard pair of linear equations  $a_1x + b_1y + c_1 = 0$  and  $a_2x + b_2y + c_2 = 0$

$$a_1 = 3, b_1 = 2, c_1 = -5, a_2 = 2, b_2 = -3, c_2 = -7$$

$$a_1/a_2 = 3/2, b_1/b_2 = 2/-3 = -2/3, c_1/c_2 = -5/-7 = 5/7$$

$$a_1/a_2 \neq b_1/b_2$$

Therefore the given pair of linear equations has unique solutions, thus it is consistent.

(ii) Rearranging the given pair of linear equation is  $2x - 3y - 8 = 0$ ,  $4x - 6y - 9 = 0$

Comparing the given pair of linear equations with standard pair of linear equations  $a_1x + b_1y + c_1 = 0$  and  $a_2x + b_2y + c_2 = 0$

$$a_1 = 2, b_1 = -3, c_1 = -8, a_2 = 4, b_2 = -6, c_2 = -9$$

$$a_1/a_2 = 2/4 = 1/2, b_1/b_2 = -3/-6 = 1/2, c_1/c_2 = -8/-9 = 8/9$$

$$a_1/a_2 = b_1/b_2 \neq c_1/c_2$$

Therefore the given pair of linear equations are parallel, it has no solutions thus it is Inconsistent.

(iii) Rearranging the given pair of linear equation  $3x/2 + 5y/3 - 7 = 0$ ,  $9x - 10y - 14 = 0$

Comparing the given pair of linear equations with standard pair of linear equations  $a_1x + b_1y + c_1 = 0$  and  $a_2x + b_2y + c_2 = 0$

$$a_1 = 3/2, b_1 = 5/3, c_1 = -7, a_2 = 9, b_2 = -10, c_2 = -14$$

$$a_1/a_2 = 3/(2 \times 9) = 1/6, b_1/b_2 = 5/(3 \times -10) = 5/-30 = -1/6, c_1/c_2 = -7/-14 = 1/2$$

$$a_1/a_2 \neq b_1/b_2$$

Therefore the given pair of linear equations has unique solutions, it is consistent.

**Q4. Which of the following pairs of linear equations are consistent/inconsistent? If consistent, obtain the solution graphically.**

(i)  $x + y = 5$ ,  $2x + 2y = 10$

(ii)  $x - y - 8, 2x + 2y = 10$

(iii)  $2x + y - 6 = 0, 4x - 2y - 4 = 0$

(iv)  $2x - 2y - 2 = 0, 4x - 4y - 5 = 0$

Ans.(i) Arranging the given pair of the linear equation  $x + y - 5=0, 2x + 2y - 10 = 0$

Comparing the given pair of linear equations with standard pair of linear equations  $a_1x+b_1y + c_1=0$  and  $a_2x+b_2y + c_2=0$

$a_1/a_2 = 1/2, b_1/b_2 = 1/2, c_1/c_2 = -5/-10 = 1/2,$

$\therefore a_1/a_2 = b_1/b_2 = c_1/c_2$

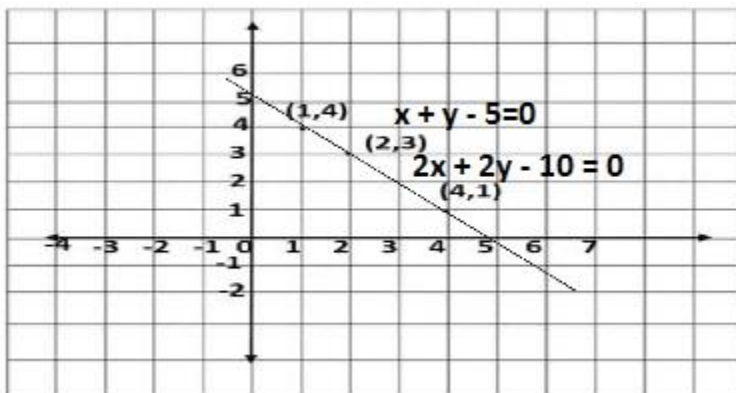
Therefore the given linear equations are coincident,so for every value of x there are infinite values of y

Solutions of the equation (i)  $x + y - 5=0$

x	1	4	2	3
y	4	1	3	2

Solutions of the equation (ii)  $2x + 2y - 10 = 0$

x	1	4	2	3
y	4	1	3	2



Similarly (ii),(iii),(iv) and v part of the questions can be solved

**Q5.Half the perimeter of a rectangular garden, whose length is 4 m more than its width is 36 m. Find the dimensions of the garden graphically.**

Ans. According to first condition of the question, the half of the perimeter of rectangle = 36

Let the length of the rectangle =  $x$  and the length of the breadth =  $y$

Half of the perimeter = 36

$$2(x + y)/2 = 36$$

$$x + y = 36 \dots\dots(i)$$

According to second condition, the length is 4 m more than the breadth

Length = Width + 4 m

$$x = y + 4$$

arranging the equation

$$x - y = 4 \dots\dots(ii)$$

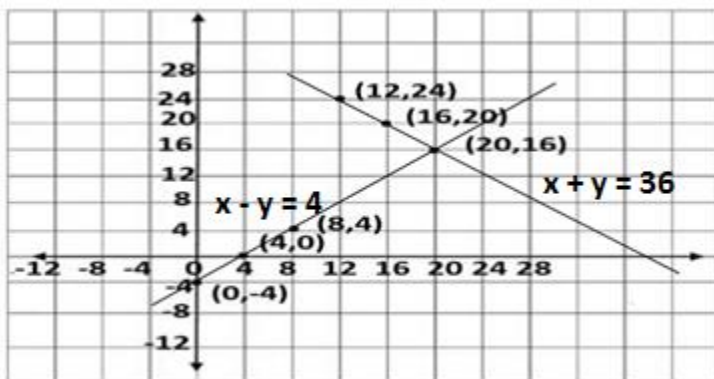
Solutions of the first equation  $x + y = 36$

x	20	16	12
y	16	20	24

Solutions of the second equation  $x - y = 4$

x	4	0	8
y	0	-4	4

Graphical representation of both equations



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## NCERT Solutions for Class 10 Maths Exercise 3.3 of Chapter 3- Pair of Linear Equations

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

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

(ii)  $s - t = 3$ ,  $(s/3) + (t/2) = 6$

Ans. The given equations are  $x + y = 14$ ....(i) and  $x - y = 4$ .....(ii)

Taking equation (i)

$$x + y = 14$$

Solving it for y

$$y = 14 - x$$

Putting the value of y in equation (ii)

$$x - (14 - x) = 4$$

$$x - 14 + x = 4$$

$$2x = 4 + 14 = 18$$

$$x = 18/2 = 9$$

Putting the value of x =9 in equation (i)

$$y = 14 - 9 = 5$$

Hence the solutions of the given pair of linear equations are  $x = 9$  and  $y = 5$

(ii)The given equations are  $s - t = 3$ .....(i) and  $(s/3) + (t/2) = 6$  ....(ii)

Taking equation (i)

$$s - t = 3$$

Solving it for s

$$s = 3 + t$$

Putting the value of s in equation (ii)

$$(s/3) + (t/2) = 6$$

$$(3+t)/3 + (t/2) = 6$$

$$(6+2t +3t)/6 = 6$$

$$6+5t = 36$$

$$5t = 36-6 = 30$$

$$t = 30/5 = 6$$

Putting the value of t =6 in equation (i)

$$s = 3+6 = 9$$

Hence the solutions of the given pair of linear equations are  $x = 9$  and  $y = 5$

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

Ans. The given equations are  $2x + 3y = 11$  ....(i) and  $2x - 4y = -24$ .....(ii)

