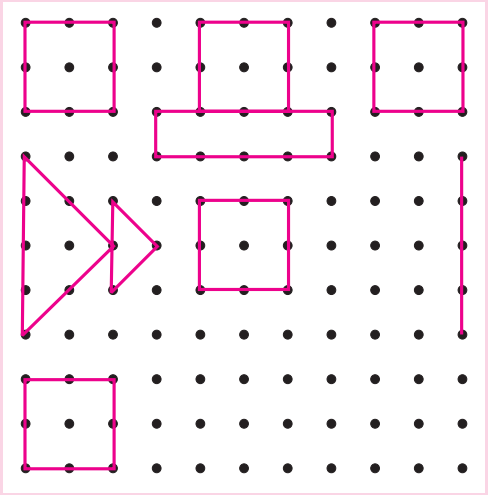
PART ONE

1 Basic Concepts in Geometry

Let's discuss.



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 ?

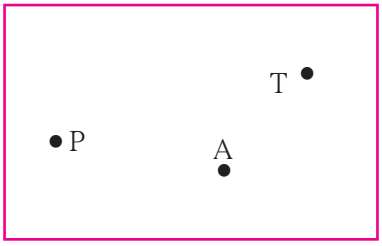
(6) When making a rangoli on paper, what do you use to make the dots ?

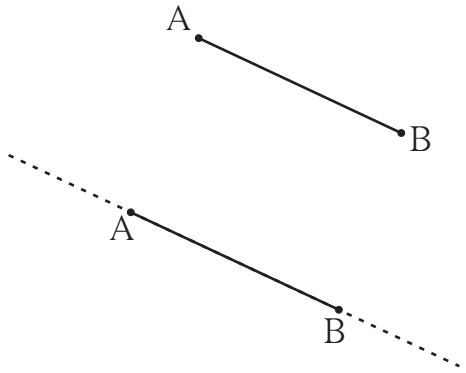
Let's learn.

Points

A point is shown by a tiny dot. We can use a pen or a sharp pencil to make the dot. The dots in the rangoli are the symbols for points.

A point can be given a name. Capital letters of the alphabet are used to name a point. The points P, A and T are shown in the figure alongside.





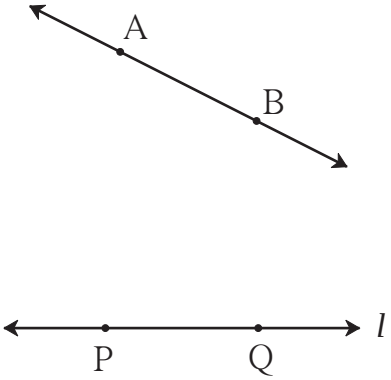
Line Segments and Lines

Take two points A and B on a sheet of paper and join them using a ruler. We get the straight line AB. Can we extend this line further on the side of point B ? On the side of point A ? How far can we extend it ?

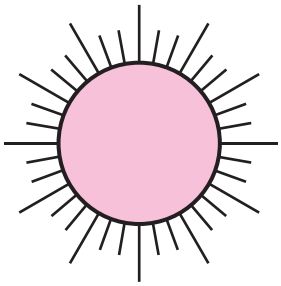
We can extend the line in both directions till the edges of the paper. If the paper is very big, the line can be very long, too.

How long would the line be on a playing field ?

Let's imagine that we can extend this line forever without any limits on both sides. To show this extended line on paper, we use arrowheads at both ends of the line. In mathematics, when we say **line**, we mean 'straight line'. The first line that we drew was only from point A to point B. It was a piece or a **segment** of the longer line. A line segment has two points showing its limits. They are called **endpoints**. We write line segment AB as 'seg AB' in short. A and B are its endpoints. A line is named using a small letter or by using any two points on the line. Line l has been shown alongside. Its name can also be written as line PQ or line QP.



Rays



Look at the pictures. What do you see? Rays starting from the sun go forward in all directions. Light rays from the torch also start from a point and go forward continuously in one direction.

