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Mathematics

9

TERM-II

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Highlights important information and questions for last minute revision

Includes **HOTS** and **Value Based** questions

Based on the latest syllabus and textbook issued by CBSE/NCERT



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TERM-II

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Based on the latest syllabus and
textbook issued by **CBSE/NCERT**

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We are committed to serve students with best of our knowledge and resources. We have taken utmost care and attention while editing and printing this book but we would beg to state that Authors and Publishers should not be held responsible for unintentional mistakes that might have crept in. However, errors brought to our notice, shall be gratefully acknowledged and attended to.

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SYLLABUS

MATHEMATICS (CLASS-IX)

Second Term

Marks: 90

UNITS

MARKS

II. ALGEBRA (Contd.)	16
III. GEOMETRY (Contd.) (Quadrilaterals-10 Marks) (Area, Circle & Constructions-28 Marks)	38
V. MENSURATION (Contd.)	18
VI. STATISTICS	10
VII. PROBABILITY	08

TOTAL (THEORY)

90

Note: The text of OTBA for SA-II will be from Unit-III, Chapter 4, Quadrilaterals.

UNIT II : ALGEBRA (Contd.)

2. LINER EQUATIONS IN TWO VARIABLES

(14) Periods

Recall of linear equations in one variable. Introduction to the equation in two variables. Focus on linear equations of the type $ax + by + c = 0$. Prove that a linear equation in two variables has infinitely many solutions and justify their being written as ordered pairs of real numbers, plotting them and showing that they lie on a line. Graph of linear equations in two variables. Examples, problems from real life, including problems on Ratio and Proportion and with algebraic and graphical solutions being done simultaneously.

UNIT III : GEOMETRY (Contd.)

4. QUADRILATERALS

(10) Periods

- (Prove) The diagonal divides a parallelogram into two congruent triangles.
- (Motivate) In a parallelogram opposite sides are equal, and conversely.
- (Motivate) In a parallelogram opposite angles are equal, and conversely.
- (Motivate) A quadrilateral is a parallelogram if a pair of its opposite sides is parallel and equal.
- (Motivate) In a parallelogram, the diagonals bisect each other and conversely.
- (Motivate) In a triangle, the line segment joining the mid points of any two sides is parallel to the third side and in half of it and (motivate) its converse.

5. AREA

(7) Periods

Review concept of area, recall area of a rectangle.

- (Prove) Parallelograms on the same base and between the same parallels have the same area.
- (Motivate) Triangles on the same (or equal base) base and between the same parallels are equal in area.

6. CIRCLES

(15) Periods

Through examples, arrive at definition of circle and related concepts—radius, circumference, diameter, chord, arc, secant, sector, segment, subtended angle.

- (Prove) Equal chords of a circle subtend equal angles at the center and (motivate) its converse.
- (Motivate) The perpendicular from the center of a circle to a chord bisects the chord and conversely, the line drawn through the center of a circle to bisect a chord is perpendicular to the chord.
- (Motivate) There is one and only one circle passing through three given non-collinear points.
- (Motivate) Equal chords of a circle (or of congruent circles) are equidistant from the center (or their respective centers) and conversely.
- (Prove) The angle subtended by an arc at the center is double the angle subtended by it at any point on the remaining part of the circle.
- (Motivate) Angles in the same segment of a circle are equal.
- (Motivate) If a line segment joining two points subtends equal angle at two other points lying on the same side of the line containing the segment, the four points lie on a circle.
- (Motivate) The sum of the either pair of the opposite angles of cyclic quadrilateral is 180° and its converse.

7. CONSTRUCTIONS

(10) Periods

1. Construction of bisectors of line segments and angles of measure 60° , 90° , 45° etc., equilateral triangles.
2. Construction of a triangle given its base, sum/difference of the other two sides and one base angle.
3. Construction of a triangle of given perimeter and base angles.

UNIT V: MENSURATION (Contd.)

2. SURFACE AREAS AND VOLUMES

(12) Periods

Surface areas and volumes of cubes, cuboids, spheres (including hemispheres) and right circular cylinders/cones.

UNIT VI: STATISTICS

1. STATISTICS

(13) Periods

Introduction to Statistics: Collection of data, presentation of data—tabular form, ungrouped/grouped, bar graphs, histograms (with varying base lengths), frequency polygons. Mean, median and mode of ungrouped data.

