

SAMPLE CONTENT

PERFECT 2.0



MATHEMATICS

PART I

BASED ON LATEST TEXTBOOK & PAPER PATTERN

Engaging Features

- ▶ Learning Outcomes
- ▶ Challenging Questions
- ▶ Smart Check
- ▶ Caution

Seating Pattern :
Arithmetic Progression
in Rows

Quadratic
Equations

STD. X

Eng. & Semi Eng. Med.

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PERFECT 2.0

Mathematics (Part – I)

STD. X

Eng. & Semi Eng. Med.

Salient Features

- Complete coverage of Textual Exercise Questions and Intext Questions
- Tentative marks allocation for all problems
- Relevant Previous Years' Board Questions (**March 2019 to July 2024**)
- Model Question Paper** designed as per the latest paper pattern
- Latest Board Question Paper**
- Each chapter includes:**
 - Theory with In-text and Activity/Project-based questions
 - Practice Sets and Problem Set with solutions
 - A dedicated section for Activities, One Mark Questions and Additional Problems for Practice
- Includes Important Features & Tools** to aid holistic learning experience

Scan the adjacent QR Code to Explore our **SCERT-approved Mathematics Challenging Questions Book**, highly appreciated for its effective practice and guidance!



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Preface

The idea behind creating *Perfect 2.0 series* is to make knowledge absorption and comprehension easier. The book not only ensures academic success but also makes the journey of learning enjoyable and worthwhile.

Perfect 2.0 Mathematics Part – I, Std. X is more than just a book; it's a transformative tool designed to elevate students' learning experiences. Aligned with the latest curriculum and board exam pattern, this book is crafted to help students achieve excellence in their studies.

To support our goal, we have incorporated innovative features. This book is a combination of Exam Prep Masters and Learning Aids.

- **Exam Prep Masters includes** Learning Outcomes, Chapter Assessments, Challenging Questions, Model Question Paper, Latest Board Questions and QR Codes
- **Learning Aids includes** A Flashback to Fundamentals, Illustrative Example, Caution, Smart Check and Important Formulae

Each chapter is thoughtfully structured to build strong foundations and make even the most complex concepts easier to understand. **Our mission is simple: to transform lives through learning** and help students reach their fullest potential.

We're confident this book will be your trusted companion as you aim for excellence.

We'd love to hear from you—whether it's feedback, suggestions, or just your thoughts. Please reach out to us at: mail@targetpublications.org

A book affects eternity; one can never tell where its influence stops.

Publisher

Edition: Fifth

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Important Features & Tools

1

Stay exam-ready with: **EXAM PREP MASTERS**

Learning Outcomes

⇒ Well-defined objectives to measure your understanding and mastery, while maintaining objectivity and ensuring thorough comprehension.

Chapter Assessment

⇒ Evaluate your understanding with targeted chapter-wise tests.

Challenging Questions

⇒ Separate Section of Critical Questions to Boost Your Board Exam Score

Model Question Paper

⇒ Familiarizes students with the types of questions asked in board exams.

Latest Board Questions

⇒ Features questions from Board Question Papers up to July 2024.

QR Codes

⇒ Unlock access to Solution to Additional Problems for Practice, Solution to Model Question Paper, Chapter Assessments with solutions, and the Latest Board Question Paper with solution.

2

Broaden Your Perspective with: **LEARNING AIDS**

A Flashback to Fundamentals

⇒ Recap of important concepts covered in earlier standards.

Illustrative Example

⇒ Step-by-step explanation of the thinking process involved in solving problems.

Caution

⇒ Avoid common mistakes with key tips.

Smart Check

⇒ Cross verify the answer.

Important Formulae

⇒ Ace Your Last-Minute Revision

Evaluation Scheme

Academic year 2019 - 2020 and onwards

Mathematics - Part I	40 Marks	Written Examination	Time: 2 hours
Mathematics - Part II	40 Marks	Written Examination	Time: 2 hours
Internal Evaluation	20 Marks		
Total	100 Marks		

The scheme of internal evaluation will be as follows:

- 2 Homework assignments [one based on Mathematics Part – I and one based on Mathematics Part – II (5 Marks each) – 10 Marks]
- Practical Exam / MCQ Test (Part I – 10 Marks and Part II – 10 Marks) - These 20 marks are to be converted into 10 Marks.

Paper Pattern

Question No.	Type of Questions	Total Marks	Marks with option
1.	(A) Solve 4 out of 4 MCQ (1 mark each)	04	04
	(B) Solve 4 out of 4 subquestions (1 mark each)	04	04
2.	(A) Solve 2 activity based subquestions out of 3 (2 marks each)	04	06
	(B) Solve any 4 out of 5 subquestions (2 marks each)	08	10
3.	(A) Solve 1 activity based subquestion out of 2 (3 marks each)	03	06
	(B) Solve any 2 out of 4 subquestions (3 marks each)	06	12
4.	Solve any 2 out of 3 subquestions (4 marks each) [Out of textbook]	08	12
5.	Solve any 1 out of 2 subquestions (3 marks each)	03	06
	Total Marks	40	60

The division of marks in question papers as per objectives will be as follows:

Distribution of Marks		Objectives	Maths – 1
Easy Questions	40%	Knowledge	20%
Medium Questions	40%	Understanding	30%
Difficult Questions	20%	Application	40%
		Skill	10%

Topic-wise weightage of marks

S. No.	Topic Name	Marks with option
1	Linear Equations in Two Variables	12
2	Quadratic Equations	12
3	Arithmetic Progression	08
4	Financial Planning	08
5	Probability	08
6	Statistics	12
	Total	60

Note: In the topic-wise weightage of marks given in the above table, flexibility of maximum 2 marks is permissible.

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	To access the latest Board Question Paper with Solution, scan the given QR Code in <i>Quill - The Padhai App</i> .	

- Note:**
- Smart check is indicated by ✓ symbol.
 - Solved examples from textbook are indicated by “+”.
 - Intext and Activity/Project based questions from the textbook are indicated by “#”.



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- # **Activity:** $x^2 + 3x - 5$, $3x^2 - 5x$, $5x^2$; Write the polynomials in the index form. Observe the coefficients and fill in the boxes.

(Textbook pg. no. 31)

Ans:

Index form of the given polynomials:

$$x^2 + 3x - 5, 3x^2 - 5x + 0, 5x^2 + 0x + 0$$

- Coefficients of x^2 are $\boxed{1}$, $\boxed{3}$ and $\boxed{5}$ respectively, and these coefficients are non zero.
- Coefficients of x are 3 , $\boxed{-5}$ and $\boxed{0}$ respectively.
- Constant terms are $\boxed{-5}$, $\boxed{0}$ and $\boxed{0}$ respectively.
Here, constant terms of second and third polynomial is zero.

Let's Learn

Standard form of quadratic equation

Learning Outcome

Gets acquainted with the concept of the standard form of quadratic equations.

The equation involving one variable with all indices as whole numbers and having 2 as the maximum index of the variable is called the quadratic equation.

The equation $ax^2 + bx + c = 0$ is called the general form or standard form of the quadratic equation.

In $ax^2 + bx + c = 0$, a , b , c are real numbers and $a \neq 0$.

Activity

- # **Activity:** Complete the following table.

(Textbook pg. no. 31)

Quadratic Equation	General form	a	b	c
$x^2 - 4 = 0$	$x^2 + 0x - 4 = 0$	1	0	-4
$y^2 = 2y - 7$	...	...	...	...
$x^2 + 2x = 0$	...	...	...	...