Taking equation (i)

$$2x + 3y = 11$$

Solving it for y

$$y = (11 - 2x) / 3$$

Putting the value of y in equation (ii)

$$2x - 4(11 - 2x) / 3 = - 24$$

$$(6x - 44 + 8x) / 3 = -24$$

$$6x - 44 + 8x = -72$$

$$14x = -72 + 44 = -28$$

$$x = -28 / 14 = -2$$

Putting the value of  $x = -2$  in equation (i)

$$2x - 2 + 3y = 11$$

$$-4 + 3y = 11$$

$$3y = 11 + 4 = 15$$

$$y = 15/3 = 5$$

Hence the solutions of the given pair of linear equations are  $x = -2$  and  $y = 5$

Putting the value of  $x = -2$  and  $y = 5$  in the given relation  $y = mx + 3$

$$5 = -2m + 3$$

$$2m = 3 - 5 = -2$$

$$m = -1$$

Hence the value of  $m$  is  $-1$

**Q3. Form 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.**

Ans. Let the two numbers are  $x$  and  $y$

According to the first condition

The difference between the numbers is  $= 26$

$$x - y = 26 \dots (i)$$

According to the second condition

One number  $= 3 \times$  Other number

$$x = 3y \dots (ii)$$

Putting the value of  $x$  from equation (ii) to in equation (i)

$$3y - y = 26$$

$$2y = 26 \Rightarrow y = 13$$



Putting the value of y in equation (i)

$$x - 13 = 26$$

$$x = 26 + 13 = 39$$

Hence the numbers are 13 and 39

**(ii) Larger of two supplementary angles exceeds the smaller by 18 degrees. Find them.**

Ans. Let the smaller angle is x and larger angle is y

According to first condition two angles are complimentary to each other

$$x + y = 180^\circ \dots\dots(i)$$

According to second condition one angle is smaller by 18 degree than the larger one

$$x = y - 18^\circ \dots\dots(ii)$$

Substituting the value of x from (ii) equation to equation (i)

$$y - 18^\circ + y = 180^\circ$$

$$2y = 180^\circ + 18^\circ = 198^\circ$$

$$y = 99^\circ$$

Putting the value of y in equation (i) in the equation

$$x + 99^\circ = 180^\circ$$

$$x = 180^\circ - 99^\circ = 81^\circ$$

Hence the solutions of the given pair of linear equations is  $x = 81^\circ$  and  $y = 99^\circ$

**(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.**

Ans. Let the cost of one bat is x and the cost of one ball is y

According to first condition

$$7x + 6y = 3800 \dots\dots(i)$$

According to second condition

$$3x + 5y = 1750 \dots(ii)$$

Taking equation (i)

$$7x + 6y = 3800$$

Solving it for y

$$y = (3800 - 7x) / 6$$

Putting the value of y in equation (ii)

$$3x + 5(3800 - 7x) / 6 = 1750$$

$$(18x + 19000 - 35x) / 6 = 1750$$

$$18x + 19000 - 35x = 10500$$

$$-17x = 10500 - 19000 = -8500$$

$$x = 500$$

Putting the value of x in equation (i)

$$7 \times 500 + 6y = 3800$$

$$6y = 3800 - 3500 = 300$$

$$y = 50$$

Hence the cost of one bat is Rs 500 and the cost of one ball is Rs 50

**Ans(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 km? How much does a person have to pay for traveling a distance of 25 km?**

Ans. Let the fixed charge of taxi is x and charge of per km is y

According to the first condition

$$x + 10y = 105 \dots(i)$$

According to the second condition

$$x + 15y = 155 \dots(ii)$$

Taking equation (i)

$$x + 10y = 105$$

Solving it for y

$$y = (105 - x) / 10$$

Putting the value of y in equation (ii)

$$x + 15(105 - x) / 10 = 155$$

$$(10x + 1575 - 15x) / 10 = 155$$

$$-5x + 1575 = 1550$$

$$-5x = 1550 - 1575 = -25$$

$$x = 5$$

Putting the value of x in equation (i)

$$5 + 10y = 105$$

$$10y = 105 - 5 = 100$$

$$y = 10$$

Hence the value of the fixed charge is Rs 5 and the per km charge of the taxi is Rs 10

## **Solutions for Class 10 Maths Exercise 3.4 of Chapter 3 Linear Equation in Two Variables**

# NCERT Solutions for Class 10 Maths Exercise 3.4 of Chapter 3 Linear Equation in Two Variables



## NCERT Solutions for Class 10 Maths Chapter 3 Linear Equations in Two Variables

**Q1. Solve the following pair of linear equations by the elimination method and the substitution method:**

(i)  $x + y = 5$  and  $2x - 3y = 4$

(ii)  $3x + 4y = 10$  and  $2x - 2y = 2$

(iii)  $3x - 5y - 4 = 0$  and  $9x = 2y + 7$

(iv)  $x/2 + 2y/3 = -1$  and  $x - y/3 = 3$

Ans. The given pair of linear equations is

$$x + y = 5 \dots\dots(i)$$

$$2x - 3y = 4 \dots(ii)$$

Multiplying the equation (i) by 2, we get equation (iii)

$$2x + 2y = 10 \dots(iii)$$

Subtracting equation (iii) from equation (ii)

$$-5y = -6$$

$$y = 6/5$$

Putting the value  $y = 6/5$  in equation (i)

$$x + 6/5 = 5$$

$$x = 5 - \frac{6}{5} = \frac{25 - 6}{5} = \frac{19}{5}$$

**Hence value of x is  $\frac{6}{5}$  and value of y is  $\frac{19}{5}$**

(ii) The given equations are

$$3x + 4y = 10 \dots (i) \text{ and } 2x - 2y = 2 \dots (ii)$$

Multiplying equation (i) by 2 and equation (ii) by 3, we get the equation (iii) and equation (iv)

$$6x + 8y = 20 \dots (iii) \text{ and } 6x - 6y = 6 \dots (iv)$$

Subtracting equation (iv) from equation (iii), we get

$$14y = 14$$

$$y = 1$$

Putting the value of y in equation (i)

$$3x + 4 \times 1 = 10$$

$$3x + 4 = 10$$

$$3x = 6$$

$$x = 2$$

**Hence the value of x is 2 and value of y is 1**

(iii) The given equations are

$$3x - 5y - 4 = 0 \text{ (i) and } 9x = 2y + 7 \text{ (i.e. } 9x - 2y - 7 = 0) \dots (ii)$$

Multiplying equation (i) by 3, we get equation (iii)

$$9x - 15y - 12 = 0 \text{ (iii)}$$

Subtracting equation (iii) from equation (ii)

$$13y + 5 = 0$$

$$y = -\frac{5}{13}$$

Putting this value of y in equation (i)

$$3x - 5(-5/13) - 4 = 0$$

$$3x + 25/13 = 4$$

$$3x = 4 - (25/13)$$

$$3x = (52-25)/13 = 27/13$$

$$x = 9/13$$

**Hence the value of x is 9/13 and value of y is -5/13**

(iv) The given equations are  $x/2 + 2y/3 = -1$  and  $x - y/3 = 3$

Arranging both equations in standard form

$$3x + 4y = -6 \dots (i) \text{ and } 3x - y = 9 \dots (ii)$$

Subtracting equation (ii) from equation (i)

$$5y = -15$$

$$y = -3$$

Putting the value of y in equation (i)

$$3x + 4 \times -3 = -6$$

$$3x - 12 = -6$$

$$3x = -6 + 12 = 6$$

$$x = 2$$

**Hence the value of x is 2 and value of y is -3**

Similarly, you can do other parts of the question and study [exercise 3.3](#) for the substitution method.