UNIT VII: PROBABILITY

1. PROBABILITY

(9) Periods

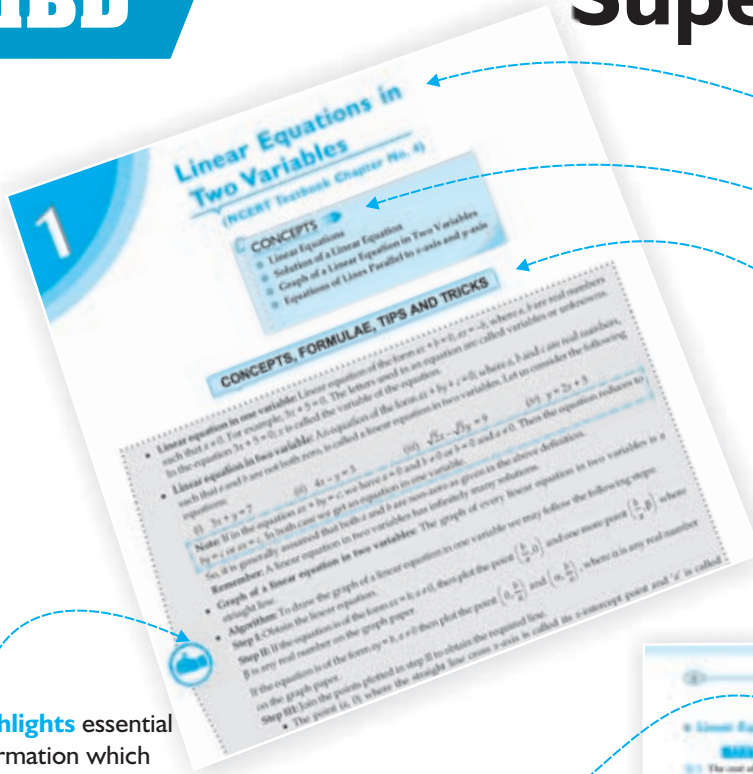
History, Repeated experiments and observed frequency approach to probability. Focus is on empirical probability. (A large amount of time to be devoted to group and to individual activities to motivate the concept; the experiments to be drawn from real-life situations, and from examples used in the chapter on statistics).

QUESTIONS PAPER DESIGNS (2016–17) CLASS-IX

MATHEMATICS (CODE NO. 041)		Time-3 Hours					Marks-90	
		Typology of Questions	Very Short Answer (VSA) (1 Mark)	Short Answer-I (SA) (2 Marks)	Short Answer-II (SA) (3 Marks)	Long Answer (LA) (4 Marks)	Total Marks	% Weightage
1	Remembering-(Knowledge based) Simple recall questions, to know specific facts, terms, concepts, principles, or theories; Identify, define, or recite, information)	1	2	2	3	23	26%	
2	Understanding-(Comprehension) –to be familiar with meaning and to understand conceptually, interpret, compare, contrast, explain, paraphrase, or interpret information)	2	1	1	4	23	26%	
3	Application (Use abstract information in concrete situation, to apply knowledge to new situations; Use given content to interpret a situation, provide an example, or solve a problem)	1	2	3	2	22	24%	
4	High Order Thinking Skills (Analysis & Synthesis) –Classify, compare, contrast, or differentiate between different pieces of information; Organize and/or integrate unique pieces of information from a variety of sources)	–	1	4	–	14	16%	
5	Creating, Evaluation and Multi-Disciplinary– (Generating new ideas, product or ways of viewing things Appraise, judge, and/or justify the value or worth of a decision or outcome, or to predict outcomes based on values)	–	–	–	2*	8	8%	
Total		4 × 1 = 4	6 × 2 = 12	10 × 3 = 30	11 × 4 = 44	90	100%	

Note: The question paper will include a section on Open Text Based Assessment (Questions of 10 marks). The case studies will be supplied to students in advance. These case studies are designed to test the analytical and higher order thinking skills of students.

*One of the LA (4 marks) will be to assess the values inherent in the texts.



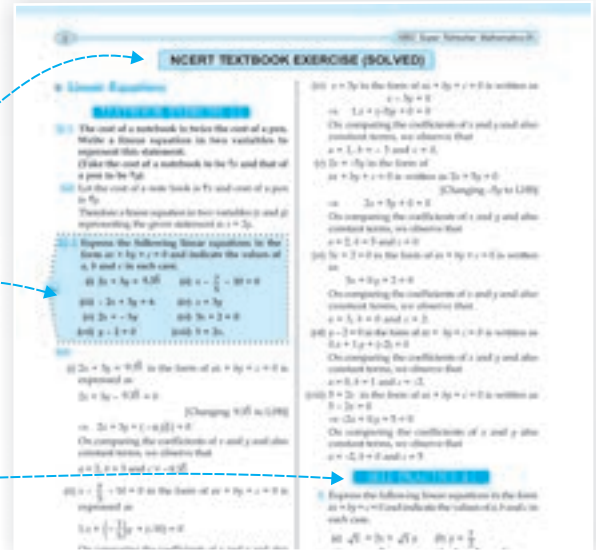
Highlights essential information which must be remembered

- All chapters as per **NCERT Syllabus and Textbook**
- Every chapter divided into **Sub-topics**
- **Concepts, Formulae, Tips and Tricks** provides a comprehensive summary of the concept

