Geometry

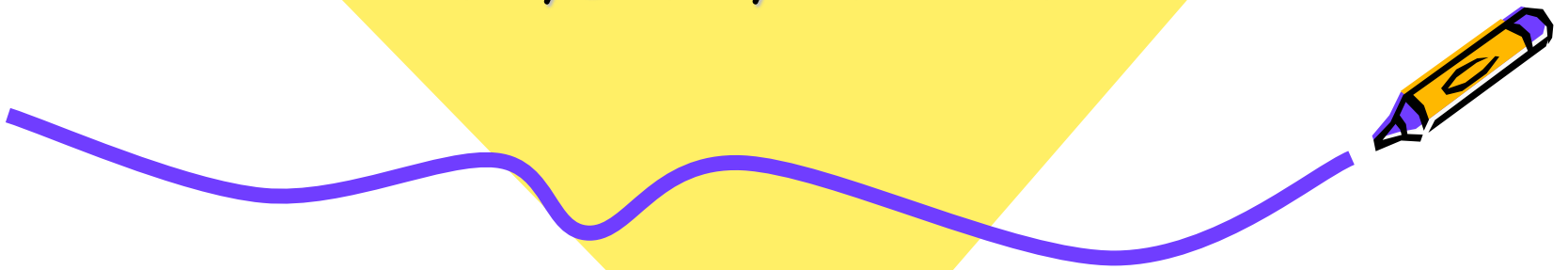## Points, Lines, and Planes
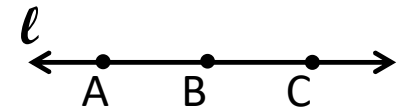
Points, Lines, and Planes

Point   Identifies a specific location. Has no dimension. Represented by a dot. Named by capital print/block letter.

• A

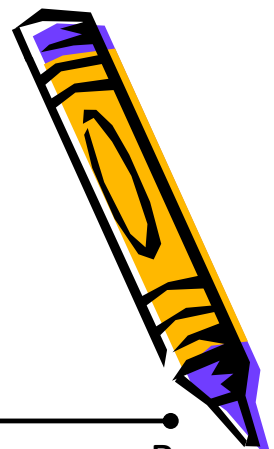**Line**   A series of points that follow a straight path. Line have no thickness. Extend forever in both directions. Named by lowercase script letter or by any two points on the line.

ℓ

$\overset{\longleftrightarrow}{A \quad B \quad C}$

line ℓ or $\overleftrightarrow{AB}$ $\overleftrightarrow{BA}$

$\overleftrightarrow{AC}$ $\overleftrightarrow{CA}$ $\overleftrightarrow{BC}$ $\overleftrightarrow{CB}$
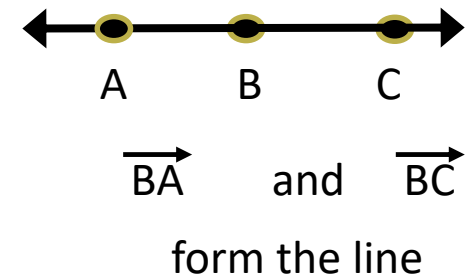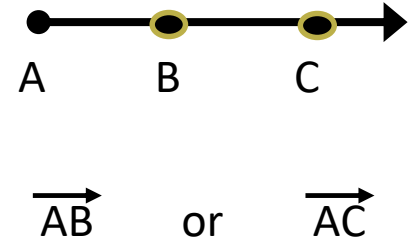
Points, Lines, and Planes

Line Segment

A section of a line with defined endpoints. Named by the two endpoints of the segment.

A •————————————————• B

$\overline{AB}$ $\overline{BA}$

Ray

A part of a line having one defined end point and extending in one direction forever. Named by is endpoint followed by a point it passes through.

A •——————•B——————•C →

$\overrightarrow{AB}$ or $\overrightarrow{AC}$

Opposite rays form a line.

