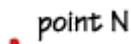


# Points, Lines, and Planes

The world is made of many things. Some can be touched, counted, or seen. There are other things that exist only in the imagination, but these imaginary things can be very powerful tools! You can see geometry everywhere around you, in manmade structures, in nature, in sports, in manufacturing, and in art. In geometry there are only four imaginary items—simple ideas—upon which everything else is built: point, line, plane, and space.

## Part A: Point

**Point:** A point has absolutely no dimensions—no length, no width, no depth. It is simply a location. We use a dot, like point N shown here, to symbolize a point, but a dot is not a true point because any written or printed dot, no matter how small, has dimensions. Generally, we label points with upper case alphabetic characters



## Part B: Line

**Straight Line:** A straight line is a collection of points along a straight path, having no endpoints. Straight lines are considered to extend indefinitely in either direction. Straight lines are determined by specifying exactly the location of two points through which it passes. Two points are needed to define a line

Points on the same line are called "collinear points." Points that lie on the same straight line are called collinear. Otherwise they are said to be non collinear. Notice how to write the symbol for the straight line. The arrowheads on straight line DE show us that it extends endlessly in both directions—it has no endpoints.



There is another way to name a line and it is by using a small letter example:



**Particular lines****Line segment**

A line segment is a part of a line that has a specific length and specific endpoints. A segment consists of its two endpoints together with all the points on the line that are between the endpoints. The length of a segment is a measure of its size and is the same as the distance between its endpoints. The terms "line segment" and "straight line segment" are also used to refer to a segment.

Notice the symbol for a line segment



Segment AB is written as  $\overline{AB}$

**Ray:**

A ray is a part of a line that has only one endpoint. It is half of a line and goes on extends endlessly in one direction.

It is determined by one endpoint and any other point that shows which half of the line constitutes the ray. A ray consists of its endpoint and all points on that half of the line.

Notice the symbol for a ray.



A ray UV is written as  $\overrightarrow{UV}$

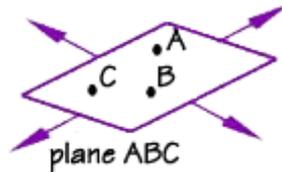
**Part C: Plane**

**Plane:** a plane is what we recognize as a flat surface. Two of the ways that planes are determined are:

- (i) By giving the exact locations of any three points through which the plane passes
- (ii) By specifying two lines that lie in the plane. Like lines, planes are considered to extend indefinitely in all directions.

The set of points called a plane lies all on one surface. In algebra, you've already used the coordinate plane for plotting points, so you're familiar with at least one example of a plane. The surface of a table is another example of a plane—but a plane actually extends endlessly.

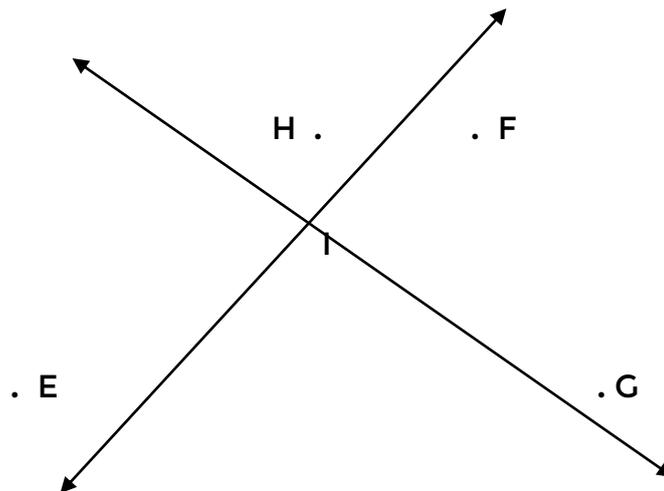
Also, remember that the surface of a plane has no thickness.



Points and lines which lie in the same plane are called coplanar otherwise they are called non-coplanar.

### Examples:

A- Use the figure to answer 1 - 3



1) Name five points: E, F, G, H, I

2) Name two rays: IE, IG

3) Name two line segments: EF, GH