Ans:

Quadratic Equation	General form	a	b	c
$x^2 - 4 = 0$	$x^2 + 0x - 4 = 0$	1	0	-4
$y^2 = 2y - 7$	$y^2 - 2y + 7 = 0$	1	-2	7
$x^2 + 2x = 0$	$x^2 + 2x + 0 = 0$	1	2	0

- # **Example:** Decide which of the following are quadratic equations? (Textbook pg. no. 31)

- $3x^2 - 5x + 3 = 0$
- $9y^2 + 5 = 0$
- $m^3 - 5m^2 + 4 = 0$
- $(l + 2)(l - 5) = 0$

Solution:

- In the equation $3x^2 - 5x + 3 = 0$, x is the only variable and maximum index of the variable is 2.
 $\therefore$ It is a quadratic equation.
- In the equation $9y^2 + 5 = 0$, y is the only variable and maximum index of the variable is $\boxed{2}$.
 $\therefore$ It **is** a quadratic equation.

- In the equation $m^3 - 5m^2 + 4 = 0$, m is the only variable and maximum index of the variable is not 2.

$\therefore$ It **is not** a quadratic equation.

$$\text{iv. } (l + 2)(l - 5) = 0$$

$$\therefore l(l - 5) + 2(l - 5) = 0$$

$$\therefore l^2 - 5l + 2l - 10 = 0$$

$$\therefore l^2 - 3l - 10 = 0.$$

In this equation l is the only variable and maximum index of the variable is $\boxed{2}$.

$\therefore$ It **is** a quadratic equation.

Let's Learn

Roots of a quadratic equation

Learning Outcome

Forms a comprehensive understanding of the roots of quadratic equations.

The values of variable which satisfy the quadratic equation $ax^2 + bx + c = 0$, (i.e. the value for which both the sides of equation are equal) are called roots (solutions) of the quadratic equation.

Illustrative Example

1. For the quadratic equation $2x^2 - x - 10 = 0$, check whether

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

are roots or not?

Solution:

The given equation is

$$2x^2 - x - 10 = 0 \quad \dots(i)$$

- Putting $x = -2$ in L.H.S. of equation (i), we get

$$\text{L.H.S.} = 2(-2)^2 - (-2) - 10$$

$$= 2(4) + 2 - 10$$

$$= 8 + 2 - 10$$

$$= 0$$

$\therefore$ L.H.S. = R.H.S.

$\therefore$ **-2 is the root of the given quadratic equation.**

- Putting $x = \frac{-5}{2}$ in L.H.S. of equation (i), we get

$$\text{L.H.S.} = 2\left(\frac{-5}{2}\right)^2 - \left(\frac{-5}{2}\right) - 10$$

$$= 2\left(\frac{25}{4}\right) + \frac{5}{2} - 10$$

$$= \frac{25}{2} + \frac{5}{2} - 10 = \frac{30}{2} - 10$$

$$= 15 - 10 = 5$$

$\therefore$ L.H.S. $\neq$ R.H.S.

$\therefore$ **$\frac{-5}{2}$ is not the root of the given quadratic equation.**



Quadratic equations are a type of polynomial with numerous applications in fields like engineering, architecture, sports etc. The shape of an arch can be described using quadratic equation. In this chapter, we are introduced to quadratic equations and various methods of solving them. Furthermore, we will learn about the nature of roots, relation between roots and coefficients and finally some of their applications in daily life situations.

Chapter is allotted weightage of **12 marks** with options.



Let's Study

- Quadratic Equations : Introduction
- Methods of solving Quadratic Equations
- Nature of roots of a Quadratic Equation
- Relation between the Roots and the Coefficients
- Applications of Quadratic Equations

Let's Recall



A FLASHBACK TO FUNDAMENTALS

Here are some important key concepts which you have studied in **Std. IX, Part - I (Chapter - 3)**

Polynomial:

$a_n x^n + a_{n-1} x^{n-1} + \dots + a_2 x^2 + a_1 x + a_0$ is a polynomial in x with degree n , where $a_0, a_1, a_2, a_{n-1}, a_n$ are coefficients and $a_n \neq 0$. It is denoted by $p(x)$.

Example:

$$p(x) = 5x^5 + \frac{3}{2}x^4 + x^3 - x^2 + 1$$

Types of polynomials in one variable (based on degree)

- Linear polynomial (Degree: 1)
Standard form: $ax + b$ ($a \neq 0$)

- Quadratic polynomial (Degree: 2)
Standard form: $ax^2 + bx + c$ ($a \neq 0$)
- Cubic polynomial (Degree: 3)
Standard form: $ax^3 + bx^2 + cx + d$ ($a \neq 0$)
where, a, b, c and d are coefficients.

Activity

Activity: Classify the following polynomials as linear and quadratic. (Textbook pg. no. 30)

- $5x + 9$
- $x^2 + 3x - 5$
- $3x - 7$
- $3x^2 - 5x$
- $5x^2$

Ans:

Linear polynomials

$$5x + 9, 3x - 7$$

Quadratic polynomials

$$x^2 + 3x - 5, 3x^2 - 5x, 5x^2$$



Following steps are to be followed:

Step 1: Convert the equation in the standard form $ax^2 + bx + c = 0$

Step 2: Convert the coefficient of x^2 to 1.
This is to be done by dividing by co-efficient of x^2 .

Step 3: Find suitable third term so that it becomes complete square. To do that, equate the equation with $(x + a)^2$. Solve and find the value of a and k .

Step 4: Add and subtract value of k . Solve and find the answer.

Illustrative Example

Solve the quadratic equation $4x^2 - 6x = 3$ by completing the square method.

Step 1: $4x^2 - 6x = 3$

$$\therefore 4x^2 - 6x - 3 = 0$$

Step 2: Divide both the sides by 4.

$$\therefore x^2 - \frac{3}{2}x - \frac{3}{4} = 0 \quad \dots(i)$$

Step 3: If $x^2 - \frac{3}{2}x + k = (x + a)^2$, then

$$\therefore x^2 - \frac{3}{2}x + k = x^2 + 2ax + a^2$$

Comparing the coefficients of x and the constant terms, we get

$$-\frac{3}{2} = 2a \text{ and } k = a^2$$

$$\therefore a = \frac{-3}{4} \text{ and } k = \left(\frac{-3}{4}\right)^2 = \frac{9}{16}$$

Step 4: Add and subtract the value of k on L.H.S. of the equation (i) and solve.

$$x^2 - \frac{3}{2}x + \frac{9}{16} - \frac{9}{16} - \frac{3}{4} = 0$$

$$\therefore \left(x - \frac{3}{4}\right)^2 = \frac{21}{16}$$

Taking square root of both sides, we get

$$x - \frac{3}{4} = \pm \frac{\sqrt{21}}{4}$$

$$\therefore x - \frac{3}{4} = \frac{\sqrt{21}}{4} \text{ or } x - \frac{3}{4} = \frac{-\sqrt{21}}{4}$$

$$\therefore x = \frac{3 + \sqrt{21}}{4} \text{ or } x = \frac{3 - \sqrt{21}}{4}$$

The roots of the given quadratic equation are $\frac{3 + \sqrt{21}}{4}$ and $\frac{3 - \sqrt{21}}{4}$.



