CHAPTER -3

PAIR OF LINEAR EQUATIONS IN TWO VARABLES

- Introduction
- Methods to find the solution pair of linear equations
- Substitution method
- Elimination method
- General method (cross multiplication method)
- Eliminating constant method
- Application of linear equations in solving practical problems.

Introduction

- An equation of the form ax + by + c = 0, where a, b, c are real numbers $a^2 + b^2 \neq 0$ is called a linear equation in two variables x and y.
- The numbers a and b are called co-efficient of the variables of equation ax + by + c = 0 , and the number c in called the constant of the equation ax + by + c = 0.
- Two linear equations is the same two variables are called a pair of linear equations in two variables. The most general form of a pair of linear equation is

$$a_1x + b_1y + c_1 = 0$$
$$a_2x + b_2y + c_2 = 0$$

Where $a_1, b_1, c_1, a_2, b_2, c_2$ are real numbers

Such that $a_1^2+b_1^2 \neq 0$; $a_2^2+b_2^2 \neq 0$

Consistent System: A system of simultaneous linear equations is said to be consistent, if it has at least one solution.

Inconsistent system: A system of simultaneous linear equations is said to be inconsistent, if it has no solution.

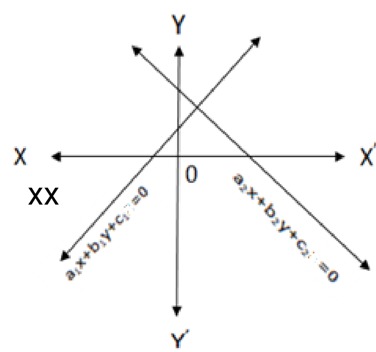
Geometrical (i.e. graphical) method of solution of a pair of linear equations: The graph of a pair of linear equations in two variables is represented by two :.

Only one of the following three possibilities can happen.

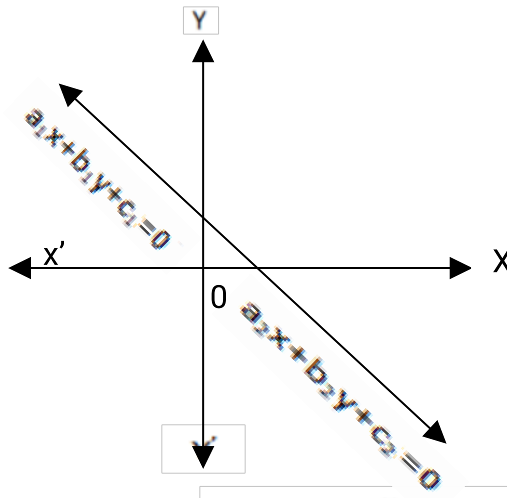
(i) The two lines will intersect at one point

(ii) The two lines will not intersect i.e. they are parallel.

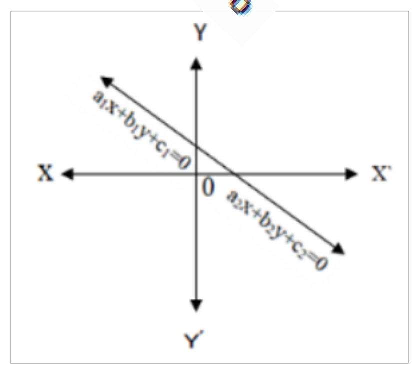
(iii) The two lines will be coincident.



1. If the lines intersect at a point, then that point gives The unique solution of two equations. In this case, The pair of equation is consistent.



2. if the lines coincides then there are infinitely many solutions. Each point on the line being a solution. In this case the pair of equations is dependent (consistent)



3. If the lines are parallel, then the pair of equations has no solution. In this case, the pair of equation is inconsistent. Algebraic interpretation of pair of linear equations in two variables. The pair of linear equations be these lines.

$a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$

(a) If $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$, then the pair of linear equations has exactly one solution i.e (unique solution)

(b) If $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ then the pair of linear equations has infinitely many solution.

(c) if $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$, then the pair of linear equations have no solution.