← •A ——— •B ——— •C →

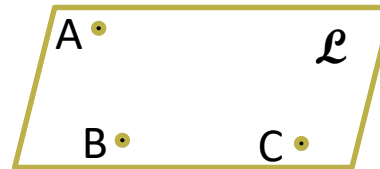$\overrightarrow{BA}$ and $\overrightarrow{BC}$

form the line

Points, Lines, and Planes

Plane A flat surface extending forever in 4 directions. Has no thickness. Named by a capital script letter or any 3 noncollinear points.
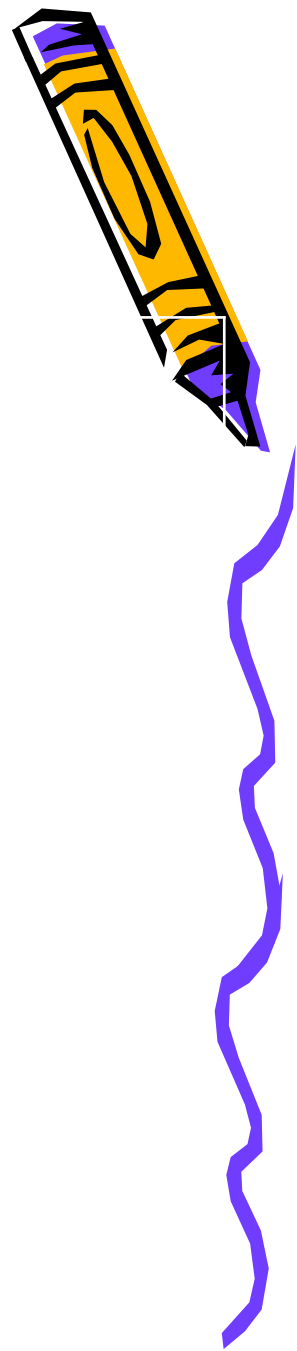
plane $\mathcal{L}$ or
plane ABC or
ABC

A $\bullet$ $\mathcal{L}$

B $\bullet$ C $\bullet$

Points, Lines, and Planes

Collinear   Points that lie on the same line. Any two points can lie on the same line. Collinear refers to a 3rd point, a collective group of points, or a point to a group or equation of a line.

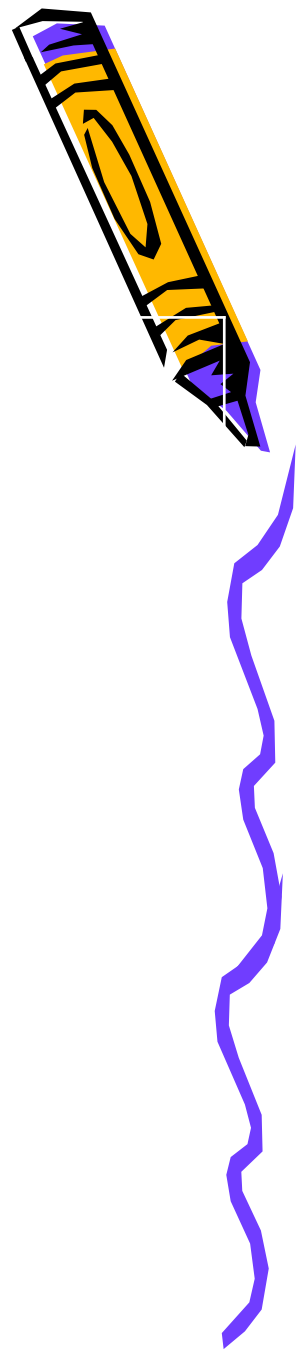**Noncollinear**   When all points in question do not lie on the same line.

Points, Lines, and Planes

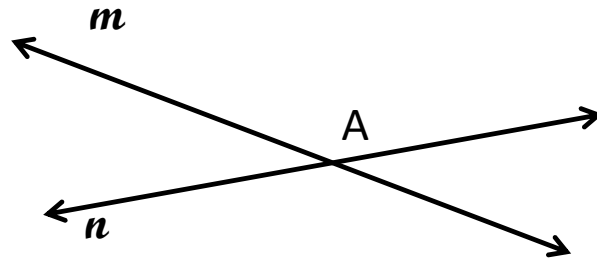**Coplanar**   Points and/or lines that lie on the same plane.