REMEMBER THIS

When equation is in the form $x^2 + bx + c = 0$, it can be written as

$$x^2 + bx + \left(\frac{b}{2}\right)^2 - \left(\frac{b}{2}\right)^2 + c = 0$$

$$\text{i.e., } \left(x + \frac{b}{2}\right)^2 = \left(\frac{b}{2}\right)^2 - c$$

Practice Set 2.3

Solve the following quadratic equations by completing the square method. [3 Marks each]

1. $x^2 + x - 20 = 0$

2. $x^2 + 2x - 5 = 0$

3. $m^2 - 5m = -3$

4. $9y^2 - 12y + 2 = 0$

5. $2y^2 + 9y + 10 = 0$

6. $5x^2 = 4x + 7$

Solution:

1. $x^2 + x - 20 = 0$

If $x^2 + x + k = (x + a)^2$, then

$$x^2 + x + k = x^2 + 2ax + a^2$$

Comparing the coefficients, we get

$$1 = 2a \text{ and } k = a^2$$

$$\therefore a = \frac{1}{2} \text{ and } k = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$$

$$\text{Now, } x^2 + x - 20 = 0$$

Adding and subtracting $\frac{1}{4}$, we get

$$\therefore x^2 + x + \frac{1}{4} - \frac{1}{4} - 20 = 0$$

$$\therefore \left(x + \frac{1}{2}\right)^2 - \left(\frac{81}{4}\right) = 0$$

$$\therefore \left(x + \frac{1}{2}\right)^2 = \frac{81}{4}$$

$$\therefore x + \frac{1}{2} = \pm \frac{9}{2} \quad \dots [\text{Taking square root of both sides}]$$

$$\therefore x + \frac{1}{2} = \frac{9}{2} \text{ or } x + \frac{1}{2} = -\frac{9}{2}$$

$$\therefore x = \frac{9}{2} - \frac{1}{2} = \frac{8}{2} = 4 \text{ or } x = -\frac{9}{2} - \frac{1}{2} = -\frac{10}{2} = -5$$

The roots of the given quadratic equation are 4 and -5.



CAUTION

While taking square root, consider both positive and negative values. If only positive value is considered, you will get only one value of x .

A quadratic equation has two roots.

2. $x^2 + 2x - 5 = 0$

If $x^2 + 2x + k = (x + a)^2$, then

$$x^2 + 2x + k = x^2 + 2ax + a^2$$

Comparing the coefficients, we get

$$2 = 2a \text{ and } k = a^2$$

$$\therefore a = 1 \text{ and } k = (1)^2 = 1$$

$$\text{Now, } x^2 + 2x - 5 = 0$$

Adding and subtracting 1, we get

$$\therefore x^2 + 2x + 1 - 1 - 5 = 0$$

$$\therefore (x + 1)^2 - 6 = 0$$

$$\therefore (x + 1)^2 = 6$$

$$\therefore x + 1 = \pm \sqrt{6} \quad \dots [\text{Taking square root of both sides}]$$

$$\therefore x + 1 = \sqrt{6} \text{ or } x + 1 = -\sqrt{6}$$

$$\therefore x = \sqrt{6} - 1 \text{ or } x = -\sqrt{6} - 1$$

The roots of the given quadratic equation are $\sqrt{6} - 1$ and $-\sqrt{6} - 1$.



ii. $(x-1)^2 = 2x + 3$
 $\therefore x^2 - 2x + 1 = 2x + 3$
 $\therefore x^2 - 2x + 1 - 2x - 3 = 0$
 $\therefore x^2 - 4x - 2 = 0$
 Comparing the above equation with $ax^2 + bx + c = 0$, we get
 $a = 1, b = -4, c = -2$

iii. $x^2 + 5x = -(3-x)$
 $\therefore x^2 + 5x = -3 + x$
 $\therefore x^2 + 5x - x + 3 = 0$
 $\therefore x^2 + 4x + 3 = 0$
 Comparing the above equation with $ax^2 + bx + c = 0$, we get
 $a = 1, b = 4, c = 3$

iv. $3m^2 = 2m^2 - 9$
 $\therefore 3m^2 - 2m^2 + 9 = 0$
 $\therefore m^2 + 9 = 0$
 $\therefore m^2 + 0m + 9 = 0$
 Comparing the above equation with $am^2 + bm + c = 0$, we get
 $a = 1, b = 0, c = 9$

v. $p(3 + 6p) = -5$
 $\therefore 3p + 6p^2 = -5$
 $\therefore 6p^2 + 3p + 5 = 0$
 Comparing the above equation with $ap^2 + bp + c = 0$, we get
 $a = 6, b = 3, c = 5$

vi. $x^2 - 9 = 13$
 $\therefore x^2 - 9 - 13 = 0$
 $\therefore x^2 - 22 = 0$
 $\therefore x^2 + 0x - 22 = 0$
 Comparing the above equation with $ax^2 + bx + c = 0$, we get
 $a = 1, b = 0, c = -22$

4. Determine whether the values given against each of the quadratic equation are the roots of the equation. [2 Marks each]

i. $x^2 + 4x - 5 = 0; x = 1, -1$
 ii. $2m^2 - 5m = 0; m = 2, \frac{5}{2}$

Solution:

i. The given equation is $x^2 + 4x - 5 = 0$... (i)
 Putting $x = 1$ in L.H.S. of equation (i), we get
 L.H.S. $= (1)^2 + 4(1) - 5 = 1 + 4 - 5 = 0$
 $\therefore$ L.H.S. = R.H.S.
 $\therefore$ **$x = 1$ is the root of the given quadratic equation.**
 Putting $x = -1$ in L.H.S. of equation (i), we get
 L.H.S. $= (-1)^2 + 4(-1) - 5 = 1 - 4 - 5 = -8$
 $\therefore$ L.H.S. $\neq$ R.H.S.
 $\therefore$ **$x = -1$ is not the root of the given quadratic equation.**

ii. The given equation is $2m^2 - 5m = 0$... (i)
 Putting $m = 2$ in L.H.S. of equation (i), we get
 L.H.S. $= 2(2)^2 - 5(2)$
 $= 2(4) - 10$
 $= 8 - 10$
 $= -2$

$\therefore$ L.H.S. $\neq$ R.H.S.
 $\therefore$ **$m = 2$ is not the root of the given quadratic equation.**

Putting $m = \frac{5}{2}$ in L.H.S. of equation (i), we get

L.H.S. $= 2\left(\frac{5}{2}\right)^2 - 5\left(\frac{5}{2}\right)$
 $= 2\left(\frac{25}{4}\right) - \frac{25}{2}$
 $= \frac{25}{2} - \frac{25}{2}$
 $= 0$

$\therefore$ L.H.S. = R.H.S.
 $\therefore$ **$m = \frac{5}{2}$ is the root of the given quadratic equation.**

✓ 5. Find k if $x = 3$ is a root of equation $kx^2 - 10x + 3 = 0$. [July '19] [2 Marks]

Solution:

$x = 3$ is the root of the equation $kx^2 - 10x + 3 = 0$.

Putting $x = 3$ in the given equation, we get

$k(3)^2 - 10(3) + 3 = 0$

$\therefore 9k - 30 + 3 = 0$

$\therefore 9k - 27 = 0$

$\therefore 9k = 27$

$\therefore k = \frac{27}{9}$

$\therefore k = 3$



SMART CHECK

In order to find out if our answer is correct or not for these type of equations, substitute the value of k in the equation and form the quadratic equation. Find the roots of quadratic equation.