S. no	Pair of lines	Compare the ratios	Graphical representation	Algebraic interpretation
1.	$a_1x+b_1y+c_1=0$ $a_2x+b_2y+c_2=0$	$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$	Intersecting Lines	Unique solution
2.	$a_1x+b_1y+c_1=0$ $a_2x+b_2y+c_2=0$	$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$	Coincident line	Infinitely many solutions
3.	$a_1x+b_1y+c_1=0$ $a_2x+b_2y+c_2=0$	$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$,	Parallel lines	No solution

ALGEBRAIC METHODS FOR SOLVING A PAIR OF LINEAR EQUATIONS:-

(A) Substitution Method:

Stepwise method of solving linear equations by (substitution method)

$a_1x+b_1y+c_1=0$___(i)

$a_2x+b_2y+c_2=0$____(ii)

step 1:

Find the value of one variable say 'y' in terms of the other variable i.e *x* from either equation, whichever is convenient.

Say $y = -\frac{a_1}{b_1}x \quad \frac{c_1}{b_1}$ (iii)

Step 2:

Substitute this value of y in the other equation say (II) and reduce it into an equation in one variable i.e interms of *x*, which can be solved.

Step 3:

Substitute value of x got in step 2 in III equations and get value of y.

In this way we get vales of x and y.

Important: sometimes while doing step 2, we get statements with no variable. If this statement is true, we conclude that the pair of linear equations has infinitely many solutions.

If the statement is False, then the pair of linear equations have no solutions i.e they are inconsistent.

ELIMINATION METHOD:

Following are the steps to solve the pair of linear equations by eliminations method:

Step 1 :_ first multiply both the equations by some suitable non-zero constants to make the co-efficient of one variable (either *x* or *y*) numerically equal.

Step 2:- Then add or subtract one equation from the other so that one variable gets eliminated. If you get an equation in one variable, go to step 3.

If in step 2, we obtain a true statement involving no variable, then the original pair of equations has infinitely many solutions. However

If in step 2, we obtain a false statement involving no variable, then the original pair of equations has no solutions i.e. it is inconsistent.

Step 3:- solve the equation in one variable (x or y) so obtained to get its value.

Step 4:- substitute this value of *x* (or y) in either of the original equations to get the value of other variable.

C) CROSS MULTIPLICATION METHOD.

Let the pair of linear equations be $a_1x + b_1y + c_1 = 0$____(1)

$a_2x + b_2y + c_2 = 0$____(2)

Step 1:- Multiplying equation (1) by b_2 and equation (2) by b_1 to get

$b_2a_1x + b_2b_1y + b_2c_1 = 0$ ____(3)

$b_1a_2x + b_1b_2y + b_1c_2 = 0$______(4)

Step 2:- subtracting equation (4) from (3) we get.

$(b_2a_1 - b_1a_2)x + (b_2b_1 - b_1b_2)y + (b_2c_1 - b_1c_2) = 0$

i.e. $(b_2a_1 - b_1a_2)x = b_2c_1 - b_1c_2$

so $x = \dfrac{b_1c_2 - b_2c_1}{b_2a_1 - b_1a_2}$ provided $b_2a_1 - b_1a_2 \neq 0$ _________(5)

Step 3 substituting this value of x in (1) or (2) we get

$Y = \dfrac{c_1a_2 - c_2a_1}{a_1b_2 - a_2b_1}$ ________________(6)

Now two cases arise:

Case I:- $a_1b_2 - a_2b_1 \neq 0 \Rightarrow a_1b_2 \neq a_2b_1 \Rightarrow \dfrac{a_1}{a_2} \quad \dfrac{b_1}{b_2}$

$\Rightarrow$ pair of linear equations has unique solution

Case II:- $a_1b_2 - a_2b_1 = 0 \Rightarrow a_1b_2 = a_2b_1 \Rightarrow \dfrac{a_1}{a_2} \quad \dfrac{b_1}{b_2}$ = K (suppose)

$\therefore$ $a_1 = ka_2$ and $b_1 = kb_2$

Substituting the values of a_1 , b_1 in equation (1) we get

$K(a_2x + b_2y) + c_1 = 0$ __________(7)