Noncoplanar   When all points and/or lines in question do not lie on the same plane.
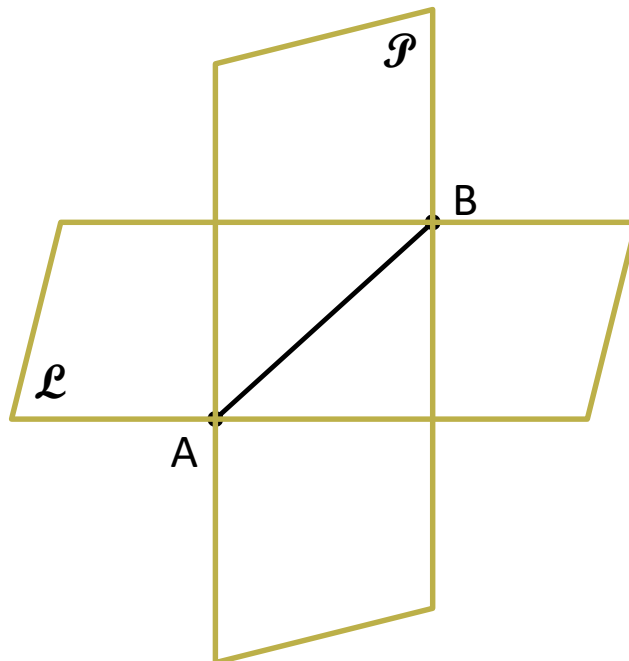
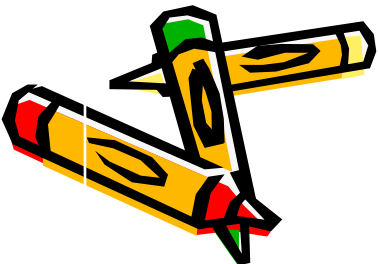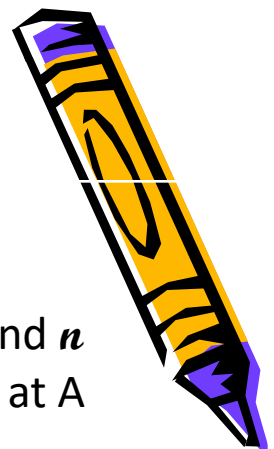# Points, Lines, and Planes

Lines intersect at a point

m

A

n

lines *m* and *n* intersect at A

Two planes intersect at a line (or line segment)
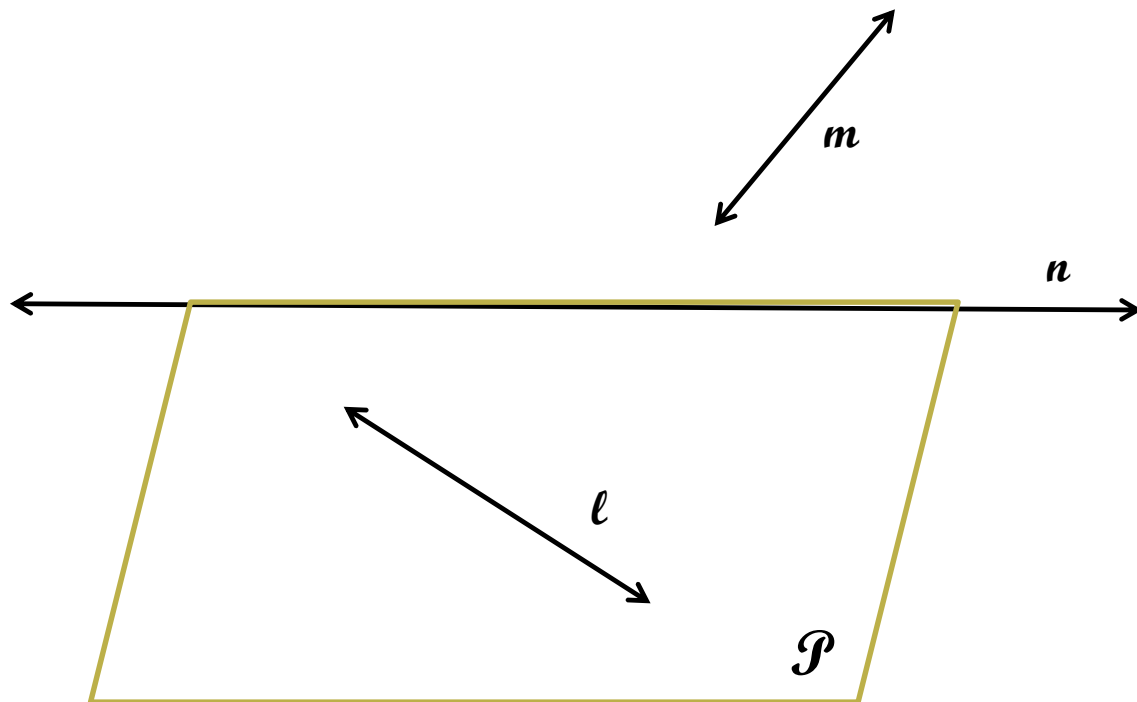
$\mathcal{P}$