**Q2. Form the pair of linear equations in the following problems, and find their solutions (if they exist) by elimination method:**

(i) If we add 1 to the numerator and subtract 1 from the denominator, a fraction reduces to 1, it becomes  $1/2$  if we only add 1 to the denominator. What is the fraction?

Ans. Let the numerator is x and denominator is y

According to the first condition

$$(x + 1)/(y - 1) = 1$$

$$x + 1 = y - 1$$

$$x - y = -2 \dots (i)$$

According to the second condition

$$x/(y+1) = 1/2$$

$$2x = y + 1$$

$$2x - y = 1 \dots (ii)$$

Multiplying the equation (i) by 2

$$2x - 2y = -4 \dots (iii)$$

Subtracting the equation (iii) from the equation (ii)

$$y = 5$$

Putting the value of y in equation (i)

$$x - 5 = -2$$

$$x = -2 + 5 = 3$$

**Hence the required fraction is  $3/5$**

**(ii) Five years ago, Nuri was thrice as old as Sonu. Ten years later, Nuri will be twice as old as Sonu. How old are Nuri and Sonu?**

Ans. Let the age of Nuri is x and the age of Sonu is y

According to first condition

5 years back the age of Nuri =  $3 \times$  5 years back the age of Sonu

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

$$x - 5 = 3y - 15$$

$$x - 3y = -10 \dots (i)$$

According to second condition

10 years later the age of Nuri =  $2 \times$  10 years later the age of Sonu

$$x + 10 = 2(y + 10)$$

$$x + 10 = 2y + 20$$

$$x + 10 = 2y + 20$$

$$x - 2y = 10 \dots (ii)$$

Subtracting the equation (ii) from the equation (i)

$$-y = -20$$

$$y = 20$$

Putting the value of y in equation (i)

$$x - 3 \times 20 = -10$$

$$x - 60 = -10$$

$$x = -10 + 60 = 50$$

Hence the age of Nuri is 50 years and the age of Sonu is 20 years

**(iii) The sum of the digits of a two-digit number is 9. Also, nine times this number is twice the number obtained by reversing the order of the digits. Find the number.**

Ans. Let once of a two-digit number is x and tense of a two-digit number is y

$$\therefore \text{The number} = 10y + x$$

According to the first condition

The sum of the digits = 9

$$x + y = 9 \dots (i)$$

$9 \times$  The number =  $2 \times$  The number obtained by reversing its digits

$$9(10y + x) = 2(10x + y)$$

$$90y + 9x = 20x + 2y$$



$$90y - 2y + 9x - 20x = 0$$

$$88y - 11x = 0$$

$$8y - x = 0 \dots (ii)$$

Substituting  $x = 8y$  from equation (ii) to equation (i)

$$8y + y = 9$$

$$9y = 9$$

$$y = 1$$

Putting the value of  $y$  in equation (i)

$$x + 1 = 9$$

$$x = 8$$

Hence the required number is  $10y + x = 10 \times 1 + 8 = 18$

**(iv) Meena went to a bank to withdraw Rs.2000. She asked the cashier to give her Rs.50 and Rs.100 notes only. Meena got 25 notes in all. Find how many notes of Rs.50 and Rs.100 she received.**

Ans. Let the notes of Rs 50 are  $x$  and of Rs 100 are  $y$

According to first condition

The notes of Rs 50  $\times$  The number of Rs 50 notes + The notes of Rs 100  $\times$  The number of Rs 100 notes = Rs 2000

$$50x + 100y = 2000$$

$$x + 2y = 40 \dots (i)$$

According to second condition

The number of Rs 50 notes + The number of Rs 100 notes = 25

$$x + y = 25 \dots (ii)$$

Subtracting equation (ii) from equation (i)

$$y = 15$$

Putting the value  $y = 15$  in equation (i)

$$x + 2 \times 15 = 40$$

$$x + 30 = 40$$

$$x = 40 - 30 = 10$$

Hence the Rs 50 notes are 10 and the Rs 100 notes are 15

**(v) A lending library has a fixed charge for the first three days and an additional charge for each day thereafter. Saritha paid Rs.27 for a book kept for seven days, while Susy paid Rs.21 for the book she kept for five days. Find the fixed charge and the charge for each extra day.**

Ans. Let a lending library has a fixed charge of  $x$  for 3 days and charge  $y$  for each extra day.

According to the first condition, Saritha paid Rs 27 for a book kept for 7 days

Total charge = 3 days fixed charge + charge for  $(7 - 3)$  days

$$27 = x + 4y$$

$$x + 4y = 27 \dots (i)$$

According to the second condition, Susy paid Rs.21 for the book she kept for five days

Total charge = 3 days fixed charge + charge for  $(5 - 3)$  days

$$21 = x + 2y$$

$$x + 2y = 21 \dots (ii)$$

Subtracting equation (ii) from equation (i)

$$2y = 6$$

$$y = 3$$

Putting the value of  $y$  in equation (i)

$$x + 4 \times 3 = 27$$

$$x + 12 = 27$$

$$x = 15$$

Therefore the fixed charge for 3 days is Rs 15 and the charge for an extra day is Rs 3

## NCERT Solutions for Class 10 Maths Exercise 3.5 of Chapter 3 Pair of Linear Equations

### NCERT Solutions for Class 10 Maths Exercise 3.5 of Chapter 3 Pair of Linear Equations



## NCERT Solutions for Class 10 Maths Exercise 3.5 of Chapter 3 Pair of Linear Equations

**Q1.** Which of the following pairs of linear equations has unique solutions, no solutions, or infinitely many solutions? In case there is a unique solution, find it by using the cross multiplication method.

(i)  $x-3y-3=0$  and  $3x-9y-2=0$  (ii)  $2x+y=5$  and  $3x+2y=8$

(iii)  $3x-5y=20$  and  $6x-10y=40$  (iv)  $x-3y-7=0$  and  $3x-3y-15=0$

Ans.(i) Given pair of linear equations are  $x-3y-3=0$  and  $3x-9y-2=0$

Evaluating the ratios of the coefficients and the constants of the equations as follows.

$$a_1/a_2 = 1/3$$

$$b_1/b_2 = -3/-9 = 1/3$$

$$c_1/c_2 = -3/-2 = 3/2$$

We observe

$$a_1/a_2 = b_1/b_2 \neq c_1/c_2$$

Therefore the given pair of the linear equations has no solution

(ii) The given pair of linear equations is  $2x + y = 5$  and  $3x + 2y = 8$

Rearranging the equations into the standard form

$$2x + y - 5 = 0 \text{ and } 3x + 2y - 8 = 0$$

Evaluating the ratios of the coefficients and the constants of the equations as follows.

$$a_1/a_2 = 2/3$$

$$b_1/b_2 = 1/2$$

$$c_1/c_2 = -5/-8 = 5/8$$

$$a_1/a_2 \neq b_1/b_2$$

The given pair of the linear equations has a unique solution

Arranging the coefficients and constants of both equations in a matrix as follows

$$\begin{array}{ccc|c} x & y & & 1 \\ 1 & -5 & 2 & 1 \\ 2 & -8 & 3 & 2 \end{array}$$

$$\frac{x}{-8 \times 1 - 2 \times -5} = \frac{y}{-5 \times 3 - 2 \times -8} = \frac{1}{2 \times 2 - 3 \times 1}$$

$$\frac{x}{-8 + 10} = \frac{y}{-15 + 16} = \frac{1}{4 - 3}$$

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

$$x = 2, y = 1$$

(iii) The given equations are  $3x - 5y = 20$  and  $6x - 10y = 40$

Arranging these equations into the standard form

$$3x - 5y - 20 = 0 \text{ and } 6x - 10y - 40 = 0$$

Arranging the coefficients and constants of both equations in a matrix as follows