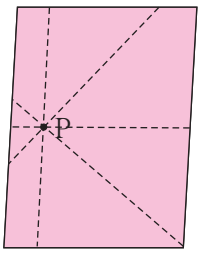
A ray is a part of a line. It starts at one point and goes forward continuously in the same direction. The starting point of a ray is called its **origin**. Here, P is the origin. An arrowhead is drawn to show that the ray is infinite in the direction of Q. The figure can be read as **ray PQ**.

The ray PQ is not read as ray QP.

Try this.

Activity 1 : Draw a point on the blackboard. Every student now draws a line that passes through that point.
How many such lines can be drawn?

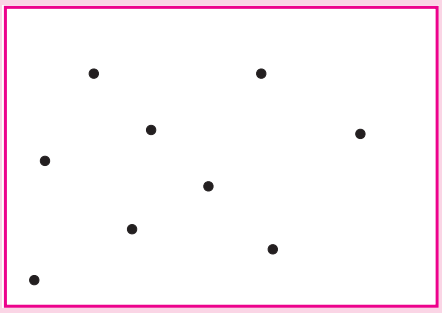
Activity 2 : Draw a point on a paper and use your ruler to draw lines that pass through it. How many such lines can you draw?



An infinite number of lines can be drawn through one point.

When two or more lines pass through the same point, they are called **concurrent lines** and the common point through which they pass is called their **point of concurrence**. In the figure alongside, which is the point of concurrence? Name it.

Can you tell?



There are 9 points in this figure. Name them.

If you choose any two points, how many lines can pass through the pair?

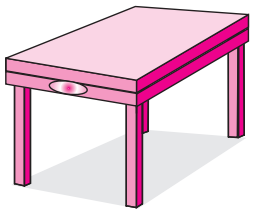
One and only one line can be drawn through any two distinct points.

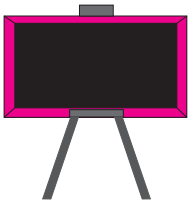
Which three or more of these nine points lie on a straight line? **Three or more points which lie on a single straight line are said to be collinear points.** Of these nine points, name any three or more points which do not lie on the same line. **Points which do not lie on the same line are called non-collinear points.**

Let's learn.

Planes

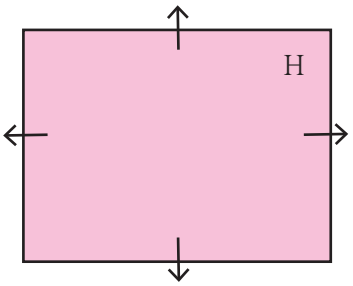
Look at the pictures. What kind of surfaces do you see?

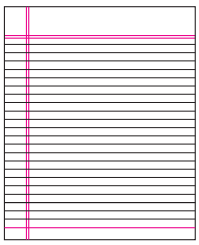




The surfaces in the first two pictures are flat. Each flat surface is a part of an infinite surface. **In mathematics, a flat surface is called a plane.**

The name of the plane in the picture is 'H'. Even though we draw a suitably small figure of the plane, it actually extends infinitely on all sides. Arrows are drawn to show that the plane extends infinitely in all directions. However, these arrows are often omitted for the sake of convenience.





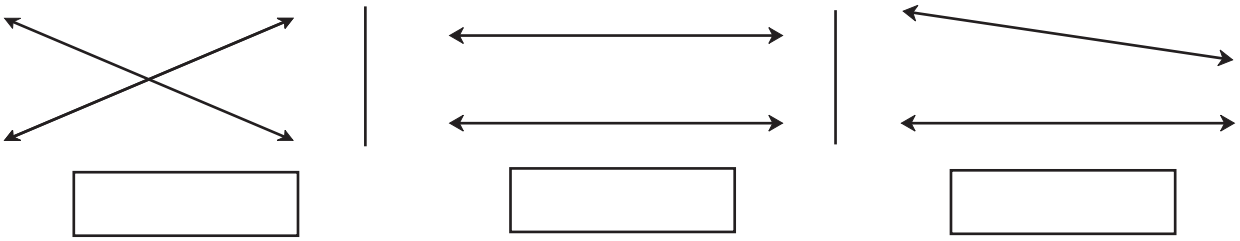
Parallel Lines

Look at this page from a notebook. Is this page a part of a plane? If we extend the lines that run sideways on the page, will they meet each other somewhere?