B

$\mathcal{L}$

A

planes $\mathcal{L}$ and $\mathcal{P}$ intersect at $\overline{AB}$

Three planes intersect at either a point or a line.

Points, Lines, and Planes

m

n

ℓ

𝒫

Line m is not on plane 𝒫
Line n is not on plane 𝒫
Line $ℓ$ is on plane 𝒫

Points, Lines, and Planes
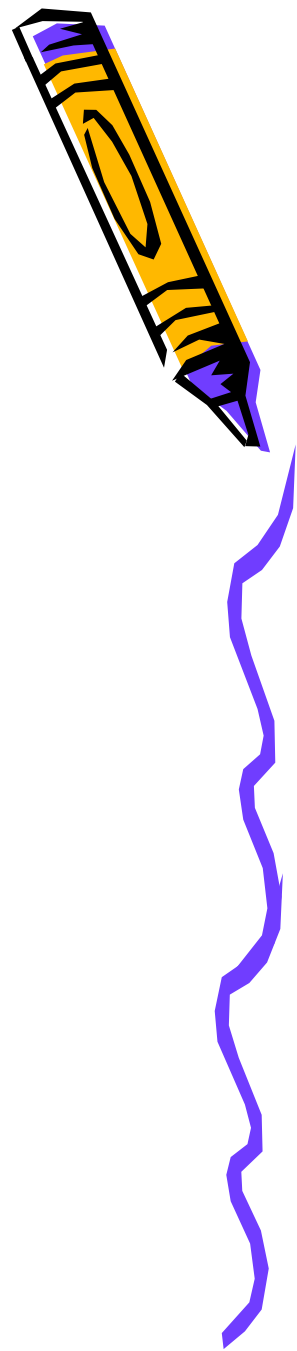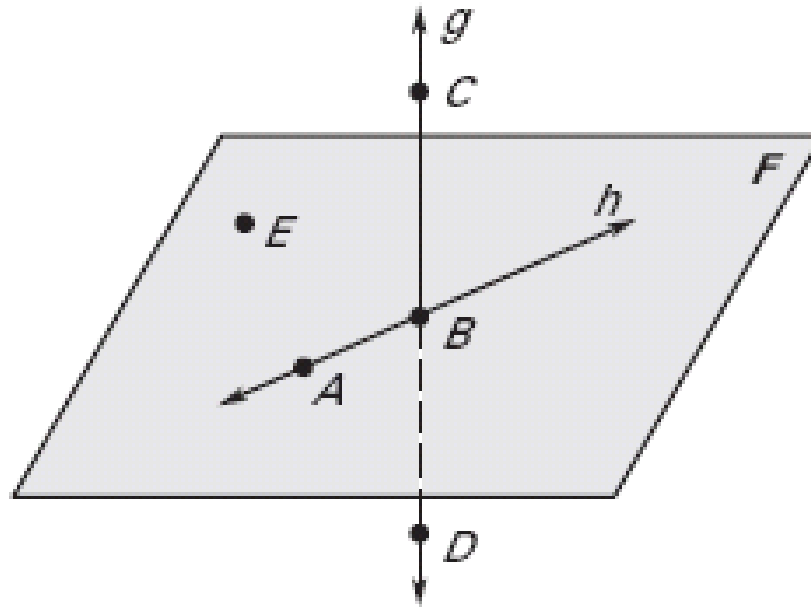
n