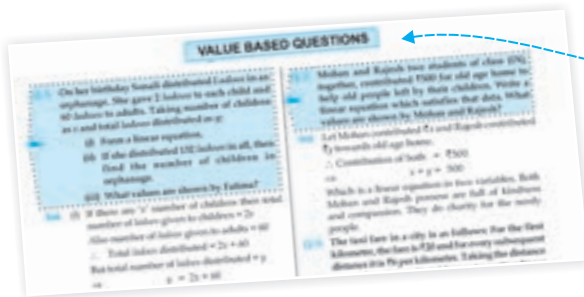
NCERT **Textbook Exercises** with detailed solution

Important Questions from examination point of view to ensure passing marks

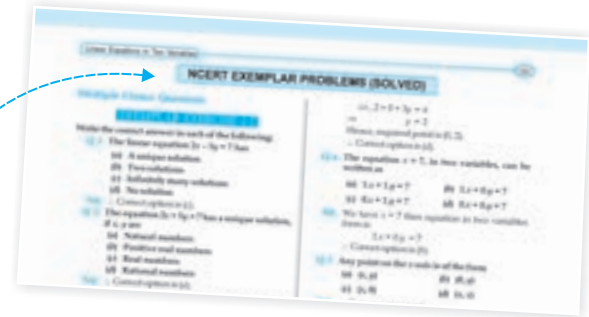
Self Practice questions for consolidation of each concept



Value Based Questions to apply mathematical concepts to real life situations with stress on social values



NCERT **Exemplar Problems** with complete solution to supplement the entire NCERT support material



Mathematics

HOTS CORNER

Q.1 Construct a triangle PQR in which $QR = 8$ cm, $\angle Q = 60^\circ$ and $PQ = 3$ cm. Give justification for construction.

Q.2 In a triangle PQR, side PQ is shorter than other side PR by 3 cm. i.e., $PQ < PR$. Therefore, we have following steps of construction:

- Draw a line segment $QR = 8$ cm.
- At Q, construct an angle $\angle CQR = 60^\circ$.
- Extend ray QN in backwards and cut $QS = 3$ cm.
- Join RS.
- Draw the perpendicular bisector of RS, intersecting QN at P.
- Join PR.

ΔPQR is the required triangle.

• **HOTS (Higher Order Thinking Skills)** Questions with answers

• **Additional Questions** with answers at the end of each chapter

ADDITIONAL QUESTIONS

Multiple Choice Questions (MCQs)

Choose the correct answer:

- In a pair of set squares, one is with angles (a) $30^\circ, 60^\circ, 90^\circ$ (b) $30^\circ, 30^\circ, 45^\circ$ (c) $75^\circ, 25^\circ, 90^\circ$ (d) $60^\circ, 15^\circ, 105^\circ$
- In a pair of set squares the other is with angles (a) $45^\circ, 45^\circ, 90^\circ$ (b) $30^\circ, 50^\circ, 100^\circ$ (c) $60^\circ, 60^\circ, 60^\circ$ (d) None
- To draw the perpendicular bisector of line segment AB, we open the compass (a) More than AB (b) Less than AB (c) equal to AB (d) None

FORMATIVE ASSESSMENT

- To construct a triangle we must know at least its (a) two parts (b) one (c) three (d) five
- For which of the following conditions the construction of a triangle is not possible (a) If two sides and angle included between them is not given

• **Self Assessment** with answers at the end of each chapter

SELF ASSESSMENT-I

Time: 1 hour

Instructions:

- Q. 1 to Q. 6 carry 1 mark each.
- Q. 7 to Q. 10 carry 3 marks each.
- Q. 11 and Q. 12 carry 4 marks each.

You are asked to "construct" an angle whose measure is 30° . Write its step of construction. Write step of construction of an equilateral Δ each of side 4 cm.

Can we construct ΔABC with perimeter 8.4 cm and sides in the ratio 2 : 1 : 1? When a triangle is uniquely constructed? Given two sides and area of a triangle, number of triangles that can be constructed are?

Which of the following geometric construction is triangle that can be constructed are:

- Construct a triangle ABC in which $AB = 4$ cm, $BC = CA = 8$ cm and $\angle A = 105^\circ$. Justify your construction.
- Construct a triangle ABC such that $BC = 6$ cm, $AB = 4$ cm and median $AD = 4$ cm.
- Construct a triangle PQR in which $\angle Q = 45^\circ$, $\angle R = 60^\circ$ and $PQ + QR + RP = 11$ cm.
- Construct ΔABC with $BC = 4.5$ cm, $\angle B = 40^\circ$ and $AB + AC = 12.5$ cm. Justify your construction.

• **3 Model Question Papers** of 90 marks each

Model Question Papers for Practice

Summative Assessment-II
SECOND TERM
MODEL QUESTION PAPER-1

Time Allowed: 3 Hours

General Instructions:

- All questions are compulsory.
- The question paper consists of 30 questions divided into four sections A, B, C and D. Section-A comprises of 4 questions of 1 mark each, section-B comprises of 6 questions of 2 marks each, section-C comprises of 10 questions of 3 marks each and section-D comprises of 10 questions of 4 marks each.
- There is no choice in any of the questions.
- Use of calculator is not permitted.

