

LESSON PLAN CLASS 9



Class	Subject	Time Slot	Lesson	Topic P1/P2
IX	Mathematics	35 mins + 35 mins 2 Pds	Linear Equations in two Variables	- Introduction - Solutions of Linear Equations in two Variables.
Expected Learning Outcome :The learners will be able to : - Write linear equation in one variable and extend to that of linear equation in two variables. - To write the equation in general form $ax + by + c = 0$ - Relate linear equations in two variables with real life situations. - Find the solution of linear equations in two variables algebraically. - Conclude that a linear equation in two variables has <i>infinitely many solutions</i>.				
Expected skill development: - Observational skills while framing the equation - Logical thinking, mathematical skills - Computational skills and thinking skills while finding the solutions of the equations.				

FLOW OF LESSON WITH RESPECT TO TIME (Introduction/warm-up, Content, Think Line, Closure)

Pedagogy	Content
(10 +5 Min) Warm Up Demonstration by Learners on Black Board Interactive Method learners will be asked to quickly recap and note the following in their note books	<u>Recap by Learners</u> - Write a linear equation in one variable. - How many solution(s) does it have? (Response 1) - Write a linear equation in two unknowns of degree 1. - Find the solution of equation and locate the solution on number line. - Facilitator will explain general form of linear equation on black board Any equation which can be put in the form $ax + by + c = 0$, where a, b and c are real numbers and a and b are both non zero, is called linear equation in two variables. $Ax + by + c = 0$ is the standard form of linear equation. - Write the following equations in the form of $ax + by + c = 0$ $2x = y$; $4 = 5x - 3y$; $x = -5$ - How many solutions does linear equations in two variables have? - Unique solution - Two solutions - Infinitely many solutions Facilitator explains on Black Board

	Consider the equation $2x + 3y = 12$ Here, $x = 3$ and $y = 2$ is a solution because when you substitute $x = 3$ and $y = 2$ in the above equation, we find that $2x + 3y = 2 \times 3 + 3 \times 2 = 12$. Can you find any other solution? Learners Response $(0, 4)$; $(6, 0)$ are also the solutions for the above equation. Thus we conclude that: A linear equation in two variables has infinitely many solutions and we can get that by picking a value of our choice for x and we get the corresponding value of y.
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<u>(55 mins) Demonstration by facilitator on Board</u> <u>(Demonstration / Discussion method)</u> The facilitator will show the algorithm of finding the solution of the linear equation and how to write it as an ordered pair and in the tabular form.	Now, let us choose $x = 0$. With this value of x, the given equation reduces to $2y = 6$ which has the unique solution $y = 3$. So $x = 0, y = 3$ is also a solution of $x + 2y = 6$. Similarly, taking $y = 0$, the given equation reduces to $x = 6$. So, $x = 6, y = 0$ is a solution of $x + 2y = 6$ as well. Finally, let us take $y = 1$. The given equation now reduces to $x + 2 = 6$, whose solution is given by $x = 4$. Therefore, $(4, 1)$ is also a solution of the given equation. So four of the infinitely many solutions of the given equation are: $(2, 2), (0, 3), (6, 0)$ and $(4, 1)$. Remark: note that an easy way of getting a solution is to take any arbitrary value of x and get the corresponding value of y or vice – versa.
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a) Proposed Questions (must include the questions asked in the classroom <u>and</u> the ones given as class-work in the notebook) 1. The cost of a notebook is twice the cost of a pen. Write a linear equation in two variables to represent this statement. (Take the cost of a notebook to be ₹ x and that of a pen to be ₹ y). 2. Write four solutions for each of the following equations: (i) $2x + y = 7$ (ii) $\pi x + y = 9$ (iii) $x = 4y$ 3. Check which of the following are solutions of the equation $x - 2y = 4$ and which are not: (i) $(0, 2)$ (ii) $(2, 0)$ (iii) $(4, 0)$ ❖	b) Evaluation/Assessment: Peer discussion will be done. Teacher will assess the children randomly and also through student teacher interaction.
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Learners on the way The equation of x – axis is of the form a) $X = 0$ (b) $y = 0$ (c) $x + y = 0$ (d) $x = y$	Advanced Learners If we multiply or divide both sides of a linear equation with a non zero number, then the solution of the linear equation a) Changes b) Remains the same c) Changes in case of multiplication only d) Changes in case of division only.
Materials needed/Resources: Chalk, blackboard, duster. A chart showing Cartesian plane	
Common Misconceptions: ❖ Identification of equations as linear or not. ❖ Transposing while solving the equation	Addressing the Misconceptions: Equations whose degree of the variable is 1, are linear. Explanation on board with proper algorithm.