In this case if 3 is one of the root of the given quadratic equation then our answer is correct.

Put $k = 3$ in the equation $kx^2 - 10x + 3 = 0$,

$\therefore 3x^2 - 10x + 3 = 0$

$\therefore 3x^2 - 9x - x + 3 = 0$

$\therefore (3x - 1)(x - 3) = 0$

$\therefore x = \frac{1}{3} \quad \text{or} \quad x = 3$



Solution:

Let Mr. Kasam make x number of pots on daily basis.

Production cost is ₹ 40 more than 10 times the total number of pots he makes in one day.

$$\therefore \text{Production cost of each pot} = ₹ (10x + 40)$$

According to the given condition,

$$\therefore x(10x + 40) = 600$$

$$\therefore 10x^2 + 40x = 600$$

$$\therefore 10x^2 + 40x - 600 = 0$$

$$\therefore x^2 + 4x - 60 = 0 \quad \dots [\text{Dividing both sides by } 10]$$

$$\therefore x^2 + 10x - 6x - 60 = 0$$

$$\therefore x(x + 10) - 6(x + 10) = 0$$

$$\therefore (x + 10)(x - 6) = 0$$

$$\begin{array}{r} -60 \\ 10 \quad -6 \\ 10 \times -6 = -60 \\ 10 - 6 = 4 \end{array}$$

By using the property, if the product of two numbers is zero, then at least one of them is zero, we get

$$\therefore x + 10 = 0 \quad \text{or} \quad x - 6 = 0$$

$$\therefore x = -10 \quad \text{or} \quad x = 6$$

But, number of pots cannot be negative.

$$\therefore x \neq -10$$

$$\therefore x = 6$$

$$\begin{aligned} \therefore \text{Production cost of each pot} &= ₹(10x + 40) \\ &= ₹ [(10 \times 6) + 40] \\ &= ₹ (60 + 40) \\ &= ₹ 100 \end{aligned}$$

$\therefore$ **Production cost of one pot is ₹ 100 and the number of pots Mr. Kasam makes per day is 6.**

- ✓ 7. Pratik takes 8 hours to travel 36 km downstream and return to the same spot. The speed of boat in still water is 12 km. per hour. Find the speed of water current. [4 Marks]

Solution:

Let the speed of water current be x km/hr.

Speed of boat is 12 km/hr.

$$\therefore \text{Speed of the boat in upstream} = (12 - x) \text{ km/hr}$$

$$\text{Speed of the boat in downstream} = (12 + x) \text{ km/hr.}$$

$$\text{Now, Time} = \frac{\text{Distance}}{\text{Speed}}$$

$$\begin{aligned} \text{Time required to cover 36 km upstream} \\ &= \frac{36}{12 - x} \text{ hrs} \end{aligned}$$

$$\begin{aligned} \text{Time required to cover 36 km downstream} \\ &= \frac{36}{12 + x} \text{ hrs} \end{aligned}$$

According to the given condition,

$$\therefore \frac{36}{12 - x} + \frac{36}{12 + x} = 8$$

$$\therefore 36 \left(\frac{1}{12 - x} + \frac{1}{12 + x} \right) = 8$$

$$\therefore \frac{1}{12 - x} + \frac{1}{12 + x} = \frac{8}{36}$$

$$\therefore \frac{(12 + x) + (12 - x)}{(12 - x)(12 + x)} = \frac{2}{9}$$

$$\therefore \frac{24}{144 - x^2} = \frac{2}{9} \quad \dots [(a + b)(a - b) = a^2 - b^2]$$

$$\therefore 24 \times 9 = 2(144 - x^2)$$

$$\therefore 216 = 288 - 2x^2$$

$$\therefore 2x^2 = 72$$

$$\therefore x^2 = 36$$

$$\therefore x = \pm 6 \quad \dots [\text{Taking square root of both sides}]$$

But, speed cannot be negative.

$$\therefore x \neq -6$$

$$\therefore x = 6$$

$\therefore$ **The speed of water current is 6 km/hr.**



CAUTION

Speed of boat is more than water current i.e., $12 > x$.

Hence,

$$\begin{aligned} \left(\begin{array}{c} \text{Speed of boat} \\ \text{in upstream} \end{array} \right) &= \left(\begin{array}{c} \text{Speed of boat} \\ \text{in still water} \end{array} \right) - \left(\begin{array}{c} \text{Speed of} \\ \text{the stream} \end{array} \right) \\ &= 12 - x \text{ km/hr} \\ &\neq x - 12 \text{ km/hr} \end{aligned}$$

- ✓ 8. Pintu takes 6 days more than those of Nishu to complete certain work. If they work together they finish it in 4 days. How many days would it take to complete the work if they work alone. [4 Marks]

Solution:

Let Nishu take x days to complete the work alone.

$$\therefore \text{Total work done by Nishu in 1 day} = \frac{1}{x}$$

Also, Pintu takes $(x + 6)$ days to complete the work alone.

$$\therefore \text{Total work done by Pintu in 1 day} = \frac{1}{x + 6}$$

$$\therefore \text{Total work done by both in 1 day} = \left(\frac{1}{x} + \frac{1}{x + 6} \right)$$

But, both take 4 days to complete the work together.

$$\therefore \text{Total work done by both in 1 day} = \frac{1}{4}$$

According to the given condition,

$$\therefore \frac{1}{x} + \frac{1}{x + 6} = \frac{1}{4}$$

$$\therefore \frac{x + 6 + x}{x(x + 6)} = \frac{1}{4}$$

$$\therefore \frac{2x + 6}{x(x + 6)} = \frac{1}{4}$$

$$\therefore 4(2x + 6) = x(x + 6)$$

$$\therefore 8x + 24 = x^2 + 6x$$

$$\therefore x^2 + 6x - 8x - 24 = 0$$

$$\therefore x^2 - 2x - 24 = 0$$

$$\therefore x^2 - 6x + 4x - 24 = 0$$

$$\therefore x(x - 6) + 4(x - 6) = 0$$

$$\therefore (x - 6)(x + 4) = 0$$

$$\begin{array}{r} -24 \\ -6 \quad 4 \\ -6 \times 4 = -24 \\ -6 + 4 = -2 \end{array}$$



By using the property, if the product of two numbers is zero, then at least one of them is zero, we get

$$x - 6 = 0 \quad \text{or} \quad x + 4 = 0$$

$$\therefore x = 6 \quad \text{or} \quad x = -4$$

But, number of days cannot be negative.

$$\therefore x \neq -4$$

$$\therefore x = 6 \text{ and } x + 6 = 6 + 6 = 12$$

$\therefore$ **Number of days taken by Nishu and Pintu to complete the work alone is 6 days and 12 days respectively.**

! CAUTION

In the expression $7m^2 = 21m$, do not cancel 'm' on both sides i.e., do not divide both sides by m. It cannot be done as $m \neq 0$. Cancelling 'm' on both sides would give only one value of 'm'.

A quadratic equation has two roots.

