STD. VI
Mathematics

Build Powerful Concepts

Assessment Test with every Chapter for Knowledge testing

Solved Examples cover all types of Problems with detailed explanation

Activity Based Questions to widen the knowledge spectrum

Factory of Facts covers fascinating information about mathematics

MCQs to aid Scholarship Preparation

Pictoral Explanations with the help of illustrations

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PREFACE

Preparing this Mathematics book was a rollercoaster ride. We had a plethora of ideas, suggestions and decisions to ponder over. However our basic premise was to keep this book in line with the new, improved syllabus and provide students with an absolutely fresh material.

To begin with, let us look at this book as a 'powerful concept building tool'. We want this book to act as a facilitator for students to deeply understand mathematical concepts presented in the class VI book by the Maharashtra State Education Board. The understanding of these concepts would eventually help students, link textual problems with their daily life and comprehend its application for future use.

We've ensured that every chapter begins with a lucid introduction to the topic. Thereon the chapter covers a multitude of solved examples related to the topic. These examples are textual as well external practice problems, so as to reinforce the topic's understanding within the reader.

The part of Formative Assessment covers Activity Based Questions from the text book. We've partially solved these questions and added additional ones for practice sake.

Every chapter ends with an Assessment Test. This test stands as a testimony to the fact that the child has understood the chapter thoroughly. The Multiple Choice Questions included in this test facilitate students to prepare for their scholarship examination.

To conclude the chapter we've presented a snippet of interesting mathematical concepts in the form of Factory of Facts. This enhances the student's knowledge beyond the textbook material.

With absolute trust in our work, we hope, our holistic efforts towards making this book are paid off if students understand mathematics conceptually rather than just focusing on the problem solving part. This text would definitely act as a reference point for the same.

The journey to create a complete book is strewn with triumphs, failures and near misses. If you think we've nearly missed something or want to applaud us for our triumphs, we'd love to hear from you.
Please write to us on : mail@targetpublications.org

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

Best of luck to all the aspirants!

From,
Publisher

Contents

1. Basic Concepts in Geometry

Introduction:
The field of Geometry was developed when ancient mathematicians made efforts to measure the earth.
This is how the word Geometry originates.
Phrase: geo + metron = geometry
Meaning: *earth + measure = to measure earth (or any other object)*
You must have come across dots and lines a numerous times.
We observe them in our daily life in the form of rangoli pattern, computer and board games, the divider lines and zebra crossing painted on road, etc
These dots and lines form the basics of Geometry and the chapter takes us through its occurrence and uses in our daily life.

Summative Assessment

Let's Study

Complete the rangoli. Then, have a class discussion with the help of the following questions:

1. What kind of surface do you need for making a rangoli?

2. How do you start making a rangoli?

3. What did you do in order to complete the rangoli?

4. Name the different shapes you see in the rangoli.

5. Would it be possible to make a rangoli on a scooter or on an elephant's back?

6. When making a rangoli on paper, what do you use to make the dots?

Ans:

1. For making a rangoli, I need a flat surface.

2. I can start making a rangoli by drawing equally spaced dots on the surface using a chalk.

3. In order to complete the rangoli, I joined the dots by straight lines to make a design.

4. In the rangoli, I find various shapes such as square, rectangle and triangles of two different shapes.

5. No. It won't be possible to make a rangoli on a scooter or on an elephant's back as they do not have a flat surface.

6. When making a rangoli on paper, I made use of scale and pencil to make equally spaced dots.
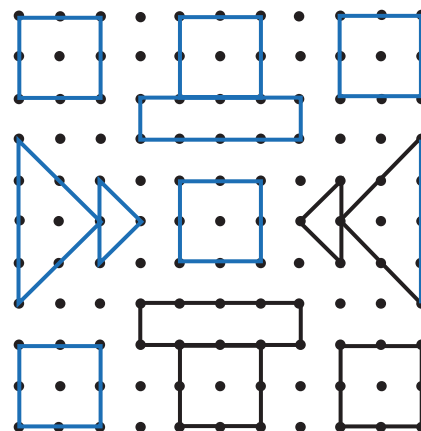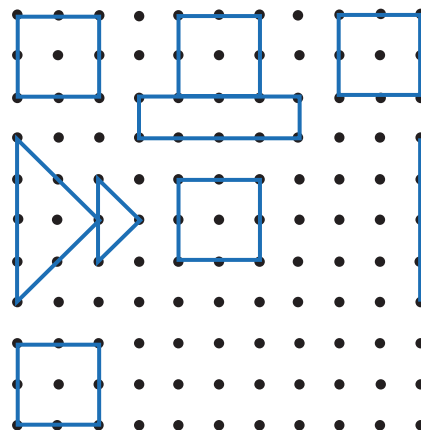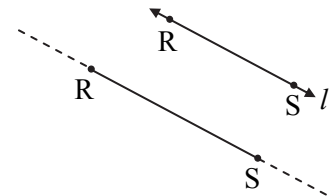
1. **Point:**
   i.   A point is an exact position or a particular location on a plane surface.
   ii.   It is not an 'object' but a place. It can be represented by a dot.
   iii. To name a point, capital letters are used.
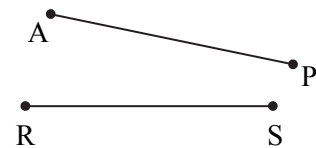   iv.   In the adjacent figure, M, N and Q are points.
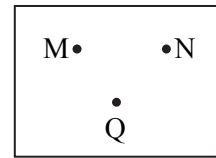
2. **Line:**
   i.   A 'line' in Mathematics means a straight line which can be extended on both its ends without any limits.
   ii.   In simple words, line has no ends.
   iii. Arrow heads are used on both ends to show the extended line.
   iv.   A line can be named by using small letters like l, m, n etc.
   v.   It can also be named by using two capital letters.
   vi.   In the adjacent figure, 'l' is a line.
   Remember this: Line 'l' can be also named as line RS or line SR.