HOME ASSIGNMENTS:

3. Check which of the following are solutions of the equation $x - 2y = 4$ and which are not:
 - (i) $(0, 2)$ (ii) $(2, 0)$ (iii) $(4, 0)$
 - (iv) $(\sqrt{2}, 4\sqrt{2})$ (v) $(1, 1)$
4. Find the value of k , if $x = 2, y = 1$ is a solution of the equation $2x + 3y = k$.

LESSON PLAN CLASS 9



DLF Public School

THE LEARNING ACADEMY
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Class	Subject	Time Slot	Lesson	Topic P3
IX	Mathematics	35 Mins 1 Pd	Linear equations in two Variables	Graph of a Linear Equations in two Variables
Expected Learning Outcome :The learners will be able to : - Represent linear equations in two variables graphically. - Calculate the x and y intercepts on the graph. - Conclude that every point on the line is solution of the equation and vice – versa.				
Expected skill development: - Observational skills while framing the equation - Logical thinking, mathematical skills - Computational skills and thinking skills while finding the solutions of the equations.				

FLOW OF LESSON WITH RESPECT TO TIME (Introduction/warm-up, Content, Think Line, Closure)

Pedagogy	Content
(5 mins) Warm up Demonstration by Facilitator Facilitator will explain that after learning how to find the solutions of a linear equation in two variables algebraically, we look at their geometric representation.	Thinkline How many linear equations can pass through (0,3)? a) One (b) two (c) many The facilitator will explain on board by drawing the diagram that through one point infinite lines can pass.

(20 mins) Demonstration by Facilitator on Board

Interactive Method

The facilitator asks the learner to make the two axis on board

Facilitator will show algorithm of representing the solution of the linear equation graphically.

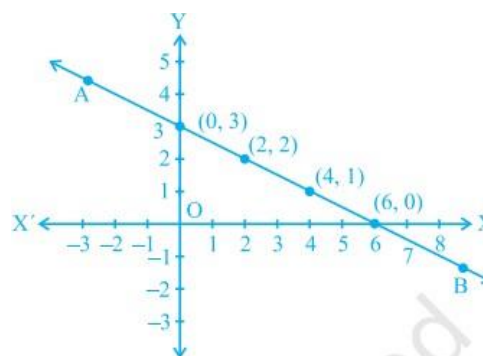
Facilitator will ask the learners to list different observations from the graph

Example: Find three solutions of the equation $x + 2y = 6$ and represent it graphically

Learners will find the solutions

x	0	2	4
y	3	2	1

Facilitator will ask learners to come and draw the coordinate plane on the board and plot the coordinates on graph paper



Responses by the Learners (OBSERVATIONS)

1. Every point whose coordinates satisfy equation $x + 2y = 6$ lies on the line AB
2. Every point (a, b) on the line AB gives a solution $x = a, y = b$ of equation $x + 2y = 6$
3. Any point, which does not lie on the line AB, is not a solution of equation $x + 2y = 6$

Learners concluded that every point on the line satisfies the equation of the line and every solution of the equation is a point on the line.

(10 mins) in class exercise: Closure

The facilitator will be reinforced to attempt in the notebook. Facilitator will take round and give personal interventions.

Thinkline

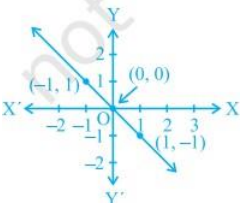
Sample Question 4 : Draw the graph of the equation represented by the straight line which is parallel to the x -axis and is 4 units above it.

Q- Draw the graph of equation $y = x$ and $x = -4$

Proposed Questions (must include the questions asked in the classroom and the ones given as class-work in the notebook)

- Draw the graph of each of the following linear equations in two variables:
 - $x + y = 4$
 - $x - y = 2$
 - $y = 3x$
 - $3 = 2x + y$
- Give the equations of two lines passing through $(2, 14)$. How many more such lines are there, and why?

c) Evaluation/Assessment: Learners will do the calculation and write their observations in their note books. Teacher will take rounds and assess the children randomly.

