Points, Lines, and Planes

Unit 1 Lesson 2

Objectives:

- Understand and use the basic undefined terms and defined terms of geometry.

- Sketch the intersections of lines and planes.

Undefined Terms

A *definition* uses known words to describe a new word.

In geometry, some words such as point, line, and plane are *undefined* terms. In other words, there is no formal definition for these words, but instead they are explained by using examples and descriptions which allows us to define other geometric terms and properties.
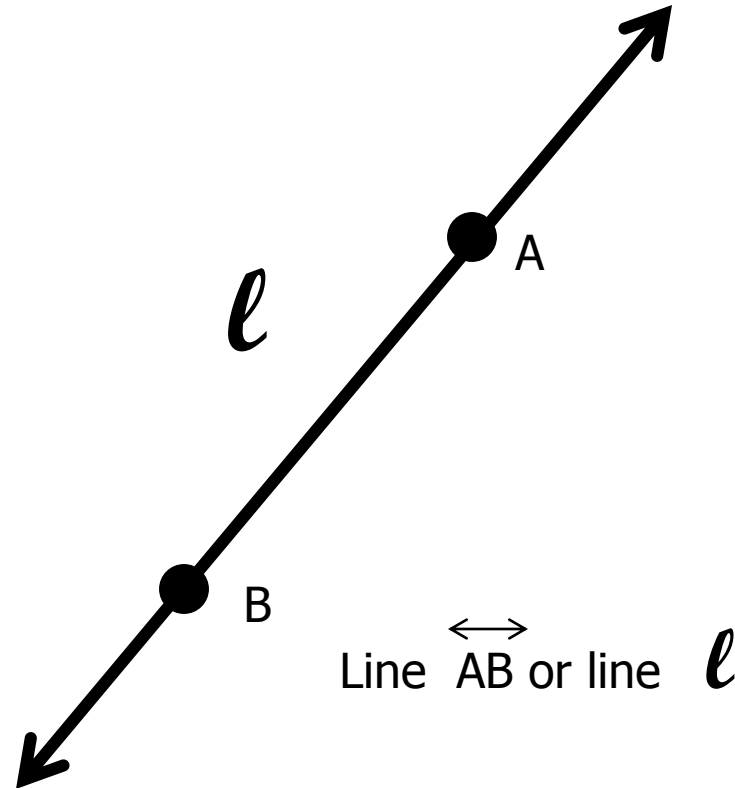
Point

- A *point* is simply a location. It has no dimension (shape or size), is usually represented by a small dot, and named by a capital letter.

A
●
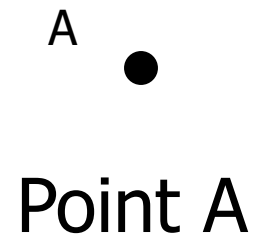
Point A

Line

- A *line* is a set of points and extends in one dimension. It has no thickness or width, is usually represented by a straight line with two arrowheads to indicate that it extends without end in both directions, and is named by two points on the line or a lowercase script letter.

ℓ

A

B

Line $\overleftrightarrow{AB}$ or line ℓ

Plane

- A *plane* is a flat surface made up of points. It extends in two dimensions, is usually represented by a shape that looks like a tabletop or wall, and is named by a capital script letter or 3 non-collinear points. You must imagine that the plane extends without end, even though the drawing of a plane appears to have edges.
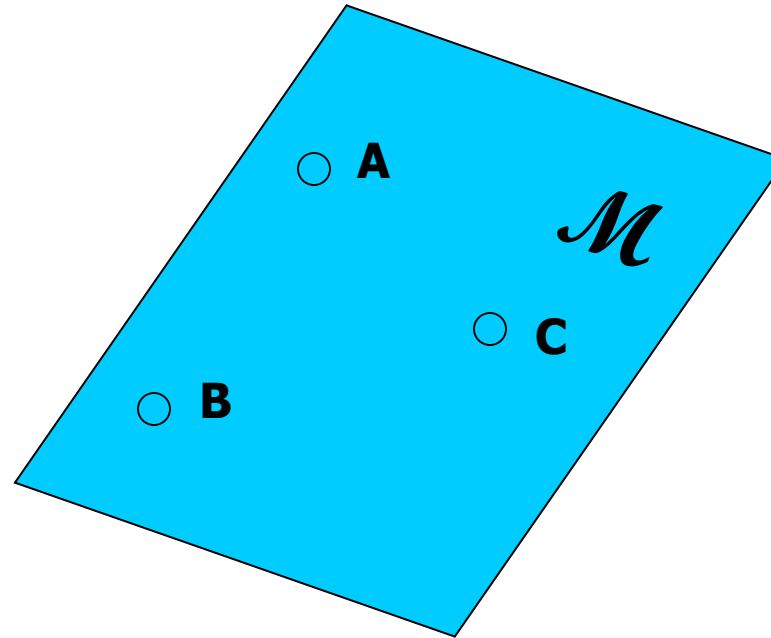
Plane ABC or plane $\mathcal{M}$

Space

- ***Space*** is a boundless, three dimensional set of all points. It can contain points, lines, and planes.