- ✓ 9. If 460 is divided by a natural number, quotient is 6 more than five times the divisor and remainder is 1. Find quotient and divisor. [4 Marks]

Solution:

Let the divisor be x .

$$\therefore \text{Quotient} = 5x + 6$$

Also, Dividend = 460 and Remainder = 1

Dividend = Divisor $\times$ Quotient + Remainder

$$\therefore 460 = x \times (5x + 6) + 1 \quad 5x - 459$$

$$\therefore 460 = 5x^2 + 6x + 1 \quad = 5 \times -3 \times 153$$

$$\therefore 5x^2 + 6x + 1 - 460 = 0 \quad = 5 \times -3 \times 3 \times 51$$

$$\therefore 5x^2 + 6x - 459 = 0 \quad = \boxed{5 \times -3 \times 3} \times \boxed{3 \times 17}$$

$$\therefore 5x^2 - 45x + 51x - 459 = 0 \quad = -45 \times 51$$

$$\therefore 5x(x - 9) + 51(x - 9) = 0$$

$$\therefore (x - 9)(5x + 51) = 0$$

By using the property, if the product of two numbers is zero, then at least one of them is zero, we get

$$\therefore x - 9 = 0 \quad \text{or} \quad 5x + 51 = 0$$

$$\therefore x = 9 \quad \text{or} \quad x = \frac{-51}{5}$$

But, natural number cannot be negative.

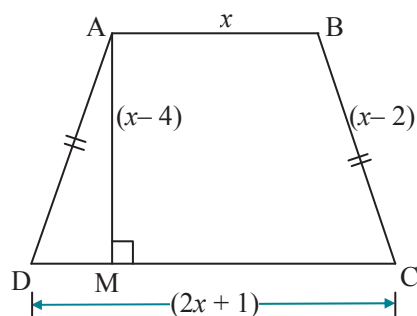
$$\therefore x \neq \frac{-51}{5}$$

$$\therefore x = 9$$

$$\therefore \text{Quotient} = 5x + 6 = 5(9) + 6 = 45 + 6 = 51$$

$\therefore$ **Quotient is 51 and Divisor is 9.**

- ✓ 10. In the given fig. $\square ABCD$ is a trapezium, $AB \parallel CD$ and its area is 33 cm^2 . From the information given in the figure find the lengths of all sides of the $\square ABCD$. Fill in the empty boxes to get the solution. [3 Marks]



Solution:

$\square ABCD$ is a trapezium. $AB \parallel CD$

Area of trapezium = $\frac{1}{2} \times$ Sum of parallel sides $\times$ Height

$$\therefore A(\square ABCD) = \frac{1}{2} \times (AB + CD) \times \boxed{AM}$$

$$\therefore 33 = \frac{1}{2} (x + 2x + 1) \times \boxed{(x - 4)}$$

$$\therefore \boxed{66} = (3x + 1) \times \boxed{(x - 4)}$$

$$\therefore 66 = 3x^2 - 12x + x - 4$$

$$\therefore 3x^2 + \boxed{-11x} - \boxed{70} = 0$$

$$\therefore 3x^2 - 21x + 10x - 70 = 0$$

$$\therefore 3x(x - 7) + 10(x - 7) = 0$$

$$\therefore (3x + 10)(x - 7) = 0$$

By using the property, if the product of two numbers is zero, then at least one of them is zero, we get

$$\therefore (3x + 10) = 0 \text{ or } \boxed{(x - 7)} = 0$$

$$\therefore x = \frac{-10}{3} \text{ or } x = \boxed{7}$$

But, length is never negative.

$$\therefore x \neq \frac{-10}{3}$$

$$\therefore x = \boxed{7}$$

$$AB = \boxed{x = 7 \text{ cm}}$$

$$CD = \boxed{2x + 1 = 2(7) + 1 = 15 \text{ cm}}$$

$$AD = BC = \boxed{x - 2 = 7 - 2 = 5 \text{ cm}}$$

Problem Set - 2

1. Choose the correct answers for the following questions. [1 Mark each]

i. Which one is the quadratic equation?

[Nov '20; Mar '22; July '24]

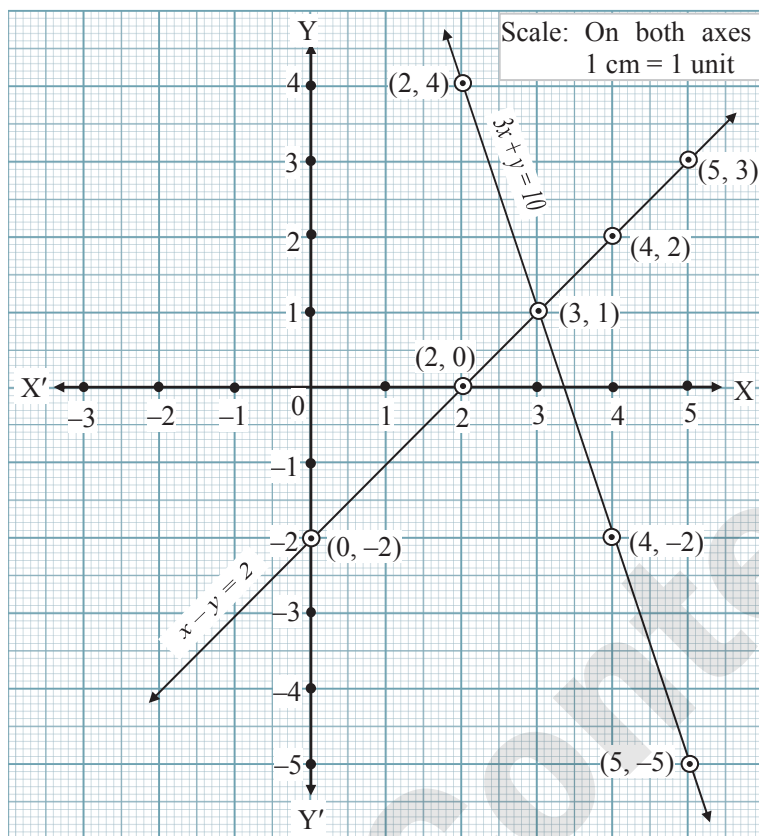
(A) $\frac{5}{x} - 3 = x^2$ (B) $x(x + 5) = 2$

(C) $n - 1 = 2n$ (D) $\frac{1}{x^2}(x + 2) = x$

ii. Out of the following equations which one is not a quadratic equation? [Mar '23; July '19]

(A) $x^2 + 4x = 11 + x^2$ (B) $x^2 = 4x$

(C) $5x^2 = 90$ (D) $2x - x^2 = x^2 + 5$



The two lines intersect at point (3, 1).

∴ $x = 3$ and $y = 1$ is the solution of the simultaneous equations $3x + y = 10$ and $x - y = 2$.

4. Find the values of each of the following determinants. [1 Mark each]

i. $\begin{vmatrix} 4 & 3 \\ 2 & 7 \end{vmatrix}$ [Mar '23] ii. $\begin{vmatrix} 5 & -2 \\ -3 & 1 \end{vmatrix}$

iii. $\begin{vmatrix} 3 & -1 \\ 1 & 4 \end{vmatrix}$

Solution:

i. $\begin{vmatrix} 4 & 3 \\ 2 & 7 \end{vmatrix} = (4 \times 7) - (3 \times 2) = 28 - 6$

∴ $\begin{vmatrix} 4 & 3 \\ 2 & 7 \end{vmatrix} = 22$

ii. $\begin{vmatrix} 5 & -2 \\ -3 & 1 \end{vmatrix} = (5 \times 1) - (-2 \times -3) = 5 - 6$

∴ $\begin{vmatrix} 5 & -2 \\ -3 & 1 \end{vmatrix} = -1$

iii. $\begin{vmatrix} 3 & -1 \\ 1 & 4 \end{vmatrix} = (3 \times 4) - (-1 \times 1)$
 $= 12 - (-1)$
 $= 12 + 1$