We see (7) and (2) can both be satisfied only if

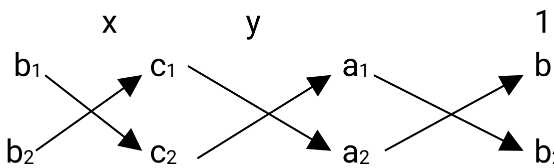
$C_1 = Kc_2$ i.e $\dfrac{c_1}{c_2} = K$ thus if $c_1 = Kc_2$. Any solution of equation (2) will satisfy the equation (1)

And vice versa so if $\dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} = \dfrac{c_1}{c_2} = K$, then there are infinitely many solutions to the pair of linear equations. If $c_1 \neq Kc_2$ then any solution of equation (1) will not satisfy equation (2) and vice versa.

Therefore the pair linear equations have no solutions We can write the solution given by equation (5) and (6)

In the form: $$\frac{x}{b_1c_2 - b_2c_1} = \frac{y}{c_1a_2 - c_2a_1} = \frac{1}{a_1b_2 - a_2b_1}$$

In remembering the above result, the following diagram may be helpful to you



The arrows between the two numbers indicate that they are to be multiplied and the second product is to be subtracted from the first.

For solving a pair of linear equations by this method we will follow the following steps.

<u>Step 1</u>:- Write the given equation in the form (1) and (2)

<u>Step 2</u>:- Taking the help of the diagram above, write equations as in given (3)

<u>Step 3</u>:- Find x and y, provided $a_1b_2 - a_2b_1 \neq 0$

<u>N:B</u>; Step 2 above gives you an indication of why this method is called the cross-multiplication method.

D) CONSTATNT ELIMINATION METHOD:

Steps to solve the pair of linear equations by constant elimination method

$$a_1x + b_1y + c_1 = 0 \_\_\_\_ (I)$$
$$a_2x + b_2y + c_2 = 0 \_\_\_\_ (II)$$

<u>Step 1</u>:- Dividing equation (1) by equation (2)

say $$\frac{a_1x + b_1y}{a_2x + b_2y} = \frac{c_1}{c_2}$$

<u>Step 2</u>:- Taking cross multiplications we get.

	$a_1c_2x + b_1c_2y = a_2c_1 + b_2c_1y$	consistants got
&	$(a_1c_2 - a_2c_1)x = (b_2c_1 - b_1c_2)y$	eliminated

Step 3:- equating this equation as (LCM of co-efficients of and y) K

e.g $(a_1c_2 - a_2c_1)x = (b_2c_1 - b_1c_2)\ y = (a_1c_2 - a_2 - a_2c_1)(b_2c_1 - b_1c_2)K$

∴ $x = (b_2c_1 - b_1c_2)K$ and $y = (a_1c_2 - a_2c_1)K$ ____________ (3)

Using these valued of x and y in (1) {or (2)}

We get

$a_1 (b_2c_1 - b_1c_2)k + b_1(a_1c_2 - a_2c_1)k = c_1$

or $[a_1b_2c_1 - a_1b_2c_2 + a_1b_1c_2 - a_2b_1c_1]k = c_1$

Or $k = \frac{c_1}{(a_1 b_2 - a_2 b_1)c_1} = \frac{1}{(a_1 b_2 - a_2 b_1)}$ provided $a_1b_2 - a_2b_1 \neq 0$

$\therefore$ From (3) $x = \frac{b_2c_1 - b_1c_2}{a_1b_2 - a_2b_1}$ and $y = \frac{a_1c_2 - a_2c_1}{a_1b_2 - a_2b_1}$

Important: Sometimes we may cross multiply and all terms cancel and we get say 0=0 i.e. statement in time , the system has infinitely many solutions or sometimes we may get 7=9 etc, the statement is false so the system has no solution.