A

$\mathcal{P}$
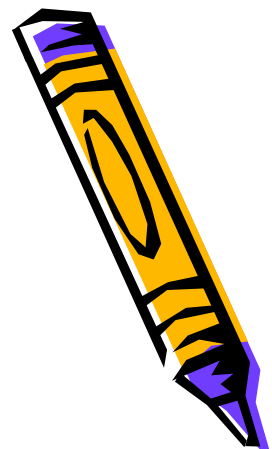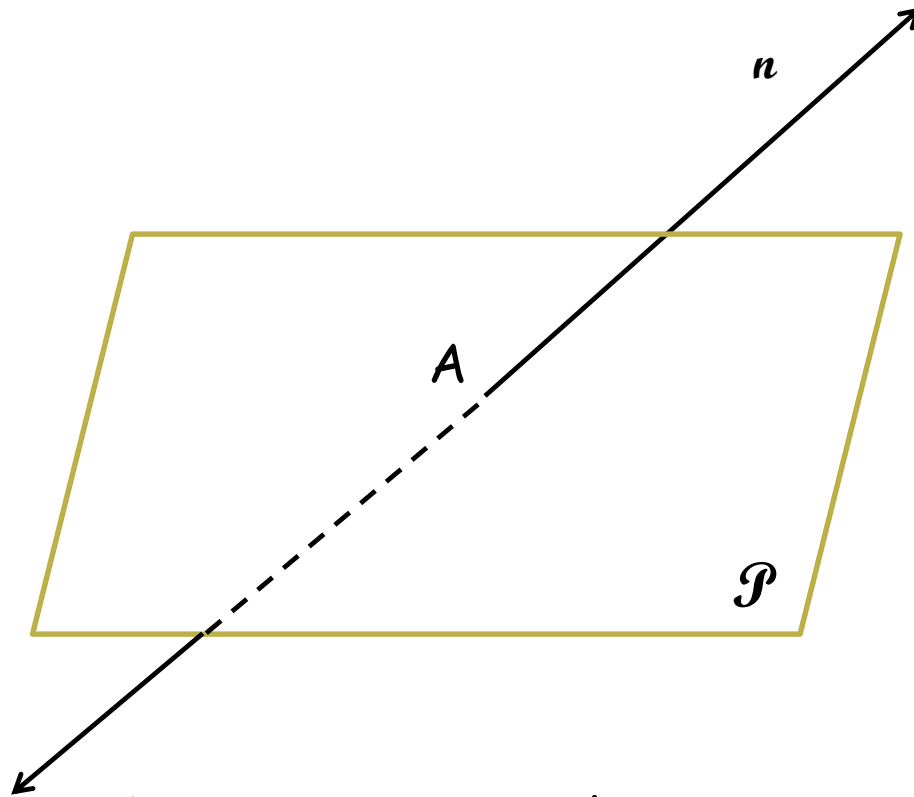
Line *n* intersects plane $\mathcal{P}$ at point A