SECTION - A

- Find the coordinates of points where graph of line $3x - 4y = 8$ cuts the y-axis.
- A square piece of paper whose side is 10 cm is rolled to form a cylinder. Find the curved surface area of the cylinder so formed.
- In fig., ABCD is a rectangle. H, G, F are mid-points of sides AD, BC, AB respectively. If $\angle ABC = 40^\circ$, find $\angle HGF$.
- In a cone, if radius is tripled and height is made one third, then find the ratio of area of new cone to the original cone.

CONTENTS

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Linear Equations in Two Variables

(NCERT Textbook Chapter No. 4)

CONCEPTS >>>

- Linear Equations
- Solution of a Linear Equation
- Graph of a Linear Equation in Two Variables
- Equations of Lines Parallel to x -axis and y -axis

CONCEPTS, FORMULAE, TIPS AND TRICKS

- **Linear equation in one variable:** Linear equation of the form $ax + b = 0$, $ax = -b$, where a, b are real numbers such that $a \neq 0$. For example, $3x + 5 = 0$. The letters used in an equation are called variables or unknowns. In the equation $3x + 5 = 0$; x is called the variable of the equation.
- **Linear equation in two variable:** An equation of the form $ax + by + c = 0$; where a, b and c are real numbers, such that a and b are not both zero, is called a linear equation in two variables. Let us consider the following equations:

(i) $3x + y = 7$

(ii) $4x - y = 3$

(iii) $\sqrt{2}x - \sqrt{3}y = 9$

(iv) $y = 2x + 5$

Note: If in the equation $ax + by = c$; we have $a = 0$ and $b \neq 0$ or $b = 0$ and $a \neq 0$. Then the equation reduces to $by = c$ or $ax = c$. In both case we get an equation in one variable.

So, it is generally assumed that both a and b are non-zero as given in the above definition.

Remember: A linear equation in two variables has infinitely many solutions.

- **Graph of a linear equation in two variables:** The graph of every linear equation in two variables is a straight line.

- **Algorithm:** To draw the graph of a linear equation in one variable we may follow the following steps:

Step I: Obtain the linear equation.

Step II: If the equation is of the form $ax = b$; $a \neq 0$, then plot the point $\left(\frac{b}{a}, 0\right)$ and one more point $\left(\frac{b}{a}, \beta\right)$ where β is any real number on the graph paper.

If the equation is of the form $ay = b$, $a \neq 0$ then plot the point $\left(0, \frac{b}{a}\right)$ and $\left(\alpha, \frac{b}{a}\right)$, where α is any real number on the graph paper.

Step III: Join the points plotted in step II to obtain the required line.

- The point $(a, 0)$ where the straight line cross x -axis is called its x -intercept point and ' a ' is called x -intercept.
- The point $(0, b)$ where the straight line crosses y -axis is called its y -intercept point and ' b ' is called y -intercept.
- $x = 0$ is the equation of the y -axis and $y = 0$ is the equation of the x -axis.
- The graph $x = a$ is a straight line parallel to the y -axis.
- The graph $y = a$ is a straight line parallel to the x -axis.
- An equation of the type $y = mx$ represents a line passing through the origin.
- Every point on the graph of a linear equation in two variables is a solution of the linear equation. Moreover every solution of the linear equation is a point on the graph of the linear equation.

NCERT TEXTBOOK EXERCISE (SOLVED)

Linear Equations

TEXTBOOK EXERCISE 4.1

Q. 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)

Sol. Let the cost of a note book is ₹ x and cost of a pen is ₹ y .

Therefore a linear equation in two variables (x and y) representing the given statement is $x = 2y$.

Q. 2. Express the following linear equations in the form $ax + by + c = 0$ and indicate the values of a , b and c in each case.

(i) $2x + 3y = 9.35$ (ii) $x - \frac{y}{5} - 10 = 0$

(iii) $-2x + 3y = 6$ (iv) $x = 3y$

(v) $2x = -5y$ (vi) $3x + 2 = 0$

(vii) $y - 2 = 0$ (viii) $5 = 2x$.

Sol.

(i) $2x + 3y = 9.35$ in the form of $ax + by + c = 0$ is expressed as

$$2x + 3y - 9.35 = 0$$

[Changing 9.35 to LHS]

$$\Rightarrow 2x + 3y + (-9.35) = 0$$

On comparing the coefficients of x and y and also constant terms, we observe that

$$a = 2, b = 3 \text{ and } c = -9.35$$

(ii) $x - \frac{y}{5} - 10 = 0$ in the form of $ax + by + c = 0$ is expressed as

$$1.x + \left(-\frac{1}{5}\right)y + (-10) = 0$$

On comparing the coefficients of x and y and also constant terms, we observe that