∴ $\begin{vmatrix} 3 & -1 \\ 1 & 4 \end{vmatrix} = 13$

- ✓ 5. Solve the following equations by Cramer's method.

i. $6x - 3y = -10$; $3x + 5y - 8 = 0$ [3 Marks]

ii. $4m - 2n = -4$; $4m + 3n = 16$

[July '24] [3 Marks]

iii. $3x - 2y = \frac{5}{2}$; $\frac{1}{3}x + 3y = -\frac{4}{3}$ [3 Marks]

iv. $7x + 3y = 15$; $12y - 5x = 39$ [3 Marks]

v. $\frac{x + y - 8}{2} = \frac{x + 2y - 14}{3} = \frac{3x - y}{4}$ [4 Marks]

Solution:

- i. The given simultaneous equations are

$6x - 3y = -10$... (i)

$3x + 5y - 8 = 0$

∴ $3x + 5y = 8$... (ii)

Comparing the given equations with $a_1x + b_1y = c_1$ and $a_2x + b_2y = c_2$, we get

$a_1 = 6$, $b_1 = -3$, $c_1 = -10$ and

$a_2 = 3$, $b_2 = 5$, $c_2 = 8$

∴ $D = \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix} = \begin{vmatrix} 6 & -3 \\ 3 & 5 \end{vmatrix}$
 $= (6 \times 5) - (-3 \times 3)$
 $= 30 - (-9)$
 $= 30 + 9$
 $= 39 \neq 0$

Important Formulae

CHAPTER 1: Linear Equations in Two Variables

Cramer's Rule:

If $a_1x + b_1y = c_1$ and $a_2x + b_2y = c_2$ are linear equations in two variables, then

$$D = \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix}, D_x = \begin{vmatrix} c_1 & b_1 \\ c_2 & b_2 \end{vmatrix} \text{ and } D_y = \begin{vmatrix} a_1 & c_1 \\ a_2 & c_2 \end{vmatrix}$$

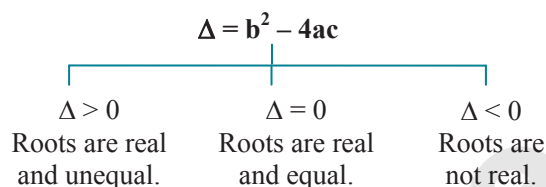
$$\therefore x = \frac{D_x}{D} \text{ and } y = \frac{D_y}{D}, \text{ where } D \neq 0$$

CHAPTER 2: Quadratic Equations

1. Formula for solving a quadratic equation:

If $ax^2 + bx + c = 0$, $a \neq 0$, is a quadratic equation, then $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

2. Nature of roots of a quadratic equation:



3. If α and β are the roots of a quadratic equation $ax^2 + bx + c = 0$, then

$$\text{Sum of the roots} = \frac{-b}{a}, \text{ Product of the roots} = \frac{c}{a}$$

4. If α and β are the roots of a quadratic equation in variable x , then $x^2 - (\alpha + \beta)x + \alpha\beta = 0$

$$\text{i.e., } x^2 - (\text{sum of roots})x + \text{product of roots} = 0$$

CHAPTER 3: Arithmetic Progression

1. In an A.P., if the first term is a and common difference is d , then the terms in the sequence are $a, (a + d), (a + 2d), (a + 3d), \dots$

2. In an A.P., if the first term is a and common difference is d , then the n^{th} term is given by $t_n = a + (n - 1)d$

3. In an A.P., if the first term is a and common difference is d , then the sum of the first n terms is given by

$$S_n = \frac{n}{2} [2a + (n - 1)d]$$

OR

$$S_n = \frac{n}{2} (t_1 + t_n); t_1 = \text{first term}, t_n = \text{last term}$$

Challenging Questions

CHAPTER 1: Linear Equations in Two Variables

1. Construct any one linear equation in two variables. Obtain another equation by interchanging only coefficients of variables. Find the value of the variables. [Nov '20]

Solution:

Consider a linear equation in two variables:

$$3x + 2y = 5 \quad \dots(i)$$

According to the given condition, another equation is

$$2x + 3y = 5 \quad \dots(ii)$$

Adding equations (i) and (ii), we get

$$\begin{array}{r} 3x + 2y = 5 \\ + 2x + 3y = 5 \\ \hline 5x + 5y = 10 \end{array}$$

$$\therefore x + y = \frac{10}{5} \quad \dots[\text{Dividing both sides by } 5]$$

$$\therefore x + y = 2 \quad \dots(iii)$$

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

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

$$x - y = 0$$

$$\therefore x - y = 0 \quad \dots(iv)$$

Adding equations (iii) and (iv), we get

$$\begin{array}{r} x + y = 2 \\ + x - y = 0 \\ \hline 2x = 2 \end{array}$$

$$\therefore x = 1$$

Substituting $x = 1$ in equation (iii), we get

$$x + y = 2$$

$$\therefore 1 + y = 2$$

$$\therefore y = 2 - 1 = 1$$

$$\therefore x = 1 \text{ and } y = 1 \text{ are the values of the variables.}$$

2. Draw the graph of the equation $x + y = 4$ and answer the following questions:
- Which type of triangle is formed by the line with X and Y-axes based on its sides.
 - Find the area of that triangle.

[Mar '24]

Solution:

$$x + y = 4$$

$$\therefore y = 4 - x$$

x	0	4	2	3
y	4	0	2	1
(x, y)	(0, 4)	(4, 0)	(2, 2)	(3, 1)



6. Solve the following equations by Cramer's Rule.
 $-3x + 14y = 2$
 $4x - 14y = 2$ [3 Marks]
 The given simultaneous equations are,
 $-3x + 14y = 2$... (i)
 $4x - 14y = 2$... (ii)
 Equation (i) and (ii) are in the form of
 $ax + by = c$
 Comparing the equations with $a_1x + b_1y = c_1$ and
 $a_2x + b_2y = c_2$ we get
 $a_1 = \square$, $b_1 = 14$, $c_1 = 2$, $a_2 = 4$, $b_2 = -14$, $c_2 = 2$

$$\therefore D = \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix} = \begin{vmatrix} -3 & 14 \\ 4 & -14 \end{vmatrix}$$

$$= (-3)(-14) - (4)(14) = -14$$

$$\therefore Dx = \begin{vmatrix} c_1 & b_1 \\ c_2 & b_2 \end{vmatrix} = \square$$

$$\therefore Dy = \begin{vmatrix} a_1 & c_1 \\ a_2 & c_2 \end{vmatrix} = \square$$

