

# Chapter 1

## Basics of Geometry

## Section 2

# Points, Lines, and Planes

## GOAL 1: Using Undefined Terms and Definitions

**Point:** a place in space; a dot [UNDEFINED TERM]

**Line:** two (or more) points connected; extends forever in both directions; straight

**Plane:** 2D surface that extends infinitely in all directions

**Collinear points:** 3 or more points on the same line

**Coplanar points:** 3 or more points on the same plane

## Example 1: Naming Collinear and Coplanar Points

a. Name three points that are collinear.

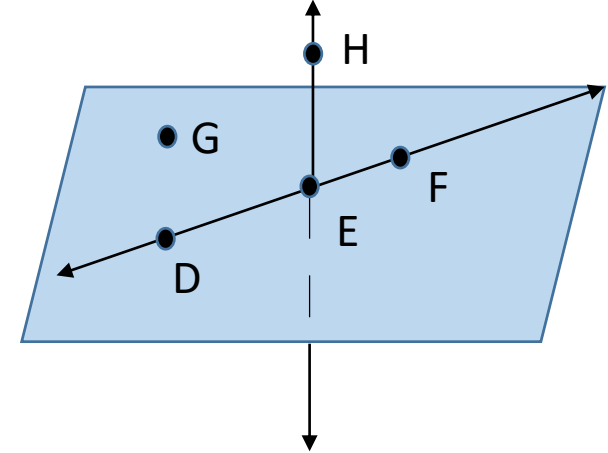
D, E, F

a. Name four points that are coplanar.

G, D, E, F

a. Name three points that are not collinear.

H, G, D

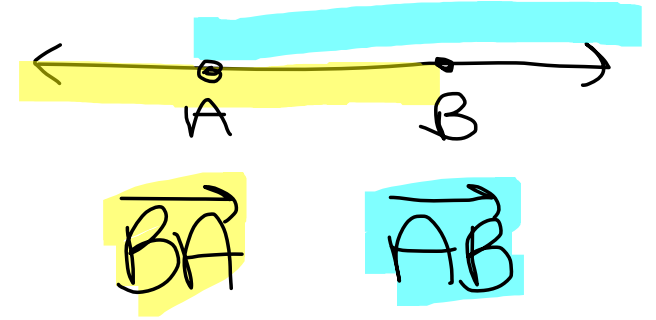


Consider the line AB (symbolized by  $\overleftrightarrow{AB}$ ).

The line segment or segment AB  
(symbolized by  $\overline{AB}$ ) consists of the endpoints A and B,  
and all points on  $\overleftrightarrow{AB}$  that are between A and B.

The ray AB (symbolized by  $\overrightarrow{AB}$ ) consists of the  
endpoint A and all points on  $\overleftrightarrow{AB}$  that lie on  
The same side of A as point B.

Note that  $\overleftrightarrow{AB}$  is the same as  $\overleftrightarrow{BA}$ , and  $\overline{AB}$  is the same as  $\overline{BA}$ . However,  $\overrightarrow{AB}$  and  $\overrightarrow{BA}$  are NOT the same. They have different initial points and extend in different directions.



If C is between A and B, then  $\overrightarrow{CA}$  and  $\overrightarrow{CB}$  are \_\_\_opposite rays\_\_\_.

Like points, segments and rays are collinear if they lie on the same line.

So, any two opposite rays are collinear. Segments, rays, and lines are coplanar if they lie on the same plane.

**Line:** see slide 3

**Line segment/segment:** connects two points; ends on both sides

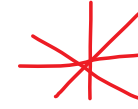
**Endpoints:** ending/starting point of segment

**Ray:** connects two points; ends on 1 side, extends infinitely in the other direction

**Initial point:** starting point for a ray

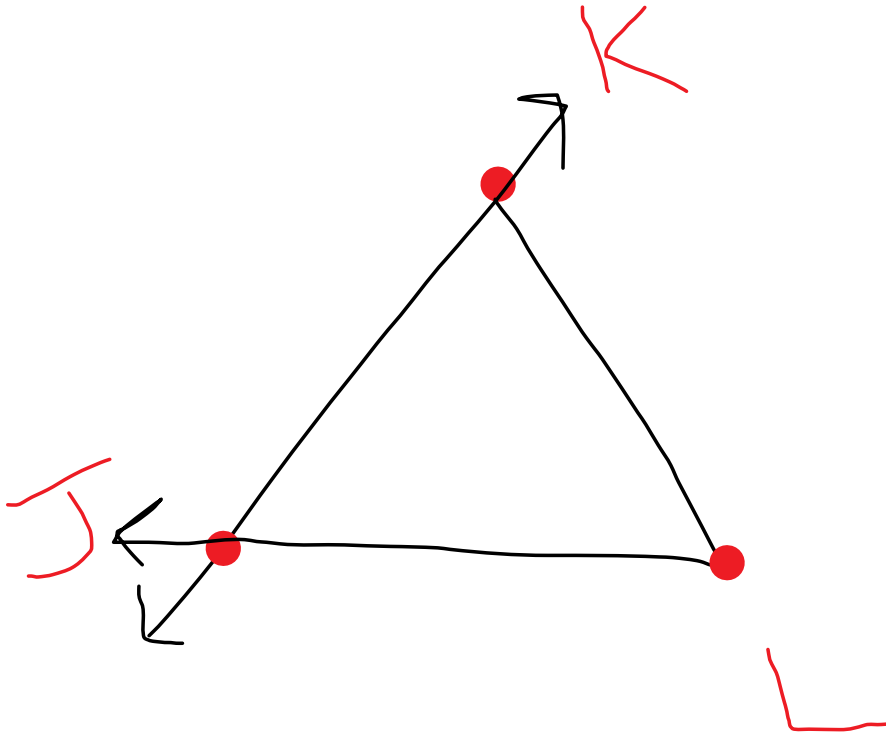
**Opposite rays:** two rays with the same initial point, extend in opposite directions

## Example 2: Drawing Lines, Segments, and Rays



Draw three **noncollinear** points, J, K, and L. Then draw  $\overleftrightarrow{JK}$ ,  $\overline{KL}$ , and  $\overrightarrow{LJ}$ .