$$a = 1, b = -\frac{1}{5} \text{ and } c = -10$$

(iii) $-2x + 3y = 6$ in the form of $ax + by + c = 0$ is written as

$$-2x + 3y - 6 = 0 \quad \text{[Changing 6 to LHS]}$$

$$\Rightarrow -2x + 3y + (-6) = 0$$

On comparing the coefficients of x and y and also constant terms, we observe that

$$a = -2, b = 3 \text{ and } c = -6$$

(iv) $x = 3y$ in the form of $ax + by + c = 0$ is written as

$$x - 3y = 0$$

$$\Rightarrow 1.x + (-3)y + 0 = 0$$

On comparing the coefficients of x and y and also constant terms, we observe that

$$a = 1, b = -3 \text{ and } c = 0.$$

(v) $2x = -5y$ in the form of

$$ax + by + c = 0 \text{ is written as } 2x + 5y = 0$$

[Changing $-5y$ to LHS]

$$\Rightarrow 2x + 5y + 0 = 0$$

On comparing the coefficients of x and y and also constant terms, we observe that

$$a = 2, b = 5 \text{ and } c = 0$$

(vi) $3x + 2 = 0$ in the form of $ax + by + c = 0$ is written as

$$3x + 0.y + 2 = 0$$

On comparing the coefficients of x and y and also constant terms, we observe that

$$a = 3, b = 0 \text{ and } c = 2.$$

(vii) $y - 2 = 0$ in the form of $ax + by + c = 0$ is written as

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

On comparing the coefficients of x and y and also constant terms, we observe that

$$a = 0, b = 1 \text{ and } c = -2.$$

(viii) $5 = 2x$ in the form of $ax + by + c = 0$ is written as

$$5 - 2x = 0$$

$$\Rightarrow -2x + 0.y + 5 = 0$$

On comparing the coefficients of x and y also constant terms, we observe that

$$a = -2, b = 0 \text{ and } c = 5$$

SELF PRACTICE 4.1

1. Express the following linear equations in the form $ax + by + c = 0$ and indicate the values of a , b and c in each case.

(a) $\sqrt{3} = 2x + \sqrt{3}y$ (b) $y = \frac{x}{2}$

(c) $u + v = 7$ (d) $-3x - 5y = -2$

(e) $2x = 17 + 5y$ (f) $3s + t = 5$

2. Write the following word problems in the form of linear equation in two variables.

(a) During a football match total runs scored by two players are 100.

(b) Cost of one notebook is 5 less than half of the cost of one book.

(c) 7 kg of oranges and 2 kg of apples cost ₹280.

(d) Cost of 1 tonne AC is ₹200 more than four times the cost of a cooler.

Solution of a Linear Equation

TEXTBOOK EXERCISE 4.2

Q. 1. Which one of the following option is true, and why?

$y = 3x + 5$ has

- (i) a unique solution
- (ii) only two solutions
- (iii) infinitely many solutions.

Sol. Statement (iii) is true because for every value of x , there is corresponding value of y and vice-versa.

Thorough justification:

Let assume that

(i) $x = 0$ then $y = 3 \times 0 + 5$

$\Rightarrow y = 0 + 5$

$\Rightarrow y = 5$

So, $x = 0, y = 5$ is a solution.

(ii) $x = 1$; then $y = 3 \times 1 + 5$

$\Rightarrow y = 3 + 5$

$\Rightarrow y = 8$

So, $x = 1, y = 8$ is also a solution.

(iii) $x = -2$ then $y = 3(-2) + 5$

$\Rightarrow y = -6 + 5$

$\Rightarrow y = -1$

So, $x = -2, y = -1$ is also a solution.

Similarly, we can find infinitely many solutions of given equation as we wish simply by putting the value of x (or y) and get the corresponding value of y (or x).

Q. 2. Write four solutions for each of the following equations:

(i) $2x + y = 7$

(ii) $\pi x + y = 9$

(iii) $x = 4y$

Sol.

(i) $2x + y = 7$

We can write equation as:

$y = 7 - 2x$

When $x = 0$;

$y = 7 - 2 \times 0 \Rightarrow y = 7 - 0 \Rightarrow y = 7$

When $x = 1$;

$y = 7 - 2 \times 1 \Rightarrow y = 7 - 2 \Rightarrow y = 5$

When $x = 2$;

$y = 7 - 2 \times 2 \Rightarrow y = 7 - 4 \Rightarrow y = 3$

When $x = -1$;

$y = 7 - 2 \times (-1) \Rightarrow y = 7 + 2 \Rightarrow y = 9$

So, four of the infinitely many solutions of the equation $2x + y = 7$ are $(0, 7), (1, 5), (2, 3)$ and $(-1, 9)$.