By Cramer's Rule,

$$x = \frac{\square}{D} = \square ; y = \frac{D_y}{D} = \square$$

One Mark Questions

Type A: Multiple Choice Questions

- Identify the linear equation in two variables from the following.
 (A) $\sqrt{3}x + \sqrt{5}y = 10$ (B) $5x - 0y - 14 = 0$
 (C) $\frac{4}{x} + \frac{5}{y} = 4$ (D) $3x^2 - 7y = 13$
- If $x - y = 10$ and $x = 2y$, then
 (A) $x = 20, y = 20$ (B) $x = 20, y = 10$
 (C) $x = 20, y = 0$ (D) $x = -20, y = 10$
- If $15x + 12y = 9$ and $12x + 15y = 6$, then $x - y =$
 (A) 1 (B) -1 (C) 2 (D) -2
- If $x = a, y = b$ is the solution of the equations $x - y = 2$ and $x + y = 4$, then the values of a and b are, respectively
 (A) 3 and 5 (B) 5 and 3
 (C) 3 and 1 (D) -1 and -3
- If $3x + 5y = 4$ and $y = \frac{x}{5}$, then $x =$
 (A) 1 (B) -5 (C) 5 (D) -1
- The point of intersection of the lines represented by $2x + 3y = 12$ and the Y-axis is
 (A) (0, 3) (B) (0, 4)
 (C) (3, 0) (D) (4, 0)
- What is the value of "k", if (k, 5) is the solution of equation, $4x - 2y = 0$
 (A) $\frac{1}{2}$ (B) $\frac{5}{2}$ (C) $\frac{3}{2}$ (D) $\frac{-5}{2}$
- Find the value of $\begin{vmatrix} 5 & 3 \\ -7 & -4 \end{vmatrix}$ [July '19]
 (A) -1 (B) -41 (C) 41 (D) 1
- The value of m for which the value of the determinant $\begin{vmatrix} -3 & m \\ -5 & -4 \end{vmatrix}$ is -18 is
 (A) 3 (B) -3 (C) 6 (D) -6

- For simultaneous equations in variables x and y , $D_x = 49$, $D_y = -63$, $D = 7$, then what is the value of y ? [Mar '22]
 (A) 9 (B) 7 (C) -7 (D) -9
- For the simultaneous equations $3x - 8y = 5$ and $x + 2y = 1$,
 (A) $D_x = 18, D_y = -2$ (B) $D_x = 10, D_y = -2$
 (C) $D_x = 18, D_y = 10$ (D) $D_x = -18, D_y = 2$
- What is the mathematical form of the following information?
 The sum of twice the smaller number (y), and the greater (x), number is 12.
 (A) $2x + y = 12$ (B) $x - 2y = 12$
 (C) $x + 2y = 12$ (D) $2y - x = 12$
- If the sum of two numbers is 35 and their difference is 13, then the numbers are
 (A) 23 and 12 (B) 24 and 11
 (C) 25 and 12 (D) 21 and 14
- To draw the graph of $x + 2y = 4$, find x when $y = 1$: [Mar '24]
 (A) 1 (B) 2 (C) -2 (D) 6

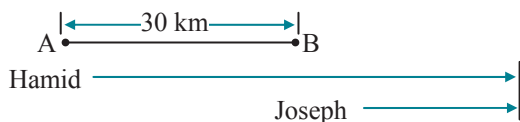
Type B: Solve the Following Questions

- If $17x + 15y = 11$ and $15x + 17y = 21$, then find the value of $x - y$. [Mar '24]
- To draw a graph of $4x + 5y = 19$, find y when $x = 1$. [Mar '22]
- Find x , if $\begin{vmatrix} x & -2 \\ 2 & 4 \end{vmatrix} = 0$
- By using two variables, write the following statement in mathematical form: "The cost of two tables and five chairs is ₹ 2,200."
- For simultaneous equations in variable x and y , if $D_x = 25$, $D_y = 40$, $D = 5$, then what is the value of x ? [Nov '20]
- Find the value of the following determinant.

$$\begin{vmatrix} 2 & -1 \\ 3 & \frac{1}{2} \end{vmatrix}$$



According to the second condition, if Joseph would have started from B at the same time but in the opposite direction then Hamid would have caught him after 3 hrs.



$$\therefore 3x - 3y = 30$$

$$\therefore x - y = 10 \quad \dots(ii) \text{ [Dividing both sides by 3]}$$

Adding equations (i) and (ii), we get

$$\begin{array}{r} x + y = 90 \\ + \quad x - y = 10 \\ \hline 2x = 100 \end{array}$$

$$\therefore x = \frac{100}{2} = 50$$

Substituting $x = 50$ in equation (i), we get

$$50 + y = 90$$

$$\therefore y = 90 - 50 = 40$$

$\therefore$ **The speeds of Hamid and Joseph are 50 km/hr and 40 km/hr respectively.**

Activities for Practice

1. Solve the simultaneous equations $4m - 2n = -4$ and $4m + 3n = 16$ by cramer's method.

[2 Marks]

$$D = \begin{vmatrix} 4 & -2 \\ 4 & 3 \end{vmatrix} = \square,$$

$$D_m = \begin{vmatrix} -4 & -2 \\ 16 & 3 \end{vmatrix} = 20,$$

$$D_n = \begin{vmatrix} 4 & -4 \\ 4 & 16 \end{vmatrix} = \square$$

$$m = \square,$$

$$n = \square$$

2. Complete the activity to find the value of the determinant.

[Mar '22] [2 Marks]

Activity:

$$\begin{vmatrix} 2\sqrt{3} & 9 \\ 2 & 3\sqrt{3} \end{vmatrix} = 2\sqrt{3} \times \square - 9 \times \square$$

$$= \square - 18$$

$$= \square$$

3. Complete the following activity; find the value of x : [Mar '23] [2 Marks]

$$5x + 3y = 9 \quad \dots(i)$$

$$2x - 3y = 12 \quad \dots(ii)$$

Add equations (i) and (ii)

$$5x + 3y = 9$$

$$+ 2x - 3y = 12$$

$$7x = \square$$

$$x = \square$$

$$x = \square$$

$$x = \square$$

4. If $(0, 2)$ is the solution of $2x + 3y = k$, then to find the value of k , complete the following activity: [Mar '24] [2 Marks]

Activity:

$(0, 2)$ is the solution of the equation $2x + 3y = k$.

Put $x = \square$ and $y = \square$ in the given equation;

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

$$\therefore 0 + 6 = k$$

$$\therefore k = \square$$

5. The ages of Durga and Hari are in the ratio 5:7. After eight years, the ratio of their ages will be 3:4. Find their present ages.

[3 Marks]

Let the present ages of Durga and Hari be x years and y years respectively.

$\therefore$ According to the first condition, the ages of Durga and Hari are in the ratio 5 : 7.

$$\therefore \square = \frac{5}{7}$$

$$\therefore \square \quad \dots(i)$$

After eight years,

Age of Durga = $(x + 8)$ years

Age of Hari = $(y + 8)$ years

According to the second condition, after 8 years, the ratio of their ages will be 3 : 4.

$$\therefore \frac{x+8}{y+8} = \square$$

$$\therefore \square \quad \dots(ii)$$

Multiplying equation (i) by 3 and equation (ii) by 5, we get

$$21x - 15y = 0 \quad \dots(iii)$$

$$20x - 15y = -40 \quad \dots(iv)$$

Subtracting equation (iv) from equation (iii)

Present age of Durga is $\square$ years and that of

Hari is $\square$ years.



14. A girl calculates that the probability of her winning the first prize in a lottery is 0.08. If 6000 tickets are sold, then how many tickets has she bought?
(A) 40 (B) 240 (C) 480 (D) 750
15. A box contains 90 discs, numbered from 1 to 90. If one disc is drawn at random from the box, the probability that it bears a prime number less than 23 is
(A) $\frac{7}{90}$ (B) $\frac{10}{90}$ (C) $\frac{4}{45}$ (D) $\frac{9}{89}$

Type B: Solve the Following Questions

1. $A = \{1, 2, 3, 4, 5\}$, $S = \{1, 2, 3, \dots, 10\}$
 $P(A) = ?$
2. If one die is rolled, find the probability of getting a number less than 5.
3. Out of 100 students from a school, 43 like football. Find the probability that the student selected likes football.
4. Each card bears one letter from the word 'Vinod'. Find the probability that card drawn the letter 'o'.
5. If $n(S) = 36$, $P(A) = \frac{7}{12}$, then $n(A) = ?$
6. If one coin is tossed, write the sample space 'S'.
[Mar '23]
7. Two coins are tossed simultaneously. Write the sample space 'S'.
[Mar '22]
8. A die is rolled then write sample space 'S' and number of sample point $n(S)$.
[Nov '20]
9. Two digit numbers are formed using digits 2, 3 and 5 without repeating a digit. Write the sample space.
[Mar '24]
10. If two coins are tossed, find the probability of getting two tails.
11. What is the probability of getting prime number from first 10 natural numbers?