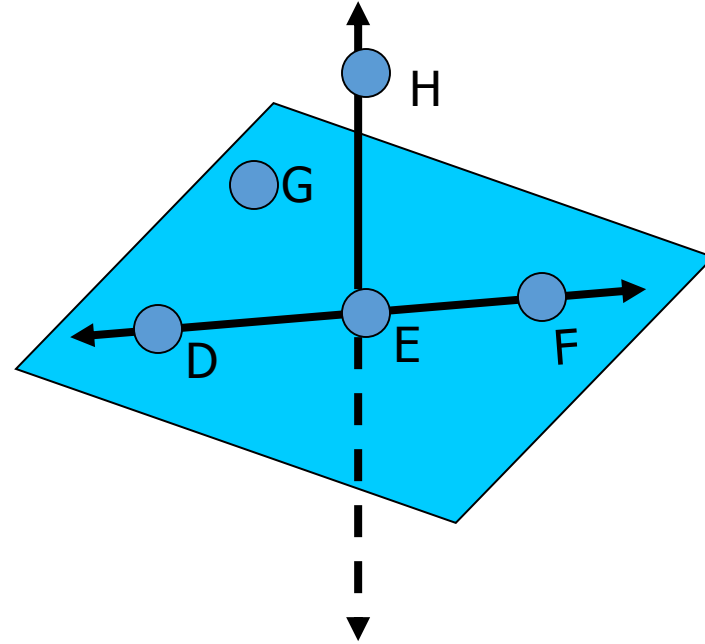# A few more basic concepts using these undefined terms . . .

- ***Collinear points*** are points that lie on the same line.
- ***Coplanar points*** are points that lie on the same plane.

Example 1:

Name three points that are collinear

Solution:

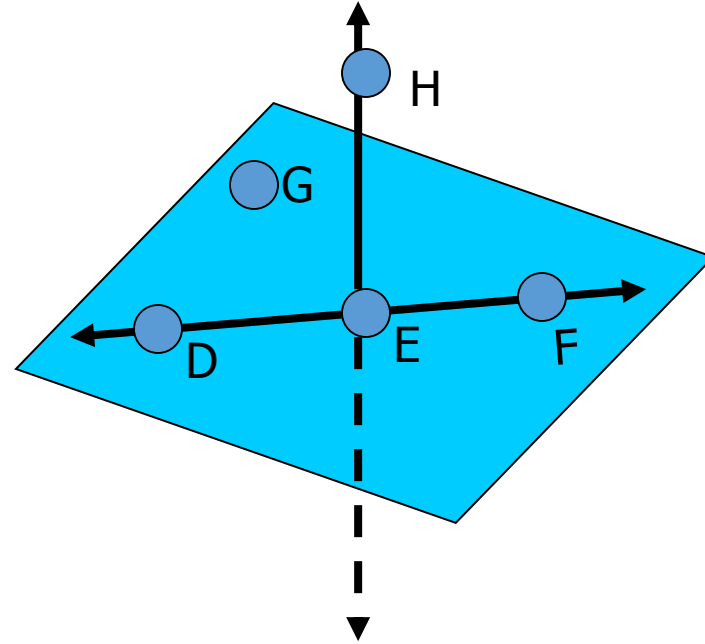D, E and F lie on the same line, so they are collinear.

Example 2:

Name four points that are coplanar.

Solution:

D, E, F, and G lie on the same plane, so they are coplanar. Also D, E, F, and H are coplanar; although, the plane containing them is not drawn.
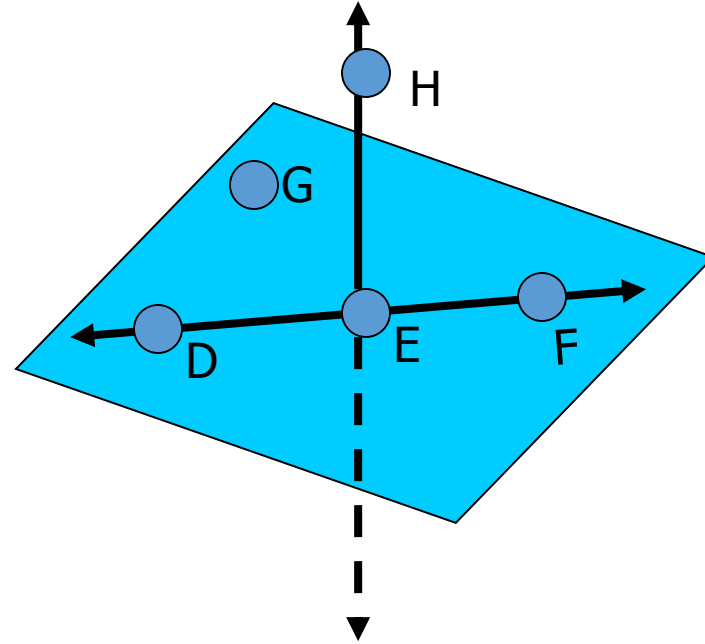
Example 3:

Name three points that are not collinear.