3. **Line Segment:**
   i.   A line segment is a part of a line whose ends are fixed.
   ii.   The endpoints are named by using capital letters.
   iii. In the adjacent figure, the given line segments are segment RS or 'seg RS' or 'seg SR' and 'seg AP' or 'seg PA'
   **Remember this:** seg RS and seg SR are the same line segments.

4. **Ray:**
   i.   Consider the adjacent figure. It starts at a point R and goes forward in the direction of S continuously without any end. Such a figure is called a 'ray'.
   ii.   A ray is a part of a line whose one end is fixed while the other is not.
   iii. The starting point R of the ray is called as origin and is shown by a point.
   iv.   The other end of the ray is shown by an arrow head.
   v.   The given ray is named as 'ray RS'.
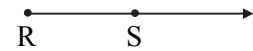
   Remember this: i.   While naming a ray, start from the origin.
                       ii.   ray RS is not the same as ray SR.

5. **Concurrent Lines:**
   i.   When two or more lines pass through the same point, they are known as **concurrent lines.**
   ii.   In simple terms, a set of lines is said to be concurrent, if they all intersect at the same point.
   iii. In the adjacent figure, lines AB, IJ, EF, NM, SR and HG pass through the point P. So, all the lines are collinear.
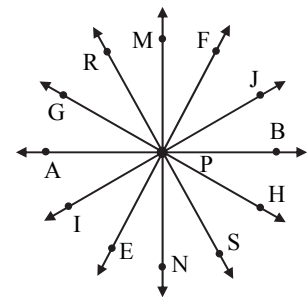
   Remember this: An infinite number of lines can be drawn through one point.

6. **Point of Concurrence:**
   i.   The common point through which several concurrent lines pass is called **point of concurrence**.
   ii.   In the above figure, point P is the point of concurrence.

7.   Collinear Points:

i.   Observe the adjacent figure. All the ants are walking in a straight line.

ii.   Three or more points which lie on a single line are said to be **collinear points.**

iii.   Here, if each ant is considered a point, all the ants are collinear.

iv.   In the adjacent figure, points A, C, E, F, D, B are collinear.
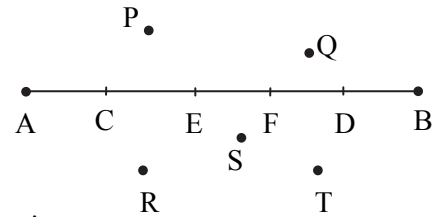
8.   Non-collinear Points:

i.   Points which do not lie on the same line are called **non-collinear points.**

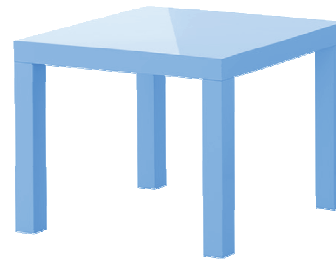ii.   In the adjacent figure, points P, Q, R, S and T are non-collinear points.