Evaluating the ratios of the coefficients and the constants of the equations as follows.

$$a_1/a_2 = 3/6 = 1/2$$

$$b_1/b_2 = -5/-10 = 1/2$$

$$c_1/c_2 = -20/-40 = 1/2$$

It is observed that

$$a_1/a_2 = b_1/b_2 = c_1/c_2$$

Therefore the pair of the equations have infinite solutions

(iv) The given equations are  $x - 3y - 7 = 0$  and  $3x - 3y - 15 = 0$

Evaluating the ratios of the coefficients and the constants of the equations as follows.

$$a_1/a_2 = 1/3$$

$$b_1/b_2 = -3/-3 = 1$$

$$c_1/c_2 = -7/-15$$

It is observed that

$$a_1/a_2 \neq b_1/b_2$$

Therefore the pair of the equations have unique solution

Arranging the coefficients and constants into a matrix as follows

$$\frac{x}{-3 \times -15 - (-3) \times -7} = \frac{y}{3 \times -7 - 1 \times -15} = \frac{1}{1 \times -3 - 3 \times -3}$$

$$\frac{x}{45 - 21} = \frac{y}{-21 + 15} = \frac{1}{-3 + 9}$$

$$\frac{x}{24} = \frac{y}{-6} = \frac{1}{6}$$

$$x = 24/6 = 4 \text{ and } y = -6/6 = -1$$

Hence the value of x is 4 and the value of y is -1

### NCERT Solutions for Class 10 Maths Exercise 3.5 of Chapter 3 Pair of Linear Equations

**Q2. (i) For which value of a and b does the following pair of linear equations have an infinite number of solutions?**

$$2x + 3y = 7$$

$$(a - b)x + (a + b)y = 3a + b - 2$$

**(ii) For which value of k will the following pair of linear equations have no solution?**

$$3x + y = 1$$

$$(2k - 1)x + (k - 1)y = (2k + 1)$$

We know two linear equations  $a_1x + b_1y + c_1 = 0$  and  $a_2x + b_2y + c_2 = 0$  have infinite solutions if the ratios between coefficients and constants are as follows.

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

Arranging the given equations into the standard form

$$2x + 3y - 7 = 0$$

$$(a - b)x + (a + b)y - 3a - b + 2 = 0$$

Where  $a_1 = 2$ ,  $b_1 = 3$ ,  $c_1 = -7$  and  $a_2 = a - b$ ,  $b_2 = a + b$ ,  $c_2 = -3a - b + 2$

$$\frac{2}{a - b} = \frac{3}{a + b} = \frac{-7}{-3a - b + 2}$$

We get two equations

$$\frac{2}{a - b} = \frac{3}{a + b}$$

$$2a + 2b = 3a - 3b$$

$$-a + 5b = 0 \dots (i)$$

$$\frac{3}{a+b} = \frac{-7}{-3a-b+2}$$

$$-9a - 3b + 6 = -7a - 7b$$

$$-2a + 4b + 6 = 0 \dots (ii)$$

Multiplying equation (i) by 2, we get equation (iii)

$$-2a + 10b = 0 \dots (iii)$$

Subtracting the equation (iii) from the equation (ii)

$$-6b + 6 = 0$$

$$-6b = -6$$

$$b = 1$$

Putting the value of b in equation (i)

$$-a + 5 \times 1 = 0$$

$$-a + 5 = 0$$

$$-a = -5$$

$$a = 5$$

Hence the required values of a, b are 5 and 1 respectively

(ii) The given pair of the equations is

$$3x + y = 1$$

$$(2k - 1)x + (k - 1)y = (2k + 1)$$

We know two linear equations  $a_1x + b_1y + c_1 = 0$  and  $a_2x + b_2y + c_2 = 0$  have no solutions if the ratios between coefficients and constants are as follows.

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

Arranging the given equations into the standard form

$$3x + y - 1 = 0$$

$$(2k - 1)x + (k - 1)y - (2k + 1) = 0$$

Where  $a_1=3$ ,  $b_1=1$ ,  $c_1=-1$  and  $a_2=2k-1$ ,  $b_2=k-1$ ,  $c_2=2k+1$

$$\frac{3}{2k-1} = \frac{1}{k-1} \neq \frac{-1}{-(2k+1)}$$

$$\frac{3}{2k-1} = \frac{1}{k-1}$$

$$3k-3 = 2k-1$$

$$k = -1 + 3 = 2$$

Therefore for  $k=2$ , the given pair of linear equations have no solution

### NCERT Solutions for Class 10 Maths Exercise 3.5 of Chapter 3 Pair of Linear Equations

**Q3. Solve the following pair of linear equations by the substitution and cross-multiplication methods:**

$$8x + 5y = 9, 3x + 2y = 4$$

Ans. The given pair of linear equations is

$$8x + 5y = 9 \dots (i)$$

$$3x + 2y = 4 \dots (ii)$$

Taking equation (i) and solving it for the value of x

$$8x = 9 - 5y$$

$$x = (9 - 5y)/8$$

Putting the value of x in equation (ii)

$$3 \times (9 - 5y)/8 + 2y = 4$$

$$27/8 - 15y/8 + 2y = 4$$

$$27/8 - (15y - 16y)/8 = 4$$

$$(27 - 15y + 16y)/8 = 4$$

$$(27 + y)/8 = 4$$

$$27 + y = 32$$



$$y = 5$$

Putting the value of y in equation (i)

$$8x + 5 \times 5 = 9$$

$$8x + 25 = 9$$

$$8x = -16$$

$$x = -2$$

Hence the value of x is -2 and the value of y is 5

(ii) Arranging the given pair of linear equations into standard form

$$8x + 5y - 9 = 0 \dots (i)$$

$$3x + 2y - 4 = 0 \dots (ii)$$

Arranging the coefficients and constants into a matrix as follows

$$\begin{array}{ccc|c} x & y & & 1 \\ \hline 1 & -5 & & 9 \\ 2 & -8 & & 4 \end{array}$$

$$\frac{x}{-4 \times 5 - 2 \times -9} = \frac{y}{3 \times -9 - 8 \times -4} = \frac{1}{2 \times 8 - 5 \times 3}$$

$$\frac{x}{-20 + 18} = \frac{y}{-27 + 32} = \frac{1}{16 - 15}$$

$$\frac{x}{-2} = \frac{y}{5} = \frac{1}{1}$$

x = -2 and y = 5

Hence the value of x is -2 and the value of y is 5

### NCERT Solutions for Class 10 Maths Exercise 3.5 of Chapter 3 Pair of Linear Equations

**Q4. Form the pair of linear equations in the following problems and find their solutions (if they exist) by any algebraic method:**

**(i) A part of monthly hostel charges is fixed and the remaining depends on the number of days one has taken food in the mess. When a student A takes food for 20 days she has to pay Rs.1000 as hostel charges whereas a student B, who takes food for 26 days, pays Rs.1180 as hostel charges. Find the fixed charges and the cost of food per day.**

Ans. Let the monthly fixed charges of the hostel is x and the cost of food per day is y

According to first condition

$$x + 20y = 1000 \dots (i)$$

According to second condition

$$x + 26y = 1180 \dots (ii)$$

Subtracting equation (ii) from equation (i)

$$-6y = -180$$

$$y = 30$$

Putting the value of y in equation (i)

$$x + 20 \times 30 = 1000$$

$$x + 600 = 1000$$

$$x = 1000 - 600 = 400$$

Hence fixed charges is Rs 400 and cost of food per day is Rs 30

**(ii) A fraction becomes  $\frac{1}{3}$  when 1 is subtracted from the numerator and it becomes  $\frac{1}{4}$  when 8 is added to its denominator. Find the fraction.**