(ii) $\pi x + y = 9$

We can write the equation as:

$y = 9 - \pi x$

When $x = 0$;

$y = 9 - \pi \times 0 \Rightarrow y = 9 - 0 \Rightarrow y = 9$

When $x = 2$;

$y = 9 - \pi \times 2 \Rightarrow y = 9 - 2\pi$

When $x = \frac{9}{\pi}$;

$y = 9 - \pi \times \frac{9}{\pi} \Rightarrow y = 9 - 9 \Rightarrow y = 0$

When $x = -1$;

$y = 9 - \pi \times (-1) \Rightarrow y = 9 + \pi \Rightarrow y = 9 + \pi$

So, four of the infinitely many solutions of the equation, $\pi x + y = 9$ are $(0, 9), (2, 9 - 2\pi),$

$(\frac{9}{\pi}, 0)$ and $(-1, 9 + \pi)$.

(iii) $x = 4y$

$\Rightarrow y = \frac{x}{4}$

when $x = 0$; $y = \frac{0}{4} \Rightarrow y = 0$

when $x = 4$; $y = \frac{4}{4} \Rightarrow y = 1$

when $x = -4$; $y = \frac{-4}{4} \Rightarrow y = -1$

When $x = 2$; $y = \frac{2}{4} \Rightarrow y = \frac{1}{2}$

Hence, four of the infinitely many solutions of the equation $x = 4y$ are $(0, 0), (4, 1), (-4, -1)$ and $(2, \frac{1}{2})$.

Q. 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) $(1, 1)$

Sol. (i) Put $x = 0$ and $y = 2$ in equation

$x - 2y = 4$

LHS, $x - 2y = 0 - 2 \times 2 = 0 - 4 = -4$

RHS = 4

Clearly, LHS \neq RHS

$\therefore (0, 2)$ is not the solution of equation $x - 2y = 4$.

(ii) Put $x = 2$ and $y = 0$ in equation

$x - 2y = 4$

LHS, $x - 2y = 2 - 2 \times 0$

$$= 2 - 0 = 2$$

$$\text{RHS} = 4$$

Clearly $\text{LHS} \neq \text{RHS}$

$\therefore (2, 0)$ is not the solution of $x - 2y = 4$.

(iii) Put $x = 4$ and $y = 0$ in the equation
 $x - 2y = 4$

$$\text{LHS, } x - 2y = 4 - 2 \times 0 = 4 - 0 = 4$$

$$\text{RHS} = 4$$

Clearly, $\text{LHS} = \text{RHS}$

$\therefore (4, 0)$ is the solution of equation $x - 2y = 4$.

(iv) Put $x = \sqrt{2}$ and $y = 4\sqrt{2}$ in the equation
 $x - 2y = 4$

$$\text{LHS, } x - 2y = \sqrt{2} - 2 \times 4\sqrt{2}$$

$$= \sqrt{2} - 8\sqrt{2}$$

$$= -7\sqrt{2}$$

$$\text{RHS} = 4$$

$$\text{LHS} \neq \text{RHS}$$

$\therefore (\sqrt{2}, 4\sqrt{2})$ is not the solution of equation
 $x - 2y = 4$.


(v) Put $x = 1, y = 1$ in the equation $x - 2y = 4$

$$\text{LHS, } x - 2y = 1 - 2 \times 1 = 1 - 2 = -1$$

$$\text{RHS} = 4$$

Clearly, $\text{LHS} \neq \text{RHS}$

$\therefore (1, 1)$ is not the solution of equation
 $x - 2y = 4$.

 **Q. 4. Find the value of k , if $x = 2, y = 1$ is a solution of the equation $2x + 3y = k$.**

Sol. If $x = 2, y = 1$ is the solution of equation $2x + 3y = k$, then it definitely satisfy the equation.

$$\therefore 2 \times 2 + 3 \times 1 = k$$

(Substituting $x = 2, y = 1$ in the equation)

$$\Rightarrow 4 + 3 = k$$

$$\Rightarrow 7 = k$$

$$\text{or } k = 7$$

Hence, required value of k is 7.

SELF PRACTICE 4.2

- Write two solutions of the following equations:
 - $x - 4y = 0$
 - $\pi x + y = 9$
- Check which of the following are solutions of the equation $x - 2y = 4$ and which are not.
 - $(\sqrt{2}, 4\sqrt{2})$
 - $(1, 1)$
 - $(2, 0)$
 - $(0, -2)$