Example 1:- let $3x + 2y = 7$ ________(1)

$3x - y = 1$ ______(2)

Dividing (1) by (11) we get $\frac{3x+2y}{3x-y} = \frac{7}{1}$

Taking cross multiplication we get

$21x-7y = 3x+2y$ or $18x = 9y$ or $2x=y$

Let $2x=7y=3x+2y$ or $18x=9y$ or $2x=y$

Using these values of x and y in (1) get

$3k + 2(2K) = 7$ or $7K = 7$ or $K \frac{7}{7} = 1$

Hence $x = k = 1$ and $y = 2k = 2x1 = 2$ so

$x = 1$

$Y = 2$

<u>Example 2</u>:- solve for x and y: $3x + 2y = 5$_____(I)

$6x + 4y = 10$____(II)

Solution: Dividing (1) by (ii) and cross multiply we get.

$30x + 20y = 30x + 20y$ or $0 = 0$

The statement is true. Hence the given system of equations have infinitely many solutions.

<u>Example 3</u>:- Solving : $3x + 2y = 7$____(1)

$6x + 4y = 12$____(II)

Solution : Dividing (1) by (II) and cross multiply we get.

$42x + 28y = 36x + 24y \Rightarrow 42x - 36x = 24y - 28y$

$\Rightarrow$ $6x = -4y \Rightarrow 3x = -2y$

Taking $3x = -2y = 6k$ | just to avoid fractional

Or $x = 2k$ and $y = -3k$ | values of K we take (LCM of 2,3)k

Using these values of x and y in (I) equation we get.

$3(2k) + 2(-3k) = 7 \Rightarrow 6k - 6k = 7$

$\Rightarrow$ $0 = 7$. The statement is false

Hence the system has no solution.

Example 4:- Solving equations $3x - y = 0$___(I)

$8x - 2y = 2$___(II)

From (1) we take $3x = y = 3k$ (suppose)

$\therefore$ $x = K; y = 3k$, using in (II) equation

$8k - 2(3k) = 2 \Rightarrow 8k - 6k = 2 \Rightarrow 2k = 2$

$\Rightarrow k = 1$

Hence ~~x~~ $= k = 1$ and $y = 3k = 3(1) = 3$

i.e $x = 1$ and $y = 3$

Note: if $a_1x + b_1y = 0$

And $a_2x + b_2y = o$

Then trivial solution is $x = 0$; $y = 0$

N:B Apply all other methods to the above examples and see if the answers are same.

Objective type: VSA Type (one mark each)

Q1:- Match column A with column B

	A		B
(i)	A pair of equation is consistant	(a)	The lines will always be parallel.
(ii)	Equations $3x + 4y = 18$ $4x + \frac{16}{3}y = 24$ ha	(b)	the lines will be Intersecting or conincident
(iii)	A pair of equation is inconsistant	C)	infinite number of solutions.

Q 2. Write true or false as the case may be.

(i) The lines $3x - 2y = 4$ and $2x + 3y = 18$ are intersecting lines.
(ii) $2 + 3y = 5$ and $6x + 9y = 18$ are intersecting lines.
(iii) $2 + 3y = 5$ and $2x + 3y = 9$ are not parallel lanes.

Q 3. Fill in the blanks.

(i) The dependent equation from ………………..lines
(ii) One line is parallel to x-axis, another is parallel to y-axis, then these two lines are ……..to each other.
(iii) A linear equation in two variables represents a ……..

Q 4. Choose the most appropriate answer among 4 given alternatives.
A pair of equations is consistent, then the lines will be.
(a) Parallel (b) Always coinicident (c) Always intersecting
(d) intersecting or conincident.

Q 5. The pair of equations $y = o$ and $y = -7$ has

(a) One solutions (b) two solutions (c) infinitely many solutions
(d) No solution.

Q 6. The pair of equation $x = a$ and $y = b$ graphically represents the lines which are
(a) parallel (b) intersecting at (a,b) (c) coincident
(d) Intersecting at (b,a)

Q 7. The value of c for which the pair of equations $cx - y = 2$ and $6x - 2y = 3$ will have infinitely many solution is
(a) 3 (b) -3 (c) -2 (d) no value.