Remember this: One and only one line can be drawn through any two distinct points.
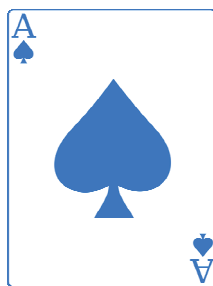
9.   Plane:

i.   In mathematics, any flat surface can be termed as a plane. Such flat surface is itself a part of an infinite surface.
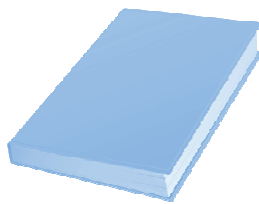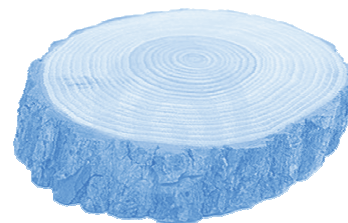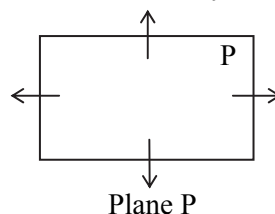
Book

Table

Playing Card

Cut surface of a tree trunk

ii.   The surfaces mentioned in the above examples are all flat surfaces. Hence, they are a part of a plane.

iii.   Arrows can be used to indicate that the plane can extend infinitely in all directions. The arrows however are not necessary to be mentioned always.
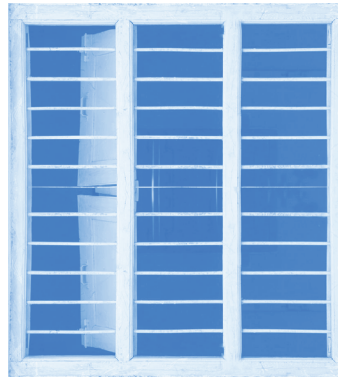
Plane P

10.   Parallel Lines:

    i.   Lines which lie in the same plane, but do not intersect each other are called **parallel lines.**

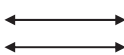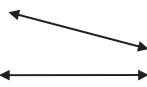   ii.   Parallel lines do not intersect even when they are extended at the ends.

Example:

In the below figure, the horizontal bars of the window are parallel to each other.

Try This:

Write the proper term, 'intersecting lines' or 'parallel lines' in each of the empty boxes.
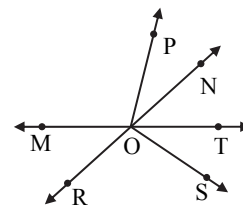
    i.   ii.   iii.

Ans: i.   Intersecting Lines
         ii.   Parallel Lines
         iii.   Intersecting Lines

Let's Practise : Practice Set 1

1.   Look at the figure alongside and name the following:

    i.   Collinear points

    ii.   Rays

    iii.   Line segments

    iv.   Lines

Ans:

i.	Collinear Points	Points M, O and T
		Points R, O and N
ii.	Rays	ray OP, ray OM, ray OR, ray OS, ray OT and ray ON
iii.	Line Segments	seg MT, seg RN, seg OP, seg OM, seg OR, seg OS, seg OT and seg ON
iv.	Lines	line MT and line RN

2.   Write the different names of the line.
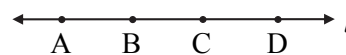
Ans: The different names of the given line are line *l*, line AB, line AC, line AD, line BC, line BD and line CD.

3. **Match the following:**

	Group "A"		Group "B"
i.		a.	Ray
ii.		b.	Plane
iii.		c.	Line
iv.		d.	Line Segment

Ans: (i – c), (ii – d), (iii – b), (iv – a)

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4. **Observe the figure below. Name the parallel lines, the concurrent lines and the points of concurrence in the figure.**
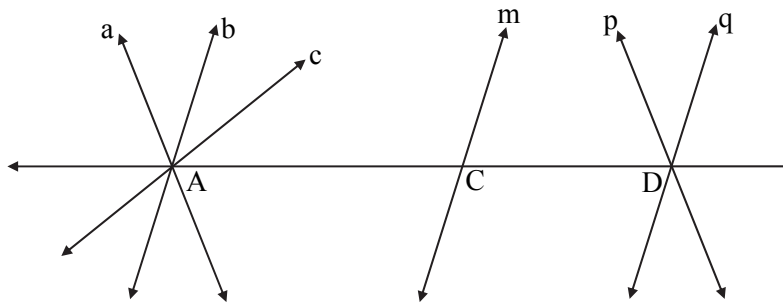
Ans:

Parallel Lines	lines b, m and q are parallel to each other.
	lines a and p are parallel to each other.
Concurrent Lines and Point of Concurrence	line AD, line a, line b and line c are concurrent. Point A is their point of concurrence.
	line AD, line p and line q are concurrent. Point D is their point of concurrence.