3. Find which of the following equations have $x = 4, y = 1$ as a solution.

$$(i) x + 3y = 7$$

$$(ii) 3x - 4y = 8$$

$$(iii) 2x + 5y = 10$$

$$(iv) 5x - 2y = 7$$

4. Find the value of k such that $(2, 1)$ is the solution of equation $2x + ky = 8$.

5. Find the value of k so that $x = -1, y = -1$ is a solution of linear equation $9kx + 12ky = 63$.

6. Find four solutions of $2x - y = 4$.

7. If $x = 2k - 1$ and $y = k$ is a solution of equation $3x - 5y = 7$. Find the value of k .

8. Express x in terms of y given that $\frac{x}{3} + 2y = 5$. Check whether $(3, 2)$ is a solution of given equation.

9. Find the values of λ , if $p = 1$ and $q = 6$ is a solution of equation $8p - \lambda q + \lambda^2 = 0$.

10. Find the value of a so that each of the equations may have $x = -4$ and $y = 1$ as a solution.

$$(i) 9ax + 12ay = 63$$

$$(ii) \frac{7}{a}x + y - 11 = 0$$

$$(iii) 3ax - 7y = 5$$

$$(iv) 2x - \frac{y}{a} = 2$$

$$(v) -5x + 2ay = -8$$

11. Which of the following options is true and why? $y = 3x + 5$

(i) no solution

(ii) infinitely many solutions

(iii) only two solutions

(iv) a unique solution

12. If a linear equation has solutions $(-2, 2), (0, 0)$ and $(2, -2)$ then it is of the form.

$$(a) y - x = 0$$


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

$$(c) -2x + y = 0$$

$$(d) x + y = 0$$

Graph of a Linear Equation in Two Variables

TEXTBOOK EXERCISE 4.3

 **Q. 1. Draw the graph of each of the following linear equations in two variables:**

$$(i) x + y = 4$$

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

$$(iii) y = 3x$$

$$(iv) 3 = 2x + y$$

Sol. (i) $x + y = 4 \Rightarrow y = 4 - x$

Table showing the values of y corresponding to the values of x is as follows:

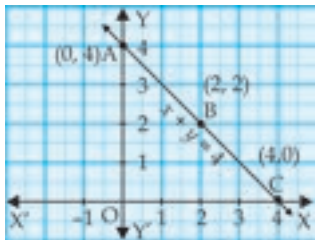
x	0	2	4
y	4	2	0
(x, y)	A (0, 4)	B (2, 2)	C (4, 0)

Plot the points A(0, 4), B(2, 2) and C(4, 0) on a graph paper. Join these points and obtain a line.

Scale chosen:

On X-axis: 5 divisions = 1 unit

On Y-axis: 5 divisions = 1 unit.



(ii) $x - y = 2 \Rightarrow -y = 2 - x$
 or $y = x - 2$

Table showing the values of y corresponding to the values of x is as follows:

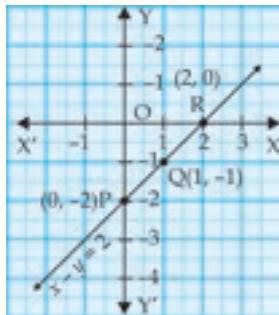
x	0	1	2
y	-2	-1	0
(x, y)	P(0, -2)	Q(1, -1)	R(2, 0)

Plot the points P(0, -2), Q(1, -1) and R(2, 0) on a graph paper. Join these points and obtain a line.

Scale chosen:

On X-axis: 5 divisions = 1 unit

On Y-axis: 5 divisions = 1 unit



(iii) $y = 3x$

Table showing the values of y corresponding to the values of x is as follows:

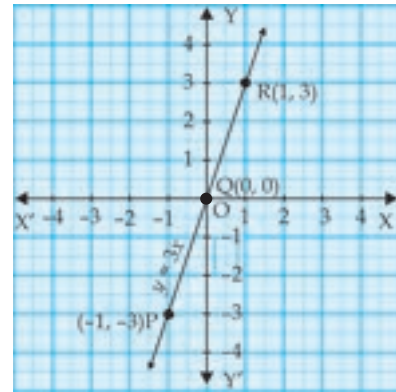
x	-1	0	1
y	-3	0	3
(x, y)	P(-1, -3)	Q(0, 0)	R(1, 3)

Plot the points P(-1, -3), Q(0, 0) and R(1, 3) on a graph paper. Join these points and obtain a line.

Scale chosen:

On X-axis: 5 divisions = 1 unit

On Y-axis: 5 divisions = 1 unit



(iv) $3 = 2x + y$
 $\Rightarrow 3 - 2x = y$
 or $y = 3 - 2x$

Table showing the values of y corresponding to the values of x is as follows:

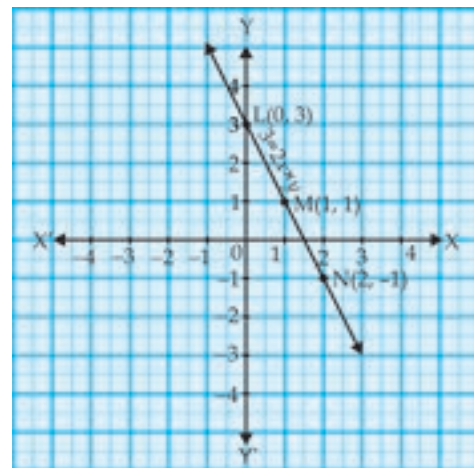
x	0	1	2
y	3	1	-1
(x, y)	L(0, 3)	M(1, 1)	N(2, -1)

Plot the points L(0, 3), M(1, 1) and N(2, -1) on a graph paper. Join these points and obtain a line.