The line comes down, punches through the plane, and continues on. The dashed part is behind the plane, then becomes visible again (solid).
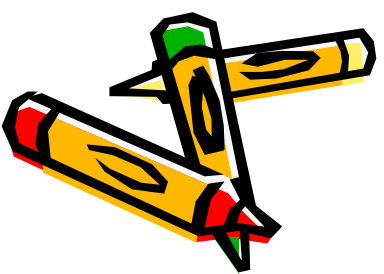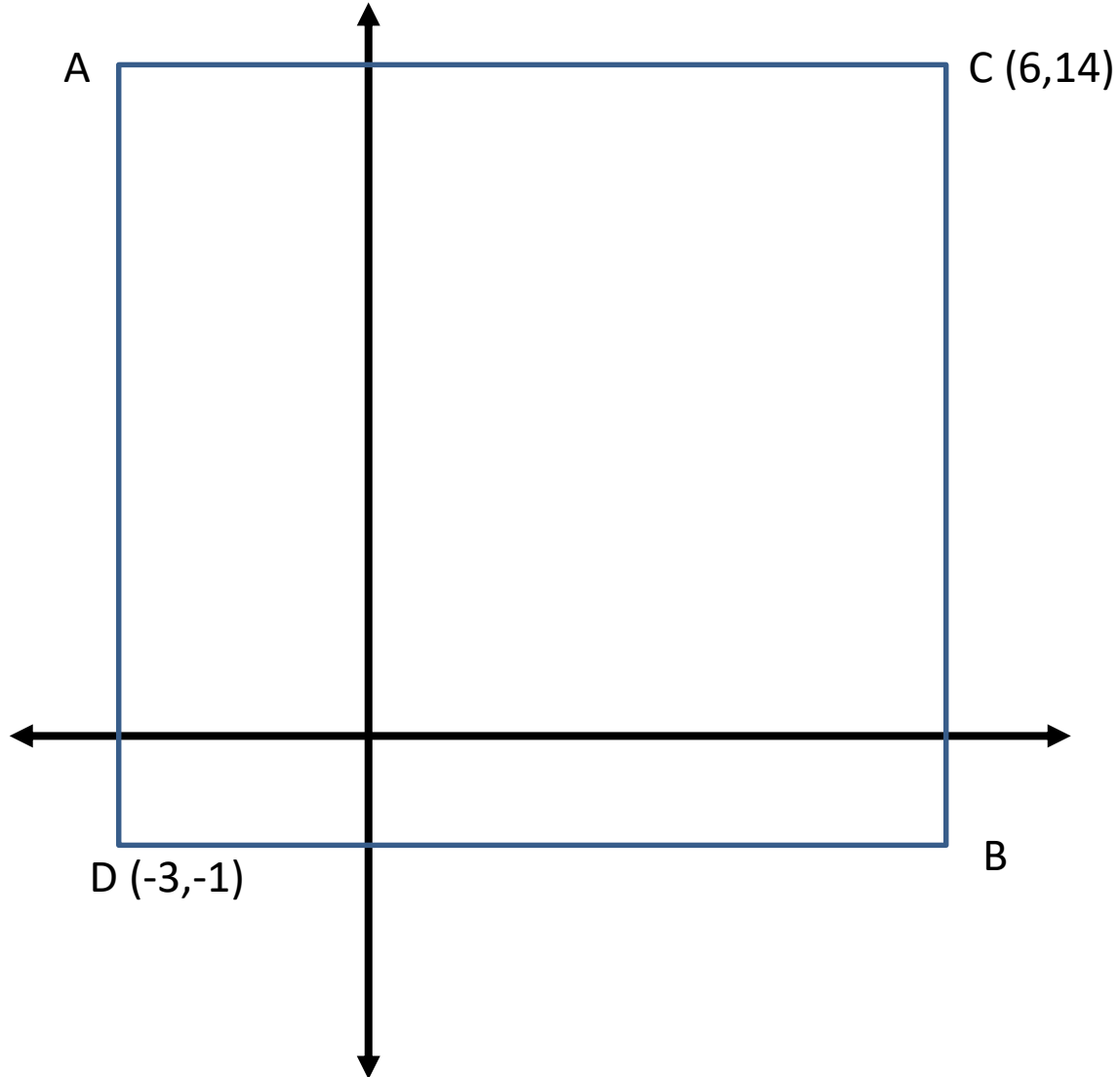
Points, Lines, and Planes

Using the figure below, give an example of a point, line, line segment, plane, ray, and endpoint.

Determine the ordered pairs for points A and B.

A   C (6,14)

D (-3,-1)   B

Points A, B, and C are collinear to the line y = 3x – 2

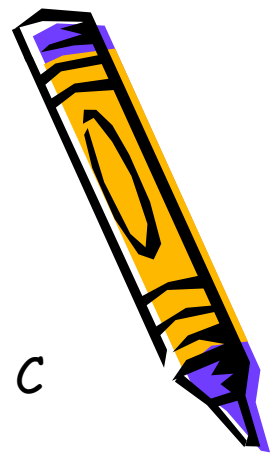Determine if the following points are collinear to A, B, and C