Additional Problems for Practice**Based on Practice Set 5.1**

How many possibilities are there in each of the following? [1 Mark each]

1. A date from 1 to 15 in the month of March is randomly selected.
2. A letter from word 'geography' is selected randomly.
3. List of games played in school is given. Students has to select any one of the games.
Kho-kho, Cricket, Football, Kabaddi, Table tennis.

Based on Practice Set 5.2

1. For the following experiment write sample space 'S' and number of sample points $n(S)$. Two digit numbers are formed from the digits 1, 3 and 7 where the digits are repeated.
[1 Mark]
2. In the month of January 2019, find the days on which the date is a multiple of 6.

January 2019						
Su	Mo	Tu	We	Th	Fr	Sa
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

[1 Mark]

3. Form a 'committee' of two, from 3 men (M_1, M_2, M_3) and 2 women (W_1, W_2). Complete the following activity to write the sample space.
- i. Committee of two men = $\square, \square, \square$
- ii. Committee of two women = $\square$
- iii. Committee of one man and one woman = $\boxed{M_1 W_1} \square \square \square \square$
- $\therefore$ Sample space = $\{ \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}} \}$
[2 Marks]

Based on Practice Set 5.3

1. A die is thrown, then write the sample space (S) and number of sample points $n(S)$ and also write event A of getting numbers multiple of 3 on the upper face and write $n(A)$.
[2 Marks]
2. Two coins are tossed simultaneously. Write the sample space (S), $n(S)$, the following event A using set notation and $n(A)$, where 'A' is the event of getting at least one head.
[2 Marks]
- +3. Two coins are tossed simultaneously. Write the sample space (S) and number of sample points $n(S)$. Also write the following events in the set form and write the number of sample points in each event.
[2 Marks each]
- i. Condition for event A : to get at least one tail.
- ii. Condition for event B : to get only one head.
- iii. Condition for event C : to get at most one tail.
- iv. Condition for event D : to get no head.



2. Two numbers differ by 3. The sum of the greater number and twice the smaller number is 15. Find the smaller number.

[Mar '19] [2 Marks]

3. Sum of two numbers is 7 and their difference is 5. Find the numbers.

[Nov '19] [2 Marks]

4. Difference between two numbers is 30. Twice the greater number is less than 7 times the smaller number by 5. Find the numbers.

[3 Marks]

- +5. The perimeter of a rectangle is 40 cm. The length of the rectangle is more than double its breadth by 2. Find length and breadth.

[3 Marks]

6. The perimeter of an isosceles triangle is 30 cm. The length of its congruent sides is 3 cm more than its base. Find the lengths of all the sides.

[3 Marks]

7. On the first day of the sale of tickets of a drama, 35 tickets in all were sold. If the rates of the tickets were ₹ 20 and ₹ 40 per ticket and the total collection was ₹ 900, find the number of tickets sold of each rate.

[3 Marks]

+8.

Sale! Sale!! Sale!!! only for 2 days



I have some analogue wrist watches and some digital wrist watches. I am going to sell them at a discount.

Sale of 1st day

Analogue watch = 11

Digital watch = 6

Received amount = ₹ 4330

Sale of 2nd day

Analogue watch = 22

Digital watch = 5

Received amount = ₹ 7330

Find selling price of wrist watch of each type.

[4 Marks]

- +9. A certain amount is equally distributed among certain number of students. Each would get ₹ 2 less if 10 students were more and each would get ₹ 6 more if 15 students were less. Find the number of students and the amount distributed.

[4 Marks]

10. Students of a school were made to stand in rows for drill. If 3 students less were standing in each row, 10 more rows were required and if 5 students more were standing in each row then the number of rows was reduced by 10. Find the number of students participating in the drill.

[4 Marks]

+11.



A boat travels 16 km upstream and 24 km downstream in 6 hours.

The same boat travels 36 km upstream and 48 km downstream in 13 hours.

Find the speed of water current and speed of boat in still water.

[4 Marks]

- +12. A three digit number is equal to 17 times the sum of its digits. If the digits are reversed, the new number is 198 more than the old number. Also the sum of extreme digits is less than the middle digit by unity. Find the original number.

[4 Marks]

To view the Solutions of Additional Problems for Practice, scan the given Q. R. Code in *Quill - The Padhai App*.



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Model Question Paper

Part - I

Time: 2 Hours

Total Marks: 40

Note:

- All questions are compulsory.
- Use of a calculator is not allowed.
- The numbers to the right of the questions indicate full marks.
- In case of MCQs [Q. No. 1(A)] only the first attempt will be evaluated and will be given credit.

Q.1. A. Choose the correct alternative.

[4]

- If the roots of a quadratic equation are -2 and 3 , then the quadratic equation is
(A) $x^2 - x - 6 = 0$ (B) $x^2 + x - 6 = 0$
(C) $x^2 - x + 6 = 0$ (D) $x^2 + x + 6 = 0$
- First four terms of an A.P. are ..., whose first term is -2 and common difference is -2
(A) $-2, 0, 2, 4$ (B) $-2, 4, -8, 16$
(C) $-2, -4, -6, -8$ (D) $-2, -4, -8, -16$
- Cumulative frequencies in a grouped frequency table are useful to find _____.
(A) Mean (B) Median
(C) Mode (D) All of these
- If $n(A) = 4$, $P(A) = \frac{1}{5}$, then $n(S) = ?$
(A) 10 (B) 20
(C) $\frac{1}{5}$ (D) $\frac{1}{3}$

Q.1. B. Solve the following questions.

[4]

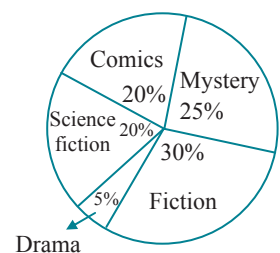
- Find first term of the sequence $t_n = 3n - 2$.
- Find the value of $\begin{vmatrix} 20 & -4 \\ 5 & 2 \end{vmatrix}$.
- If $MV = ₹ 575$, premium = ₹ 500, find FV.
- Two coins are tossed simultaneously. Write the sample space 'S'.

Q.2. A. Complete the following activities. (Any two)

[4]

- In the pie diagram, the data of 720 students who opted for their favourite literature type is shown. The data is expressed in percentages. Using this diagram complete the following table.

Type of Literature	Measure of central angle	Number of students
Comics	72°	144
Mystery	90°	<input type="text"/>
Fiction	<input type="text"/>	216
Drama	<input type="text"/>	<input type="text"/>
Science Fiction	72°	144





AVAILABLE NOTES FOR STD. X:

(ENG., MAR. & SEMI ENG. MED.)

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- Mathematics (Part - II)
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- गणित (भाग - II)
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