Ans. Let the denominator of the fraction is x and the numerator is y

According to the first condition of the question

$$(y-1)/x = 1/3$$

$$3y - 3 = x$$

$$3y - x = 3 \dots (i)$$

According to the second condition of the question

$$y/(x + 8) = 1/4$$

$$4y = x + 8$$

$$4y - x = 8 \dots (ii)$$

Subtracting equation (ii) from equation (i)

$$-y = -5$$

$$y = 5$$

Putting the value of y in equation (ii)

$$4 \times 5 - x = 8$$

$$x = 20 - 8 = 12$$

**(iii) Yash scored 40 marks in a test, getting 3 marks for each right answer and losing 1 mark for each wrong answer. Had 4 marks been awarded for each correct answer and 2 marks been deducted for each incorrect answer, then Yash would have scored 50 marks. How many questions were there in the test?**

Ans. Let the correct answers Yash solved in the exam = x and wrong answers are = y

According to first condition of the question

Total marks of Yash in a test = Marks in one correct answer  $\times$  Number of correct answers + Marks in wrong answer  $\times$  Number of wrong answers

$$40 = 3x + (-1)y = 3x - y$$

$$3x - y = 40 \dots (i)$$

According to second condition

$$4x - 2y = 50 \dots (ii)$$

Multiplying equation (i) by 2, we get equation (iii)

$$6x - 2y = 80 \dots (iii)$$

Subtracting equation (iii) from equation (ii)

$$-2x = -30$$

$$x = 15$$

Putting the value of x in equation (i)

$$3 \times 15 - y = 40$$

$$45 - y = 40$$

$$y = 45 - 40 = 5$$

Hence total questions in the test are = Number of correct answers + Number of wrong answers =  $x + y = 15 + 5 = 20$

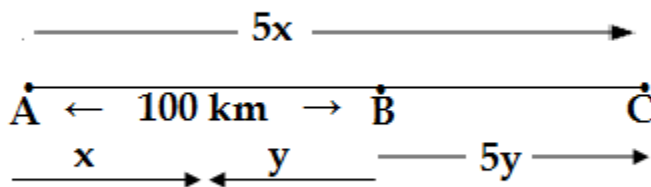
**(iv) Places A and B are 100 km apart on a highway. One car starts from A and another from B at the same time. If the cars travel in the same direction at different speeds, they meet in 5 hours. If they travel towards each other, they meet in 1 hour. What are the speeds of the two cars?**

Ans. Let the speed of the car which starts from the place A is = x km/h and the speed of the car which starts from the place B is = y km/h

According to first condition

The car from A travels the distance in 5 h = Speed  $\times$  Time =  $x \times 5 = 5x$  km

The car from B travels the distance in 5 h = Speed  $\times$  Time =  $y \times 5 = 5y$  km



As per the fig.

$$5x - 5y = 100 \dots (i)$$

According to second condition, if both of the cars travel in opposite direction

The car from A travels the distance in 1 h = Speed  $\times$  Time =  $x \times 1 = x$  km

The car from B travels the distance in 1 h = Speed  $\times$  Time =  $y \times 1 = y$  km

As per the fig.

$$x + y = 100 \dots (ii)$$

Multiplying the equation (ii) by 5, we get equation (iii)

$$5x + 5y = 500 \dots (iii)$$

$$10x = 600$$

$$x = 60$$

Putting the value of x in equation (ii)

$$60 + y = 100$$

$$y = 100 - 60 = 40$$

Hence the speeds of the cars which start from the place A is 60 km/h and from place B is 40 km/h

**(v) The area of a rectangle gets reduced by 9 square units, if its length is reduced by 5 units and breadth is increased by 3 units. If we increase the length by 3 units and the breadth by 2 units, the area increases by 67 square units. Find the dimensions of the rectangle.**

Ans. Let the length of the rectangle is x and the breadth of the rectangle is y

$$\therefore \text{Area of the rectangle is } = \text{Length} \times \text{Breadth} = xy$$

According to first condition of the question

$$(x - 5)(y + 3) = xy - 9$$

$$xy + 3x - 5y - 15 = xy - 9$$

$$3x - 5y = 6 \dots (i)$$

According to second condition of the question

$$(x + 3)(y + 2) = xy + 67$$

$$xy + 2x + 3y + 6 = xy + 67$$

$$2x + 3y = 61 \dots (ii)$$

Multiplying equation (i) by 2 and equation (ii) by 3, we get equation (iii) and equation (iv)

$$6x - 10y = 12 \dots (iii) \text{ and } 6x + 9y = 183 \dots (iv)$$

Subtracting equation (iv) from the equation (iii)

$$-19y = -171$$

$$y = 171/19 = 9$$

Putting the value of y in equation (i)

$$3x - 5 \times 9 = 6$$

$$3x - 45 = 6$$

$$3x = 6 + 45 = 51$$

$$x = 51/3 = 17$$

Hence the length of the rectangle is 17 units and the breadth is 9 units

## **NCERT Solutions for Class 10 Maths Exercise 3.6 of Chapter 3 Pair of Linear Equations In Two Variables**

**NCERT Solutions for  
Class 10 Maths Exercise 3.6  
of Chapter 3 Pair of Linear  
Equations**



## NCERT Solutions for Class 10 Maths Exercise 3.6 of Chapter 3 Pair of Linear Equations In Two Variables

Q1. Solve the following pairs of equations by reducing them to a pair of linear equations:

$$(i) \frac{1}{2}x + \frac{1}{3}y = 2$$

$$\frac{1}{3}x + \frac{1}{2}y = \frac{13}{6}$$

Ans. The given pair of linear equations is

$$\frac{1}{2}x + \frac{1}{3}y = 2 \dots (i)$$

$$\frac{1}{3}x + \frac{1}{2}y = \frac{13}{6} \dots (ii)$$

Let  $\frac{1}{x} = a$  and  $\frac{1}{y} = b$ , then we get equation (iii) and equation (iv)

$$\frac{a}{2} + \frac{b}{3} = 2$$

$$3a + 2b = 12 \dots (iii)$$

$$\frac{a}{3} + \frac{b}{2} = \frac{13}{6}$$

$$2a + 3b = \frac{13}{6}$$

$$12a + 18b = 78 \dots (iv)$$

Multiplying equation (iii) by 4, we get equation (v)

$$12a + 8b = 48 \dots (v)$$

Subtracting equation (v) from equation (iv)

$$10b = 30$$

$$b = 3$$

Putting the value of  $b$  in equation (iii)

$$3a + 2 \times 3 = 12$$

$$3a + 6 = 12$$

$$3a = 12 - 6 = 6$$

$$a = 2$$

Since  $1/x = a$  and  $1/y = b$

Substituting the value  $a$  and  $b$ , we get  $x = 1/2$  and  $y = 1/3$

**(ii) The given pair of linear equation is**

$$2/\sqrt{x} + 3/\sqrt{y} = 2 \dots\dots(i)$$

$$4/\sqrt{x} - 9/\sqrt{y} = -1 \dots\dots(ii)$$

Let  $1/\sqrt{x} = a$  and  $b = 1/\sqrt{y}$ , we get the equations (iii) and equation (iv)

$$2a + 3b = 2 \dots\dots(iii)$$

$$4a - 9b = -1 \dots\dots(iv)$$

Multiplying equation (iii) by 2, we get equation (v)

$$4a + 6b = 4 \dots\dots(v)$$

Subtracting equation (v) from equation (iv)

$$-15b = -5$$

$$b = 1/3$$

Putting the value of  $b$  in equation (iii)