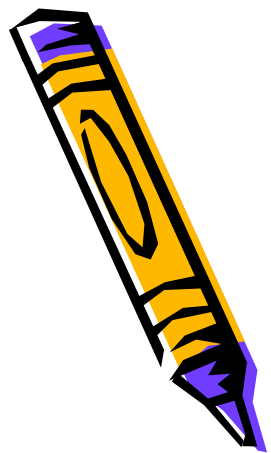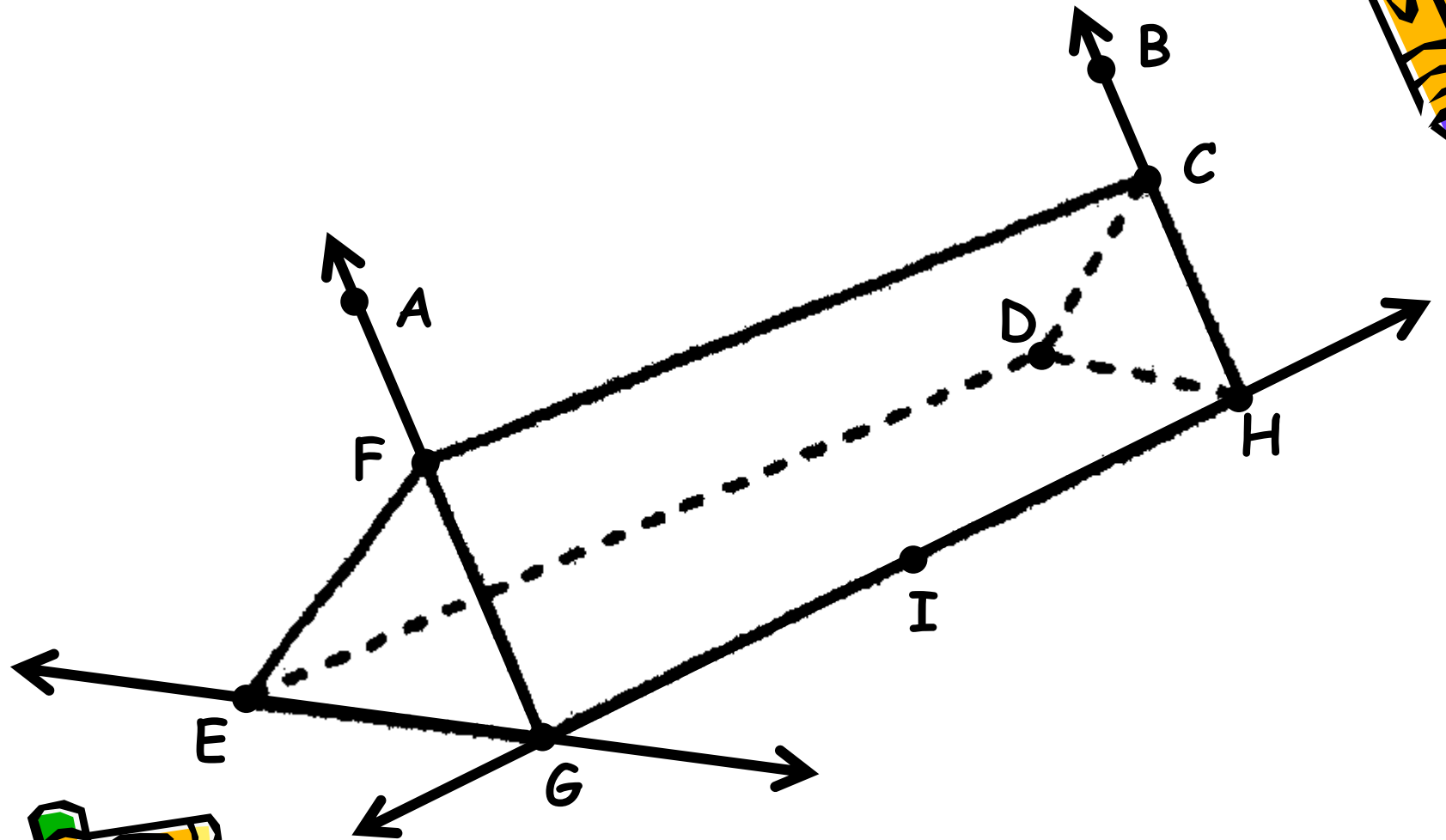D (-2, -8)   E (4, 6)

F (1/4, -5/4)   G (-2/3, 0)

Points, Lines, and Planes

1. Name a line containing point E
2. Name a ray containing point H
3. Name 2 lines that intersect
4. Name the intersection of lines EG and IH
5. How many planes are in the figure?
6. Name a plane that contains point I
7. Name any parallel planes
8. Name the intersection of planes EFG and ICH
9. What planes intersect at segment FC
10. Name the line segments that intersect at D
11. Is D on plane CFE?
12. Is A on segment FG?
13. How many planes does F belong to?
14. If we draw ray IF, how many planes would that ray intersect?