Formative Assessment

Activity

1. **Observe the picture of the game being played. Identify the collinear players, non-collinear players, parallel lines and the plane.**
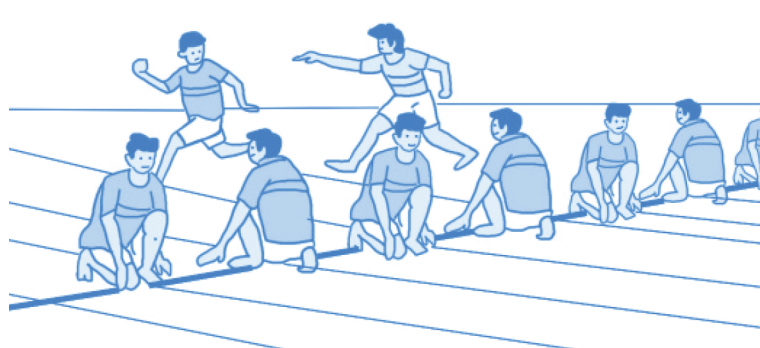
Ans:

i.	Collinear Players	The players who are sitting are collinear players
ii.	Non-collinear Players	The players who are running are non-collinear players
iii.	Parallel Lines	The lines which are intersecting the line along which all players are sitting, are parallel lines
iv.	Plane	The ground on which the boys are playing is the plane

2. **Look at the image of the chess board with a chess game in progress. Identify the collinear and non-collinear chess pieces.**
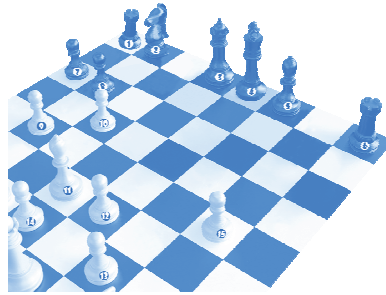
Ans:

i.	Collinear chess pieces	1, 2, 3, 4, 5, 6
		8, 10, 12, 13
ii.	Non-collinear chess pieces	7, 9, 11, 14, 15

Assignment Test

1. **Choose the correct option for each of the following questions:**

   i. _____ is used to name a point.
(A)	Capital letter	(B)	Small letter
(C)	Number	(D)	Roman numeral

   ii. A line segment has two points showing its limits. They are called _____.
(A)	origin	(B)	end points
(C)	arrow heads	(D)	infinite points

   iii. An arrow head is drawn at one end of the ray to show that it is _____ on that side.
(A)	finite	(B)	ending
(C)	infinite	(D)	broken

   iv. Lines which lie in the same plane but do not intersect are said to be _____ to each other.
(A)	intersecting	(B)	collinear
(C)	parallel	(D)	non-collinear

   v. Each flat surface is a part of an infinite surface. In mathematics, a flat surface like this is called _____.
(A)	a plane	(B)	a line
(C)	a point	(D)	a line segment

2. **Determine the collinear and non-collinear points in the figure alongside:**

3. **Look at the figure alongside and answer the questions given below:**

    i.   Name the parallel lines
    ii.   Name the concurrent lines and the point of concurrence.
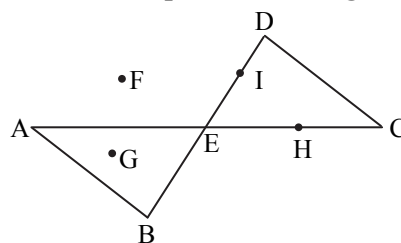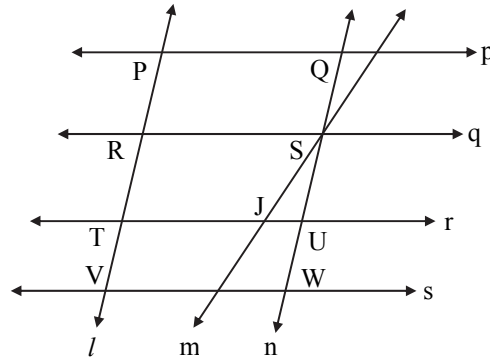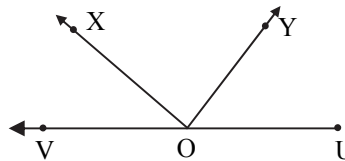   iii.   Write the different names of line PV.

4. **Name the different line segments and rays in the adjacent figure:**

Answers:

1.   i.   (A)   ii.   (B)   iii.   (C)   iv.   (C)   v.   (A)

2.   *Collinear points:*
    i.   Points A, E, H and C.
    ii.   Points B, E, I and D.

    Non-collinear points:
    Point G and F.

3.   i.   *Parallel lines:*
          a.   line *l* and line n
          b.   line p, line q, line r and line s

    ii.   *Concurrent Lines:*
        line q, line m, line n
        Point of Concurrence: point S

    iii.   line *l*, line PT, line PR,
        line PV, line RT, line RV
        and line TV.

4.   *Line Segments:*
    seg UV, seg OY, seg OX, seg OV
    and seg OU
    Rays:
    ray OV, ray OX, ray OY and
    ray UV.

FACTORY OF FACTS

The latitudes and longitudes are used to point any location on the globe.
All the latitudes are parallel to one another. All the longitudes are concurrent. The north and south poles are the points of concurrence.