Q 8. The pair of equations $5x - 15y = 8$ and $3x - 9y = \frac{24}{5}$

has

(a) infinite solutions (b) unique solution (c) no solution
(d) one solution.

Q 9. The sum of the digits of two digit number is 9. If 27 is added to it, the digits of the numbers get reversed. The number is
(a) 36 (b) 72 (c) 63 (d) 25

Q 10. The solutions of the equation $x + y = 14$ and $x - y = 4$ is
(a) $x = 9$ and $y = 5$ (b) $x = 5$ and $y = 9$
(c) $x = 7$, $y = -7$ (d) $x = 10$, $y = 4$

Q 11. The value of K for which the system of equations ~~x~~ $- 2y = 3$ and $3x + ky = 1$ has a unique solution is
(a) $K = -6$ (b) $K \neq -6$ (c) $K = 0$ (d) no value.

Q12. A pair of equations is inconsistent, then the lines will be.
(a) parallel (b) Always coincident (c) Always intersecting
(d) intersecting or coincident

Q13. The value of K for which the system of equations $Kx - y = 2$ and $6x - 2y = 3$ has a unique solution is
(a) $k = -3$ (b) $k \neq -3$ (c) $k = 0$ (d) $k \neq 0$

Q 14. The value of K for which the system of equations $2x + 3y = 5$ and $4x + ky = 10$ has infinitely many solutions is
(a) $k = -3$ (b) $k \neq -3$ (c) $k = 6$ (d) none of these

Q 15. Sum of two numbers is 35 and their difference is 13 then the numbers are.
(a) 24 and 12 (b) 24 and 11 (c) 12 and 11 (d) none of these

Q 16. The value of K for which the system of equations $x + 2y = 3$ and $5x + ky + 7 = 0$ has no solution is.

(a) K = 10 (b) K = 6 (c) K = 3 (d) K = 1

Q 17. The value of K for which the system of equations 3x + 5y = 0 and Kx + 10y = 0 has a non-zero solution is

(a) K = 0 (b) K = 2 (c) K = 6 (d) K = 8

Q 18. The sum of the digits of a two digit number is 12. The number obtained by intersecting its digits exceeds the given number by 18. Then the number is

(a) 72 (b) 75 (c) 57 (d) none of these

Q 19. If (6,k) is a solution of the equation 3x + y – 22 = 0, then the valuce of k is:

(a) 4 (b) –4 (c) 3 (d) –3

Q 20. The pair of equations 2x + 3y = 7 and k $+ \frac{9}{2}y = 12$ have no solutions, then the value of k is

(a) $\frac{2}{3}$ (b) – 3 (c) 3 (d) 3/2

SHORT ANSWER TYPE (2 MARKS EACH)

Q1. Solve for x and y:

$$11x + 15y + 23 = 0$$
$$7x - 2y - 20 = 0$$

Q 2. 2x + y = 7 and 4x – 3y + 1 = 0

Q 3. $2x + 5y = \frac{8}{3}$ and $3x - 2y = \frac{5}{6}$

Q 4. 3x – 5y – 19 = 0 and – 7x + 3y + 1 = 0

Q 5. Find the value of k so that the system of equations has no solution

3x – y –5 = 0 ; 6x – 2y – k = 0

Q 6. Find the value of k, so that the following system of equations has a non-zero solution

$3 + 5y = 0$; $kx + 10y = 0$

Q 7. Find the value of k, so that the system of equations has no solution:

$x - 2y = 3$; $3x + ky = 1$

Q 8. Find the value of k, so that the system of equation has no solution.

$kx + 3y = 3$; $12x + ky = 6$

Q 9. Find the values of k so that the system of equations has a unique solution:

$x - 2y = 3$ and $3x + ky = 1$

Q 10. For what value of k the pair of linear equations has infinite number of solutions.

$kx + 3y = 2k + 1$; $2(k+ 1)x + 9y = 7k + 1$

Q 11. Solve the system of linear equations graphically.

$x + 2y = 3$; $4x + 3y = 2$

Q 12. Solve the system of linear equations graphically.