Scale chosen:

On X-axis: 5 divisions = 1 unit

On Y-axis: 5 divisions = 1 unit



Q. 2. Give the equations of two lines passing through (2, 14). How many more such lines are there, and why?

Sol. As we know that through a point, infinitely many lines can be drawn. So out of these; any two linear equations which are satisfied by the point (2, 14) are as follows:

Let $ax + by = c$ be linear equation in x and y which is satisfied by the point (2, 14).

It means (2, 14) lie on it:

$$\therefore 2a + 14b = c$$

Substituting the value of c in equation, we get:

$$ax + by = 2a + 14b$$

$$\Rightarrow a(x - 2) + b(y - 14) = 0$$

$$\Rightarrow b(y - 14) = -a(x - 2)$$

$$\Rightarrow \frac{y - 14}{x - 2} = \frac{-a}{b}$$

By using different values of a and b , we can find the infinitely many required equations.

If $a = 2, b = 1$

then $\frac{y - 14}{x - 2} = \frac{-2}{1}$

$$\Rightarrow y - 14 = -2x + 4$$

$$\Rightarrow 2x + y = 18$$

If $a = 7, b = -1$

then $\frac{y - 14}{x - 2} = -\left(\frac{7}{-1}\right)$

$$\Rightarrow y - 14 = 7x - 14$$

$$\Rightarrow 7x - y = 0$$

Q. 3. If the point $(3, 4)$ lies on the graph of the equation $3y = ax + 7$, Find the value of a .

Sol. Given that point $(3, 4)$ lie on the graph corresponding to:

$$3y = ax + 7$$

So, it satisfy this linear equation.

There by

$$3 \times 4 = a \times 3 + 7$$

$$\Rightarrow 12 = 3a + 7$$

$$\Rightarrow 12 - 7 = 3a$$

$$\Rightarrow 5 = 3a$$

or $3a = 5$

$$\Rightarrow a = \frac{5}{3}$$

Hence, required value of a is $\frac{5}{3}$.

Justification: Substitute, $a = \frac{5}{3}$ in the given equation, we get

$$3y = \frac{5}{3}x + 7$$

$$\Rightarrow 9y = 5x + 21$$

$$\Rightarrow y = \frac{5x + 21}{9}$$

Table showing the values of y corresponding to the values of x is as follows:

x	-6	12
y	-1	9
(x, y)	P(-6, -1)	Q(12, 9)

Plot the points P(-6, -1) and Q(12, 9) on a graph paper. Join these points and obtain a line. From the graph, we observe that point $(3, 4)$ lies on the line. Hence it satisfies the equation,

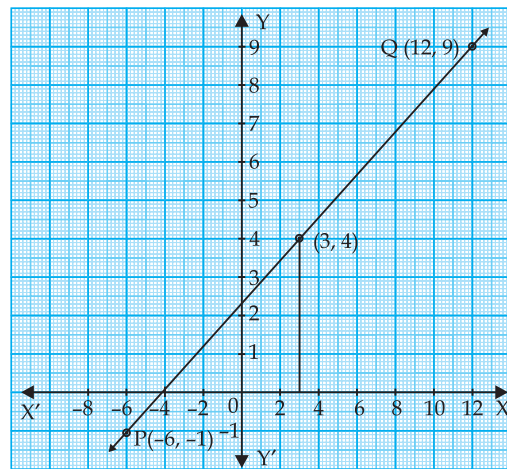
$$3y = \frac{5}{3}x + 7$$

Therefore, found value of a is $\frac{5}{3}$. [Hence justified]

Scale chosen:

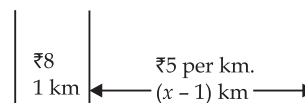
On X-axis: 5 divisions = 2 units

On Y-axis: 5 divisions = 1 unit



Q. 4. 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 kilometre. Taking the distance covered as x km and total fare as ₹ y , write a linear equation for this information, and draw its graph.

Sol.

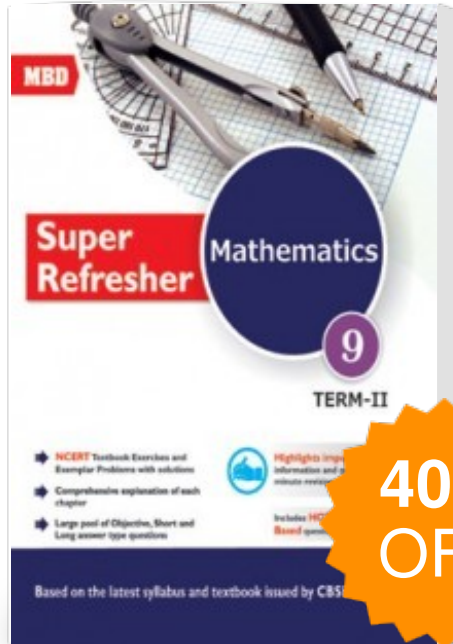


Taking total distance travelled as x km.

For first kilometre, fare = ₹8

For subsequent distance *i.e.*, for remaining distance;

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