Solution:

There are many correct answers. For instance, points H, E, and G do not lie on the same line.

More . . .

- Another undefined concept in geometry is the idea that a point on a line is between two other points on the line. You can use this idea to define other important terms in geometry.

- Consider the line AB (symbolized by AB).

$\longleftrightarrow$

Line ℓ or $\overleftrightarrow{AB}$
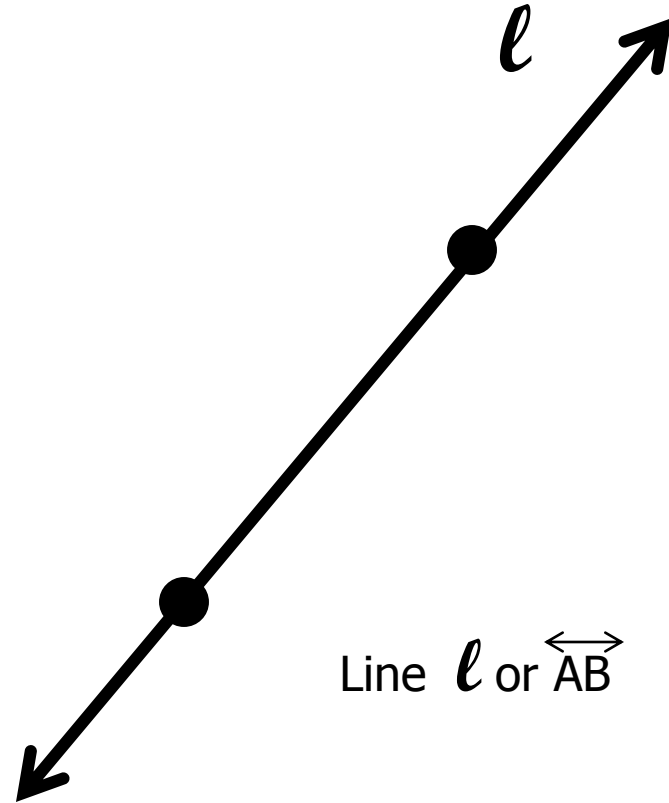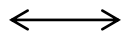
Intersections of Lines & Planes

- Two or more lines *intersect* if they have a common point. Two or more planes *intersect* if they have a common line. The intersection of any figures is the set of points the figures have in common.

Example 4:

- How to sketch a line that intersects a plane in one point

➢ Draw a plane and a line.

➢ Emphasize the point where they meet.

➢ Use dashes to indicate where the line is hidden by the plane.
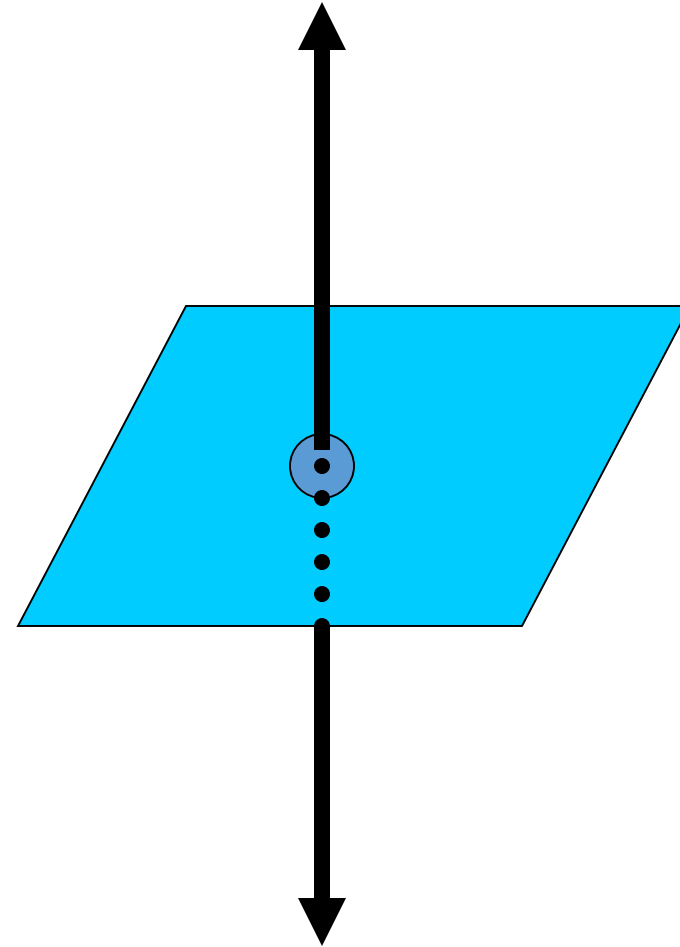
Example 5:

- How to sketch two planes that intersect in a line.

➢ Draw two planes.

➢ Emphasize the line where they meet.

➢ Use dashes to indicate where one plane is hidden by the other plane.