$$2a + 3(1/3) = 2$$

$$2a + 1 = 2$$

$$2a = 1$$

$$a = 1/2$$

Since  $1/\sqrt{x} = a$  and  $1/\sqrt{y} = b$

Substituting the value of  $a$  and  $b$

$$1/\sqrt{x} = 1/2 \text{ and } 1/\sqrt{y} = 1/3$$

Squaring both equations

$$1/x = 1/4 \text{ and } 1/y = 1/9$$

$$x = 4 \text{ and } y = 9$$



**(iii) The given equations are**

$$4/x + 3y = 14 \dots (i)$$

$$3/x - 4y = 23 \dots (ii)$$

Let  $1/x = z$

$$4z + 3y = 14 \dots (iii)$$

$$3z - 4y = 23 \dots (iv)$$

Multiplying equation (iii) by 3 and equation (iv) by 4, we get equation (v) and equation (vi)

$$12z + 9y = 42 \dots (v)$$

$$12z - 16y = 92 \dots (vi)$$

Subtracting equation (vi) from equation (v)

$$25y = -50$$

$$y = -2$$

Putting the value of y in equation (v)

$$12z + 9 \times -2 = 42$$

$$12z - 18 = 42$$

$$12z = 42 + 18 = 60$$

$$z = 5$$

Since  $1/x = z$

Substituting the value of z

$$x = 1/5$$

Therefore the value of x is  $1/5$  and the value of y is  $-2$

**(iv) The given equations are**

$$5/(x-1) + 1/(y-2) = 2 \dots (i)$$

$$6/(x-1) - 3/(y-2) = 1 \dots (ii)$$

Let  $1/(x-1) = a$  and  $1/(y-2) = b$

$$5a + b = 2 \dots \text{(iii)}$$

$$6a - 3b = 1 \dots \text{(iv)}$$

Multiplying equation (iii) by 3, we get equation (v)

$$15a + 3b = 6 \dots \text{(v)}$$

Adding equation (iv) and (v)

$$21a = 7$$

$$a = 7/21 = 1/3$$

Putting the value of a in equation (iii)

$$5 \times 1/3 + b = 2$$

$$5/3 + b = 2$$

$$b = 2 - (5/3)$$

$$b = 1/3$$

Putting the value of a and b in  $1/(x-1) = a$  and  $1/(y-2) = b$

$$1/(x-1) = 1/3 \text{ and } 1/(y-2) = 1/3$$

$$x-1 = 3 \text{ and } y-2 = 3$$

$$x = 4 \text{ and } y = 5$$

**(v) The given pair of linear equations is**

$$(7x-2y)/xy = 5$$

$$(8x + 7y)/xy = 15$$

Simplifying the given equations

$$7x/xy - 2y/xy = 5$$

$$7/y - 2/x = 5 \dots \text{(i)}$$

$$8x/xy + 7y/xy = 15$$

$$8/y + 7/x = 15 \dots (\text{ii})$$

Let  $1/y = a$  and  $1/x = b$

$$7a - 2b = 5 \dots (\text{iii})$$

$$8a + 7b = 15 \dots (\text{iv})$$

Multiplying equation (iii) by 8 and equation (iv) by 7, we get equation (v) and equation (vi)

$$56a - 16b = 40 \dots (\text{v})$$

$$56a + 49b = 105 \dots (\text{vi})$$

Subtracting equation (vi) from equation (v)

$$-65b = -65$$

$$b = 1$$

Putting the value of  $b$  in equation (iii)

$$7a - 2 \times 1 = 5$$

$$7a - 2 = 5$$

$$7a = 7$$

$$a = 1$$

Since  $1/y = a$  and  $1/x = b$

$$\therefore 1/y = 1 \text{ and } 1/x = 1$$

$$y = 1 \text{ and } x = 1$$

**(vi) The given equations are**

$$6x + 3y = 6xy$$

$$2x + 4y = 5xy$$

Simplifying the given equations

$$6x/xy + 3y/xy = 6xy/xy$$

$$6/y + 3/x = 6 \dots (\text{i})$$

$$2x/xy + 4y/xy = 5xy/xy$$

$$2/y + 4/x = 5 \dots \text{(ii)}$$

Let  $1/y = a$  and  $1/x = b$

$$6a + 3b = 6 \dots \text{(iii)}$$

$$2a + 4b = 5 \dots \text{(iv)}$$

Multiplying equation (iii) by 2 and equation (iv) by 6, we get equation (v) and equation (vi)

$$12a + 6b = 12 \dots \text{(v)}$$

$$12a + 24b = 30 \dots \text{(vi)}$$

Subtracting equation (vi) from equation (v)

$$-18b = -18$$

$$b = 1$$

Putting the value of b in equation (iii)

$$6a + 3 \times 1 = 6$$

$$6a + 3 = 6$$

$$6a = 3$$

$$a = 3/6 = 1/2$$

Since  $1/y = a$  and  $1/x = b$

Substituting the value of a and b

$$1/y = 1/2 \text{ and } 1/x = 1$$

$$y = 2 \text{ and } x = 1$$

**(vii) The given pair of linear equations is**

$$10/(x+y) + 2/(x-y) = 4 \dots \text{(i)}$$

$$15/(x+y) - 5/(x-y) = -2 \dots \text{(ii)}$$

Let  $1/(x+y) = a$  and  $1/(x-y) = b$

$$10a + 2b = 4 \dots\dots (iii)$$

$$15a - 5b = -2 \dots\dots (iv)$$

Multiplying equation (iii) by 5 and equation (iv) by 2, we get equation (v) and equation (vi)

$$50a + 10b = 20 \dots\dots (v)$$

$$30a - 10b = -4 \dots\dots (vi)$$

Adding both of the equation (v) and equation (vi)

$$80a = 16$$

$$a = 16/80 = 1/5$$

Putting the value of a in equation (v)

$$50 \times 1/5 + 10b = 20$$

$$10 + 10b = 20$$

$$10b = 20 - 10 = 10$$

$$b = 1$$

Since  $1/(x+y) = a$  and  $1/(x-y) = b$

Substituting the value of a and b, we get equation (vii) and equation (viii)

$$1/(x+y) = 1/5 \text{ and } 1/(x-y) = 1$$

$$x + y = 5 \dots\dots (vii) \text{ and } x - y = 1 \dots\dots (viii)$$

Adding both equations (vii) and (viii)

$$2x = 6$$

$$x = 3$$

Putting the value of x in equation (vii)

$$3 + y = 5$$

$$y = 5 - 3 = 2$$

**Hence the value of x is 3 and value of y is 2**

$$\text{(viii) } 1/(3x+y) + 1/(3x-y) = 3/4 \dots \text{(i)}$$

$$1/2(3x+y) - 1/2(3x-y) = -1/8 \dots \text{(ii)}$$

$$\text{Let } 1/(3x+y) = a \text{ and } 1/(3x-y) = b$$

$$a + b = 3/4$$

$$4a + 4b = 3 \dots \text{(iii)}$$

$$a/2 - b/2 = -1/8$$

$$4a - 4b = -1 \dots \text{(iv)}$$

Adding both equations (iii) and (iv)

$$8a = 2$$

$$a = 2/8 = 1/4$$

Putting the value of a in equation (iv)

$$4 \times 1/4 + 4b = 3$$

$$1 + 4b = 3$$

$$4b = 3 - 1 = 2$$

$$b = 2/4 = 1/2$$

Since  $1/(3x+y) = a$  and  $1/(3x-y) = b$

$$1/(3x+y) = 1/4 \text{ and } 1/(3x-y) = 1/2$$

$$3x + y = 4 \dots \text{(v) and } 3x - y = 2 \dots \text{(vi)}$$

Adding the equations (v) and equation (vi)

$$6x = 6$$

$$x = 1$$

Putting the value of x in equation (v)

$$3 \times 1 + y = 4$$

$$3 + y = 4$$

$$y = 4 - 3 = 1$$

Hence the value of x is and value of y is 1

**Q2. Formulate the following problems as a pair of equations, and hence find their solutions:**

**(i) Ritu can row downstream 20 km in 2 hours, and upstream 4 km in 2 hours. Find her speed of rowing in still water and the speed of the current.**