Learners on the way	Advanced Learners
From the choices given below, choose the equation whose graph is given below $Y = x$ $X + y = 0$  $Y = 2x$ $2 + 3y = 7x$	Sample Question 2 : At what point does the graph of the linear equation $x + y = 5$ meet a line which is parallel to the y-axis, at a distance 2 units from the origin and in the positive direction of x-axis.
Materials needed/Resources: Chalk, blackboard, duster, graph paper, geometry box.	
Common Misconceptions:	Addressing the Misconceptions:

HOME ASSIGNMENTS: Attempt the following Questions in the notebook

- Draw the graph of each of the following linear equations in two variables:
 - $x + y = 4$
 - $x - y = 2$
 - $y = 3x$
 - $3 = 2x + y$
- Give the equations of two lines passing through $(2, 14)$. How many more such lines are there, and why?
- If the point $(3, 4)$ lies on the graph of the equation $3y = ax + 7$, find the value of a .
- The taxi fare in a city is as follows: For the first kilometre, the fare is ₹ 8 and for the subsequent distance it is ₹ 5 per km. Taking the distance covered as x km and total fare as ₹ y , write a linear equation for this information, and draw its graph.



LESSON PLAN CLASS 9

Class	Subject	Time Slot	Lesson	Topic
IX	Mathematics	35 mins 1 Pd	Linear Equations in two Variables.	P4 • Graph of a Linear Equation in two Variables
Expected Learning Outcome :The learners will be able to : - Represent linear equations in two variables graphically. - Calculate the x and y intercepts on the graph. - Conclude that every point on the line is solution of the equation and vice – versa. - Apply the knowledge in real life situations				
Expected skill development: - Observational skills while framing the equation - Logical thinking, mathematical skills - Computational skills and thinking skills while finding the solutions of the equations.				

FLOW OF LESSON WITH RESPECT TO TIME (Introduction/warm-up, Content, Think Line, Closure)

Pedagogy	Content
(5 mins) Warm up Demonstration by facilitator on Black Board (Interactive Method)	Thinkline Where the points (2, 0) ; (-3, 0) ; (4, 0) and (n, 0), for any real number n, lie in the Cartesian plane? Why? Response by learners: they all lie on x – axis, because on the x – axis, the y – coordinate of each point is 0.
(25 min) Demonstration by learners on Board Learners will be reinforced to attempt questions in the notebook. Facilitator will take round and give personal interventions.	6. If the work done by a body on application of a constant force is directly proportional to the distance travelled by the body, express this in the form of an equation in two variables and draw the graph of the same by taking the constant force as 5 units. Also read from the graph the work done when the distance travelled by the body is (i) 2 units (ii) 0 unit 7. Yamini and Fatima, two students of Class IX of a school, together contributed ₹ 100 towards the Prime Minister's Relief Fund to help the earthquake victims. Write a linear equation which satisfies this data. (You may take their contributions as ₹ x and ₹ y.) Draw the graph of the same.
(5 mins) Inclass Exercise: closure Thinkline If the point (3, 4) lies on the graph of the equation $3y = ax + 7$, find the value of 'a'	

Proposed Questions (must include the questions asked in the classroom <u>and</u> the ones given as class-work in the notebook) Where the points $(2, 0)$; $(-3, 0)$; $(4, 0)$ and $(n, 0)$, for any real number n, lie in the Cartesian plane? Why?	
Evaluation/Assessment: Learners will do the calculation in their notebook. Teacher will take rounds and assess the children randomly.	
Learners on the way Plot the equation $x + 2y = 6$	Advanced Learners How many solution(s) of the equation $2x + 1 = x - 3$ are there on the : (i) Number line (ii) Cartesian plane
Materials needed/Resources: Chalk, blackboard, duster	
Common Misconceptions : Drawing axes as line segments	Addressing the Misconceptions: Learners should not forget to mark arrow heads for axes (lines)

HOME ASSIGNMENTS: Complete rest parts of Ex – 4.3 of NCERT text book class 9.