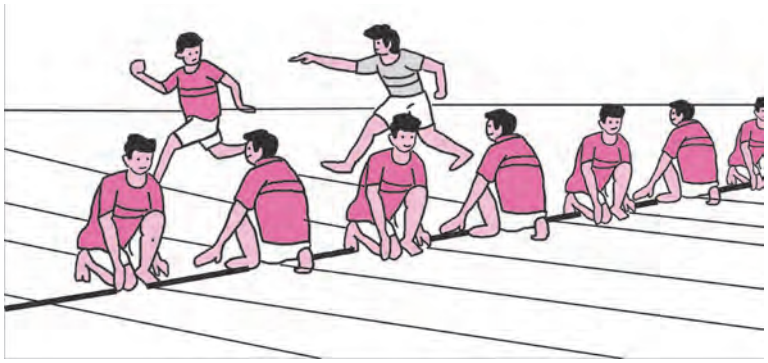
Now I know –

Lines which lie in the same plane but do not intersect are said to be parallel to each other.

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

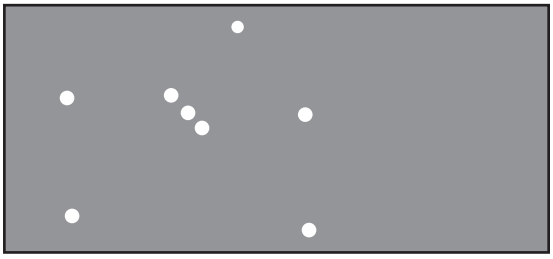


My friend, Maths : On the ground, in the sky.



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

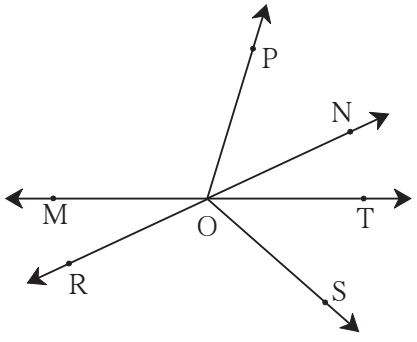
In January, we can see the constellation of Orion in the eastern sky after seven in the evening. Then it moves up slowly in the sky. Can you see the three collinear stars in this constellation? Do you also see a bright star on the same line some distance away?



Practice Set 1

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

   (1) Collinear points
   (2) Rays
   (3) Line segments
   (4) Lines

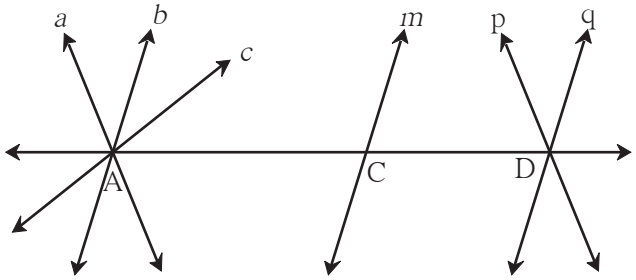


2. Write the different names of the line.

3. Match the following:

Group A		Group B
(i)		(a) Ray
(ii)		(b) Plane
(iii)		(c) Line
(iv)		(d) Line segment

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



ICT Tools or Links

Use the tools of the Geogebra software to draw various points, lines and rays. See for yourself what a never ending line is like.

Maths is fun !

Take a flat piece of thermocol or cardboard, a needle and thread. Tie a big knot or button or bead at one end of the thread. Thread the needle with the other end. Pass the needle up through any convenient point P. Pull the thread up, leaving the knot or the button below. Remove the needle and put it aside. Now hold the free end of the thread and gently pull it straight. Which figure do you see? Now, holding the thread straight, turn it in different directions. See how a countless number of lines can pass through a single point P.