Ans. Let the speed of the boat in still water is x km/h and the speed of the current is y km/h

The speed of boat in down stream is =  $x + y$

Since we are given distance covered by the boat in downstream is 20 km in time 2 hour

Therefore speed of boat in downstream =  $\text{Distance}/\text{Time} = 20/2 = 10 \text{ km/h}$

According to first condition

$$x + y = 10 \dots\dots(i)$$

The speed of boat in down stream is =  $x - y$

Since we are given distance covered by the boat in upstream is 4 km in time 2 hour

Therefore speed of boat in upstream =  $\text{Distance}/\text{Time} = 4/2 = 2 \text{ km/h}$

According to second condition

$$x - y = 2 \dots\dots(ii)$$

Adding both equations (i) and (ii)

$$2x = 8$$

$$x = 8/2 = 4$$

Putting the value of x in equation (ii)

$$4 - y = 2$$

$$y = 4 - 2 = 2$$

Hence the speed of the boat in still water is 4 km/h and the speed of the current is 2 km/h

**(ii) 2 women and 5 men can together finish an embroidery work in 4 days, while 3 women and 6 men can finish it in 3 days. Find the time taken by 1 woman alone to finish the work, and also that taken by 1 man alone.**

Ans. Let 1 woman alone can finish the work in  $x$  days and 1 man alone can finish the work in  $y$  days

Since in  $x$  days 1 woman do 1 work

In 1 day a woman will do =  $1/x$  work

In 1 day 2 women will do =  $2/x$  work

Since in  $y$  days, 1 man do 1 work

In 1-day a man will do =  $1/y$  work

In 1 day 5 men will do =  $5/y$  work

2 woman and 5 men do a work in 4 days

In 1 day they will work =  $1/4$  work

Therefore according to first condition

$$2/x + 5/y = 1/4 \dots (i)$$

Similarly according to second condition, we can create second equation

$$3/x + 6/y = 1/3 \dots (ii)$$

Let  $1/x = a$  and  $1/y = b$

$$2a + 5b = 1/4$$

$$8a + 20b = 1 \dots (iii)$$

$$3a + 6b = 1/3$$

$$9a + 18b = 1 \dots (iv)$$

Multiplying equation (iii) by 9 and equation (iv) by 8

$$72a + 180b = 9 \dots (v)$$

$$72a + 144b = 8 \dots (vi)$$



$$36b = 1$$

$$b = 1/36$$

Putting the value of b in equation (iii)

$$8a + 20 \times 1/36 = 1$$

$$8a + 5/9 = 1$$

$$8a = 1 - 5/9 = 4/9$$

$$a = 1/18$$

Since  $1/x = 1/18$  and  $1/y = 1/36$

$$x = 18 \text{ and } y = 36$$

Hence a woman alone can do the work in 18 days and a man alone can do the given work in 36 days.

**(iii) Roohi travels 300 km to her home partly by train and partly by bus. She takes 4 hours if she travels 60 km by train and the remaining by bus. If she travels 100 km by train and the remaining by bus, she takes 10 minutes longer. Find the speed of the train and the bus separately.**

Ans. Let the speed of the train is x km/h and speed of the bus is y km/h

According to first condition Roohi travels 60 km by train and the remaining (300 - 60 = 240 km) by bus and total time taken is 4 hours.

Time taken to cover the distance 60 km + Time taken to cover the distance 240 km/h = 4 hours

Since time = Distance/Speed

$$60/x + 240/y = 4 \dots\dots(i)$$

According to second condition Roohi travels 100 km by train and the remaining (300 - 100 = 200 km) by bus and total time taken is 4 hours + 10 minutes

Time taken to cover the distance 100 km + Time taken to cover the distance 200 km/h =  
(4 + 10/60) = 4 + 1/6 = (25/6)h

Since time = Distance/Speed

$$100/x + 200/y = 25/6 \dots\dots(ii)$$

Let  $a = 1/x$  and  $b = 1/y$

$$60a + 240b = 4 \dots\dots (iii)$$

$$100a + 200b = 25/6$$

$$600a + 1200b = 25 \dots (iv)$$

Multiplying the equation (iii) by 10, we get equation (v)

$$600a + 2400b = 40 \dots (v)$$

Subtracting equation (v) from equation (iv)

$$-1200b = -15$$

$$b = 15/1200 = 1/80$$

Putting the value of b in equation

$$60a + 240 \times 1/80 = 4$$

$$60a + 3 = 4$$

$$60a = 4 - 3 = 1$$

$$a = 1/60$$

Since  $a = 1/x$  and  $b = 1/y$

$$1/60 = 1/x \text{ and } 1/80 = 1/y$$

$$x = 60 \text{ and } y = 80$$

Hence the speed of train is 60 km/h and speed of the bus is 80 km/h

## **NCERT Solutions for Class 10 Maths Exercise 3.7 of the Chapter 3 Linear Equations in Two Variables**

# NCERT Solutions for Class 10 Maths Exercise 3.7 of the Chapter 3 Linear Equations in Two Variables



NCERT Solutions for Class 10 Maths Exercise 3.7 of the Chapter 3 Linear Equations in Two Variables are the NCERT solutions of an optional exercise of the chapter 3 Linear Equation in Two Variables which contains most important questions not only for the 10 class CBSE board but also important for competitive entrance exams. All NCERT solutions of the exercise 3.7 of the chapter 3 solved here by a step by step method.

## Exercise 3.1- Linear Equation in Two Variables

## Exercise 3.7 - Linear Equations in Two Variables

**Other study inputs for Linear Equations in two variables and Pair of linear equations in two variables.**

## Class 10 maths NCERT solutions of important questions of chapter 3 Pair of Linear Equations

## NCERT Solutions of class 9 maths exercise 4.3 of chapter 4- Linear equations in two variables

## How to creat and solve algebraic equations like linear and quadratic equations

## **NCERT Solutions for Class 10 Maths Exercise 3.7 of the Chapter 3 Linear Equations in Two Variables**

**Q1.The ages of two friends Ani and Biju differ by 3 years. Ani's father Dharam is twice as old as Ani and Biju is twice as old as his sister Cathy. The ages of Cathy and Dharam differ by 30 years. Find the ages of Ani and Biju.**

Ans. Let the age of Ani is =  $x$  and of Biju is  $y$

It is given that the difference of both age is 3

If the age of Ani is  $>$  The age of Biju

$$x - y = 3 \dots (i)$$

It is given to us that Ani's father Dharam's age =  $2x$

Also given

$$y = 2 \times \text{Cathy's age} \Rightarrow \text{Cathy's age is} = y/2$$

It is given that the ages of Cathy and Dharam differ by 30 years

It is clear that Dharam's age is (i.e  $2x$ )  $>$  The age of Cathy( $y/2$ )

$$2x - y/2 = 30$$

$$4x - y = 60 \dots (ii)$$

Subtracting equation (i) from equation (ii), we get

$$3x = 57 \Rightarrow x = 19$$

Putting the value  $x = 19$  in equation (i)

$$19 - y = 3 \Rightarrow y = 16$$

If the age of Biju is more than the age of Ani

$$y - x = 3 \dots (iii)$$

In this case also the age of Dharam is more than the age of Cathy, so the equation remains the same as (ii)