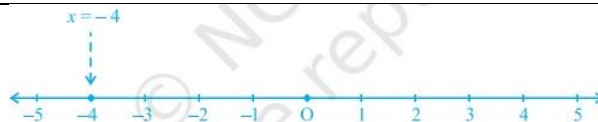


LESSON PLAN CLASS 9

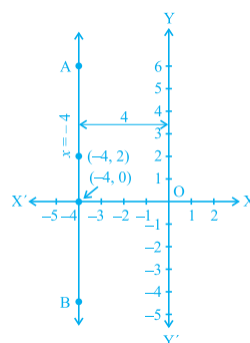
Class	Subject	Time Slot	Lesson	Topic
IX	Mathematics	35 mins 1 Pd	Linear Equations in two Variables	P5 Equations of lines parallel to x – axis and y - axis
Expected Learning Outcome :The learners will be able to : - Frame the linear equation parallel to x – axis and linear equation parallel to y – axis. - Plot the linear equation parallel to axis. - Write the equation of X- axis and y – axis.				
Expected skill development: - Representation skill while plotting the coordinates. - Developing connections while finding the equations of a line parallel to x – axis and y – axis. - Visual and spatial ability.				

FLOW OF LESSON WITH RESPECT TO TIME (Introduction/warm-up, Content, Think Line, Closure)

Pedagogy	Content
(5 mins) Warm up (Interactive Method)	The facilitator will ask the learners - How can we represent the coordinates of the point which lies on x – axis and y – axis? Response : (x, 0) and (0, y) - Can you now guess the equation of the x – axis? Response: It is given by $y = 0$ which can be expressed as $0.x + 1.y = 0$ - Can you now guess the equation of the y – axis? Response: it is given by $x = 0$ which can also be expressed as $1.x + 0.y = 0$
(15 min) Demonstration by Facilitator on Board Consider the equation $x - 2 = 0$. If this is treated as an equation in one variable x only, then it has the unique solution $x = 2$, which is a point on the number line. However, when treated as an equation in two variables, it can be expressed as $x + 0.y - 2 = 0$. This has infinitely many solutions and can be plotted on Cartesian plane.	The following question will be written on black board Solve the equation $2x + 1 = x - 3$, and represent the solution(s) on (i) the number line, (ii) the Cartesian plane. The facilitator will explain the following steps Solution: We solve $2x + 1 = x - 3$, to get $2x - x = -3-1$ i.e $x = -4$ i) the representation of the solution on the number line is shown in, where $x = -4$ is treated as an equation in one variable



ii) We know that $x = -4$ can be written as $x + 0.y = -4$, which is a linear equation in the variables x and y . This is represented by a line. Now all the values of y are permissible because $0.y$ is always 0. However, x must satisfy the equation $x = -4$. Hence, two solutions of the given equation are $x = -4, y = 0$ and $x = -4, y = 2$.



Note: The graph AB is a line parallel to the y – axis and at a distance of 4 units to the left of it.

(5 mins) Inclass Exercise: closure

Learners will be reinforced to attempt the following questions in the notebook. Facilitator will take round and give personal interventions.

1. Give the geometric representations of $y = 3$ as an equation
 - (i) in one variable
 - (ii) in two variables
2. Give the geometric representations of $2x + 9 = 0$ as an equation
 - (i) in one variable
 - (ii) in two variables

Proposed Questions (must include the questions asked in the classroom and the ones given as class-work in the notebook)

1. Give the geometric representations of $y = 3$ as an equation
 - (i) in one variable
 - (ii) in two variables

Evaluation/Assessment: Learners will do the calculation in their notebook. Teacher will take rounds and assess the children randomly.

Learners on the way Give the geometric representation of $y = 3$ as an equation in one variable.	Advanced Learners Give the geometric representation of $5y + 4 = 0$ as an equation in two variables.
Materials needed/Resources: Chalk, blackboard, duster	
Common Misconceptions : Difficulty in geometrically interpreting that $x = a$ or $y = b$ as linear equation in two variables.	Addressing the Misconceptions: After doing multiple questions on graphs, learners will observe that all the values of x and y are permissible because $0.x$ and $0.y$ is always 0 respectively.

HOME ASSIGNMENT: Do Ex – 4.4 in note book of NCERT text book of class 9