$2x - 3y - 17 = 0$; $4x + y - 13 = 0$

Shade the region bounded by the above lines and x-axis.

Q 13. The sum of two numbers is 137 and their difference is 43. Find the numbers.

Q 14. The sum of two natural numbers is 8 and the sum of their reciprocals is $\frac{18}{15}$. Find the the numbers.

Q 15. The sum of the digits of a two digit number is 12. The number obtained by interchanging the two digits exceeds the given number by 18. Find the number.

Q 16. 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 denominator, it becomes $\frac{5}{6}$. Find the fraction.

LONG ANSWER TYPE (3 MARKS EACH)

Q 1. Find the value of k, so that the system of equations has no solution:

$(3k + 1) x + 3y - 2 = 0$

and $(x^2 + 1) x (x - 2) y -5 =0$

Q 2. Find the value of K so that the systems of equations has a unique solution:

$$kx + 3y = k - 3$$
and $$12x + ky = K$$

Q 3. For what value fo k, the pair of linear equations has infinite number of solutions:

$x + (2k - 1)\,y = 4$ and $kx + 6y = k+6$

Q 4. Solve the pair of linear equations.

$\frac{x}{3} + \frac{y}{2} = 3$; $x - 2y = 2$

Q 5. Find the value of a and b for which system of linear equations has an infinite number of solutions.

$(a - 1)\,x + 3y = 2$; $6x + (1 - 2b)\,y = 6$

Q 6. Solve the system of linear equations graphically

$2x - 5y + 4 = 0$; $2x + y - 8 = 0$. Find the points where these lines meet the y – axis.

Q 7. Mutton is sold at Rs 535 per kg without offal and Rs 495 per kg alongwith 100gms offal. Find the cost of 1kg of an offal.

Q 8. The cost of one quintal of paddy is Rs 1200 and cost of one quintal rice is Rs 2000. Over head costs to convert paddy into rice is Rs 400. A one quintal paddy gives 70 kg rice and 30 kg husk. Find the cost of 1 quintal of husk?

Q 9. The sum of twice the first and thrice the second is 92 and four times the first exceeds seven times the second by 2. Find the numbers.

Q 10. Seven times a two digit number is equal to four times the number obtained by reversing the order of its digits. If the difference between the digits is 3, then find the number.

Q 11. Five years ago Nuri was thrice old as Sony. Ten years later, Nuri will be twice as old as Sonu. Find the present age of Nuri and Sony.

Q 12. In a $\triangle$ ABC , $\angle C = 3 \angle B = 2 (\angle A + \angle B)$. Find the angles.

Q 13. Find the four angles of a cyclic quadrilateral ABCD in which $\angle A = (2x - 1)^{\circ}$; $\angle B$ $(y + 5)^{\circ}$; $\angle C = (2y + 15)^{\circ}$; $\angle D = (4x - 7)^{\circ}$

Q 14. The cost of 5 oranges and 3 apples is Rs 35 and the cost of 2 oranges and 4 apples is Rs 28. Find the cost of an orange and an apple.

LONG ANSWER TYPE (4 MARKS EACH)

Q1. Solve for x and y

$x + y = 5xy$; $3 + 2y = 13xy$; $x \neq 0$; $y \neq 0$

Q 2. Solve: $\frac{x}{3} + \frac{y}{4} = 11$; $\frac{5x}{6} - \frac{y}{3} + 7 = 0$

Q 3. $\frac{1}{2(2x+3y)} + \frac{12}{7(3x-2y)} = \frac{1}{2}$

$\frac{7}{(2x+3y)} + \frac{4}{(3x-2y)} = 2$ solve it.

Q 4. Solve for —and y

$\frac{44}{x+y} + \frac{30}{x-y} = 10$; $\frac{55}{x+y} + \frac{40}{x-y} = 13$; where $x + y \neq 0$ and $x - y \neq 0$

Q 5. Solve for x and y

$$(a-b)x+(a+b)=a^2-2ab-b^2$$
$$(a+b)(x+y)=a^2+b^2$$

Q 6. Solve for x and y : $ax-by=a^2+b^2$

$x+y=2a$

Q 7. Solve for x and y

$2(ax-by)+(a+4b)=0$

$2(bx+ay)+(b-4a)=0$

Q 8. The sum of a two digit number and the number obtained by reversing the digits is 66. If the digits of the number differ by 2. Find the number. How many such numbers are there?