Adding both equation (iii) and second equation (ii)

$$3x = 63 \Rightarrow x = 21$$

Putting  $x = 21$  in equation (iii)

$$y - 21 = 3 \Rightarrow y = 24$$

Hence the age of Ani when she is older than Biju is 19 and of Biju is 16. and the age of Ani when Biju is older than Ani is 21 and of Biju is 24

**Q2.** One says, "Give me a hundred, friend! I shall then become twice as rich as you". The other replies, "If you give me ten, I shall be six times as rich as you". Tell me what is the

**amount of their (respective) capital? [From the Bijaganita of Bhaskara II] [Hint :  $x + 100 = 2(y - 100)$ ,  $y + 10 = 6(x - 10)$ ].**

Ans. Let one has the capital of Rs  $x$  and the other has the capital of Rs  $y$

According to first condition

$$x + 100 = 2(y - 100)$$

$$x - 2y = -300 \dots (i)$$

According to second condition

$$y + 10 = 6(x - 10)$$

$$-6x + y = -70 \dots (ii)$$

Multiplying equation (i) by 6, we get equation (iii)

$$6x - 12y = -1800 \dots (iii)$$

Adding both equation (ii) and equation (iii)

$$-11y = -1870$$

$$y = 170$$

Putting  $y = 170$  in equation (i)

$$x - 2 \times 170 = -300$$

$$x - 340 = -300$$

$$x = 40$$

Hence one has the capital of Rs 40 and other has the capital of Rs 170

**Q3. A train covered a certain distance at a uniform speed. If the train would have been 10 km/h faster, it would have taken 2 hours less than the scheduled time. And, if the train were slower by 10 km/h, it would have taken 3 hours more than the scheduled time. Find the distance covered by the train.**

Ans. Let the original speed of the train is  $x$  km/h and the scheduled time to cover the distance is  $y$ .

$$\text{Distance} = \text{Original speed} \times \text{Scheduled time} = xy$$

Speed = distance/time

According to first condition

$$x + 10 = \frac{xy}{y-2}$$

$$(x + 10)(y - 2) = xy$$

$$xy - 2x + 10y - 20 = xy$$

$$-2x + 10y = 20 \dots\dots(i)$$

According to second condition

$$x - 10 = \frac{xy}{y + 3}$$

$$(x - 10)(y + 3) = xy$$

$$xy + 3x - 10y - 30 = xy$$

$$3x - 10y = 30 \dots\dots(ii)$$

Adding both equation (i) and the equation (ii)

$$x = 50$$

Putting  $x = 50$  in equation (i)

$$-2 \times 50 + 10y = 20$$

$$-100 + 10y = 20$$

$$10y = 120$$

$$y = 12$$

$$\text{Distance covered is } = x \times y = 50 \times 12 = 600$$

**Hence the distance covered by the train is 600 km**

**Q4. The students of a class are made to stand in rows. If 3 students are extra in a row, there would be 1 row less. If 3 students are less in a row, there would be 2 rows more. Find the number of students in the class.**

Ans. Let the number of rows are  $x$  and the number of students in a row is  $y$

The number of students in the class = number of rows  $\times$  number of students in a row =  $xy$

According to first condition

$$xy = (x - 1)(y + 3)$$

$$xy = xy + 3x - y - 3$$

$$3x - y = 3 \dots\dots(i)$$

According to second condition

$$xy = (x + 2)(y - 3)$$

$$xy = xy - 3x + 2y - 6$$

$$3x - 2y = -6 \dots\dots(ii)$$

Subtracting equation (ii) from equation (i)

$$y = 9$$

Putting the value  $y = 9$  in equation (i)

$$3x - 9 = 3$$

$$3x = 12 \Rightarrow x = 4$$

The number of students in the class = number of rows( $x$ )  $\times$  number of students in a row( $y$ ) =  $4 \times 9 = 36$

**Q5. In a  $\Delta ABC$ ,  $\angle C = 3 \angle B = 2(\angle A + \angle B)$ . Find the three angles.**

Ans. We are given

In a  $\Delta ABC$ ,  $\angle C = 3 \angle B = 2(\angle A + \angle B)$

Let  $\angle C = 3 \angle B = 2(\angle A + \angle B) = x$

$$\angle C = x \dots\dots(i) \quad \angle B = x/3 \dots\dots(ii) \quad 2(\angle A + \angle B) = x \Rightarrow \angle A + \angle B = x/2 \dots\dots(iii)$$

From equation (ii) and equation (iii)

$$\angle A + x/3 = x/2$$

$$\angle A = (x/2) - (x/3)$$

$$\angle A = x/6 \dots (\text{iv})$$

From equation (i), equation (ii) and equation (iv)

$$\angle A : \angle B : \angle C = x/6 : x/3 : x$$

$$\angle A : \angle B : \angle C = 1 : 2 : 6$$

$$\angle A = (1/9) \times 180 = 20^\circ$$

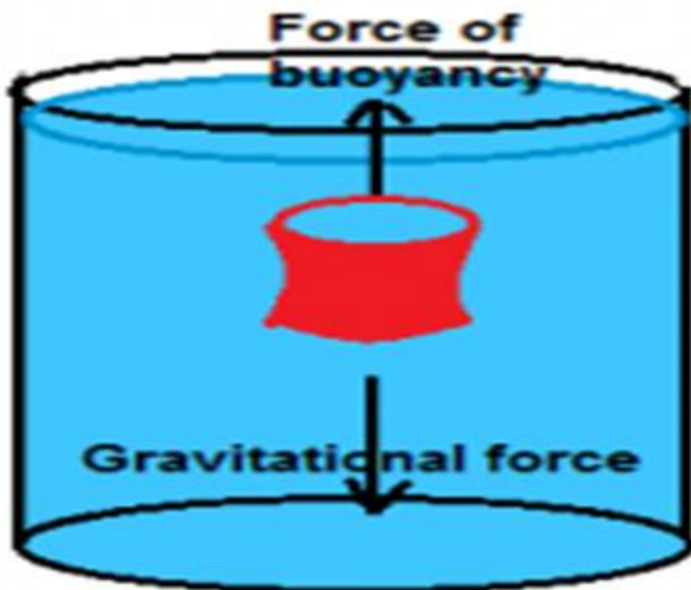
$$\angle B = (2/9) \times 180 = 40^\circ$$

$$\angle C = (6/9) \times 180 = 120^\circ$$

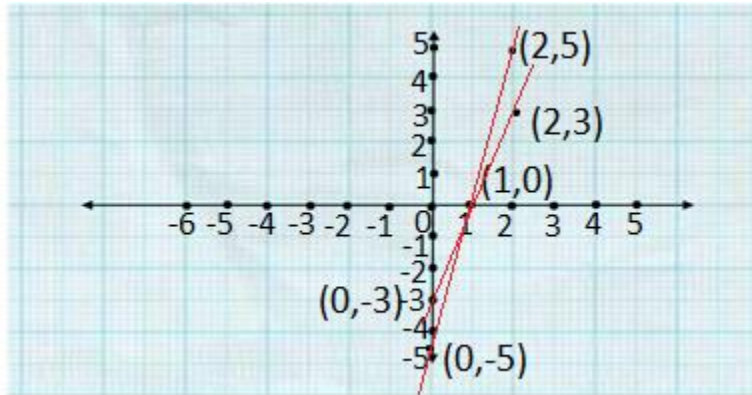
Hence three angles are  $20^\circ$ ,  $40^\circ$  and  $120^\circ$

**Q6. Draw the graphs of the equations  $5x - y = 5$  and  $3x - y = 3$ . Determine the coordinates of the vertices of the triangle formed by these lines and the y axis.**

Ans.







As shown in the graph vertices of the triangle formed by these lines and the y axis are  $(0,-3)$ ,  $(0,-5)$  and  $(1,0)$

See the video of Solutions of Question 4 , Question 5, and Question 6

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