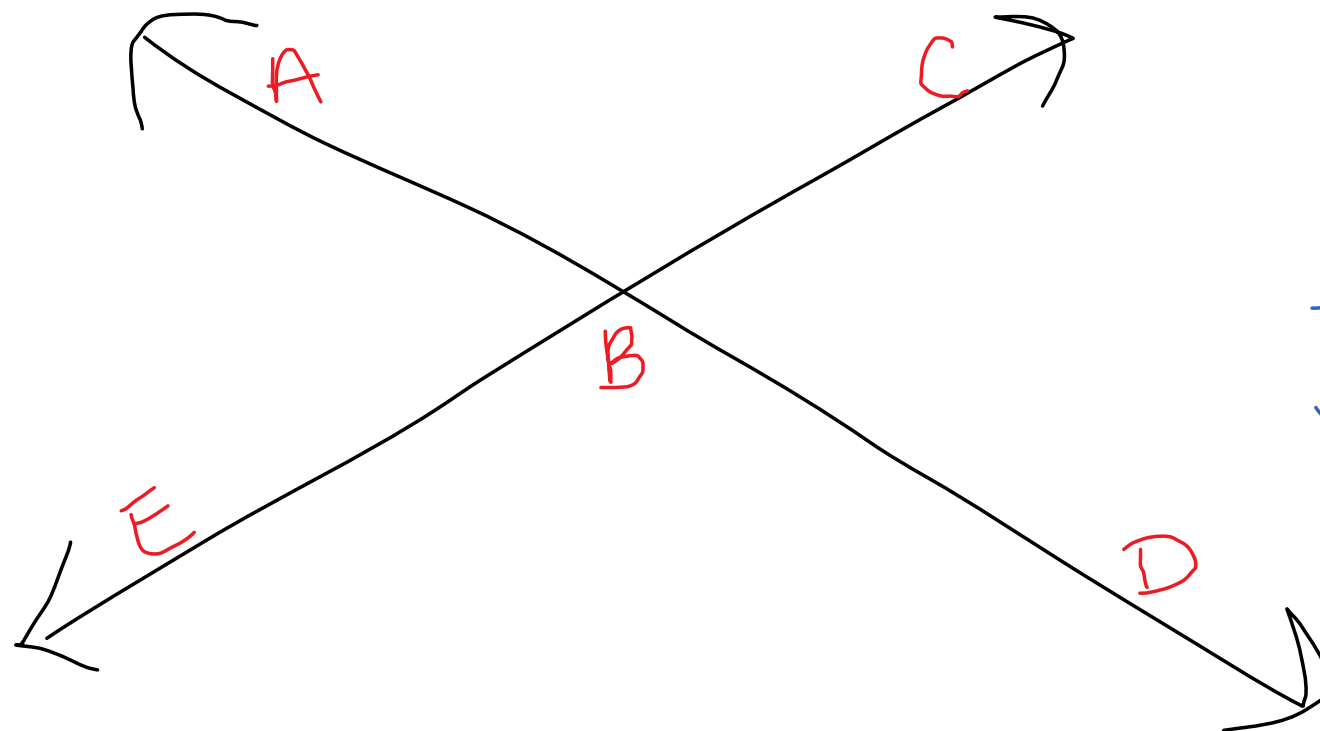
\*\*all 3 points cannot be in same line; 2 of the 3 can be





### Example 3: Drawing Opposite Rays

Draw two lines. Label points on the lines and name two pairs of opposite rays.



$$\overrightarrow{BC} + \overrightarrow{BE}$$

$$\overrightarrow{BD} + \overrightarrow{BA}$$

## GOAL 2: Sketching Intersections of Lines and Planes

Note:

Two or more figures intersect if they have one or more points in common. The intersection of the figures is the set of points the figures have in common.

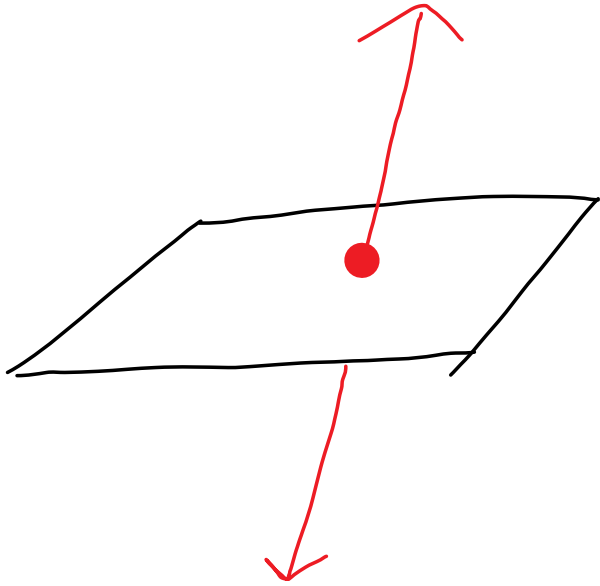
\*two lines  $\rightarrow$  point

\*two planes  $\rightarrow$  line

## Example 4: Sketching Intersections

Sketch the figures described.

- a. A line that intersects a plane in one point



- b. two planes that intersect in a line