Q 9. The denominator of a fraction is greater than its numerator by 11. If 8 is added to both its numerator and denominator, it reduces to $\frac{1}{2}$. Find the fraction.

Q 10. The present age of a women is 3 years more than three times the age of her daughter. Three years hence, the woman's age will be 10 years more than twice the age of her daughter. Find their present ages.

Q 11. A boat goes 30 km upstream and 44 km downstream in 10 hours. In 13 hours, it can go 40 km upstream and 55 km down stream. Determine the speed of the stream and that of the boat in still water.

Q 12. The area of a rectangle remains the same if the length is increased by 7m and the breadth is decreased by 3 m. The area remains unaffected, if the length is decreased by 7 m and the breadth is increased by 5m . find the dimensions of the rectangle.

Q 13. A and B each has some money. If A gives Rs 30 to B then B will have twice the money left with A. But if B gives Rs 10 to A then A will have thrice as much as is left with B. How much money does each have.

ANSWERS

VERY SHORT ANSWER TYPE

Q 1. (i) → (b) (ii) → (c) (iii) → (a)
Q 2. (i) True (ii) False (iii) False
Q 3. (i) coincident (ii) perpendicular (iii) line.
Q 4. (d) Q 5 (d) Q 6 (b) Q7 (d) Q8 (c) Q9 (a)
Q10 (a) Q11 (b) Q12 (a) Q 13 (C) Q14 (C)
Q15 (b) Q16 (a) Q17 (C) Q18 (c) Q19 (a)
Q 20 (c)

SHORT ANSWER TYPE

Q 1. x = 2 ; y = 3 Q 2. x = 2 ; y = 3 Q 3. x $\frac{1}{2}$; y= $\frac{1}{3}$
Q 4. x – 2 ; y – 5 Q 5. k = 10 Q 6. k = 6
Q 7. k = – 6 Q8. k = – 6 Q 9. k ≠ – 6
Q 10. k = 2 Q 11. x = –1 ; y = 2 Q 12. x = 4 ; y = $\frac{47}{7}$
Q 13. x= 90 ; y = 47 Q 14. Two natural numbers are 3 and 5
Q 15. 57 Q 16. $\frac{7}{9}$

lONG ANSWER TYPE

Q1. K = – 1 Q2. K ≠ 6 Q3. K = 2 Q4. x = 6;y = 2
Q5. a = 3 ; b = – 4 Q 6. X = $\frac{10}{3}$; y = $\frac{4}{3}$ Q 7. Rs 135. Q8. Rs 666.66
Q 9. Numbers are 25 and 14 Q 10. 36
Q 11. Nuri = 50 years sonu= 20 years

Q 12. $\angle A = 20^\circ$, $\angle B = 40^\circ$, $\angle c = 120^\circ$.
Q 13. $\angle A = 65^\circ$, $\angle B = 55^\circ$, $\angle C\ 115^\circ$, $\angle D = 125^\circ$
Q 14. Cost of orange = Rs 4 cost of an apple = Rs5

VERY lONG ANSWER TYPE

Q1. $x = \frac{1}{2}$; $y = \frac{1}{3}$ Q 2. x = 6 ; y = 36   Q3. x = 2; y =1

Q 4. x= 8 , y = 3   Q 5. $x = a + b$, $y = \frac{-2ab}{a+b}$

Q6. $x = a + b$, $y = a - b$ Q 7. $x = \frac{-1}{2}$,y =2

Q 8. 42   Q9. $\frac{3}{14}$ Q10. Woman = 33yrs, Daughter=10 yrs.

Q11. Speed of water = 3km/h, speed of boat = 8 km / h
Q 12. Length = 28 m, Breadth = 15 m
Q 13. A has Rs 62 , B has Rs 34.