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Points Lines and Planes

Unit 1 Lesson 2

Students will be able to:

• Draw points, lines, line segments, rays, and planes.

• Identify points, lines, line segments, rays and planes.

Know precise definitions of line, and line segment, based on the undefined notions of point, line.

Key Vocabulary:

A line,

A point,

A line segment,

A plane,

Intersection.

- In geometry, some words, such as point, line, and plane, are **<u>undefined terms</u>**. Although these words are not formally defined, it is important to have general agreement about what each word means.

- **<u>A point</u>** has no dimension.
- It is usually represented by a small dot and named by a capital letter.

- **A line** extends in one dimension.

- It is usually represented by a straight line with two arrowheads to indicate that the line extends without end in two directions, and is named by two points on the line or a lowercase script letter.

- **<u>A plane</u>** extends in two dimensions.

- It is usually represented by a shape that looks like a tabletop or wall.

- You must imagine that the plane extends without end, even though the drawing of a plane appears to have edges, and is named by a capital script letter or 3 non-collinear points.

- **A line segment** is a set of points and has a specific length i.e. it does not extend indefinitely.

- It has no thickness or width, is usually represented by a straight line with no arrowheads to indicate that it has a fixed length, and is named by two points on the line segment with a line segment symbol above the letters.

- **<u>A ray</u>** is a set of points and extends in one dimension in one direction (not in two directions). It has no thickness or width, is usually represented by a straight line with one arrowhead to indicate that it extends without end in the direction of the arrowhead, and is named by two points on the ray with a ray symbol above the letters

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

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

Sample Problem 1: Use the figure to name each of the following.

a.

D

A

B

C
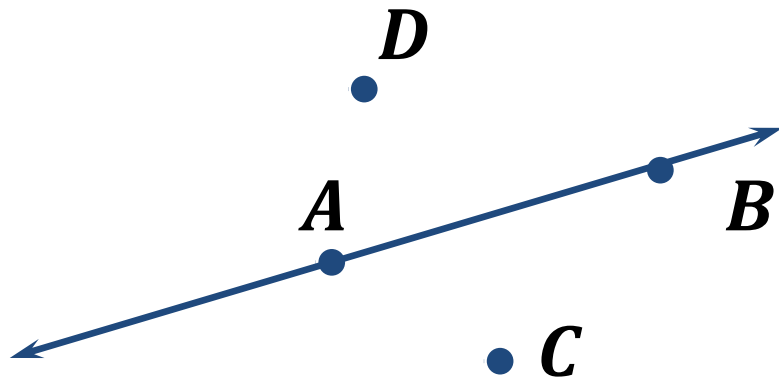
Line
Points
Collinear points
Non collinear points

Sample Problem 1: Use the figure to name each of the following.
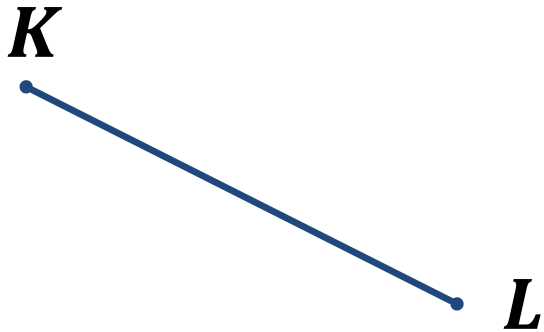
a.
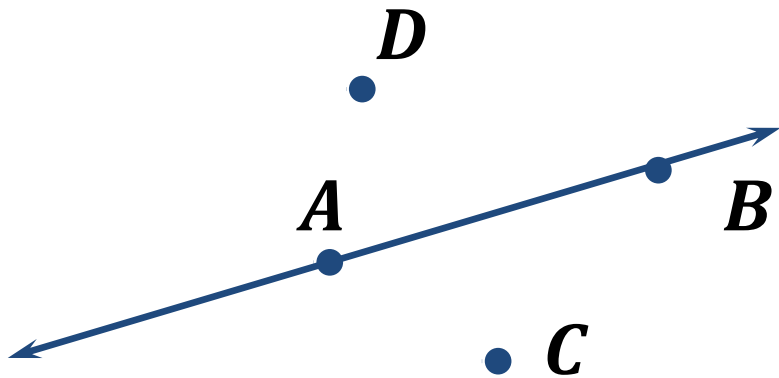
Line $\overleftrightarrow{AB}$

Points A, B, C and D

Collinear points A, B

Non collinear points A, C, D

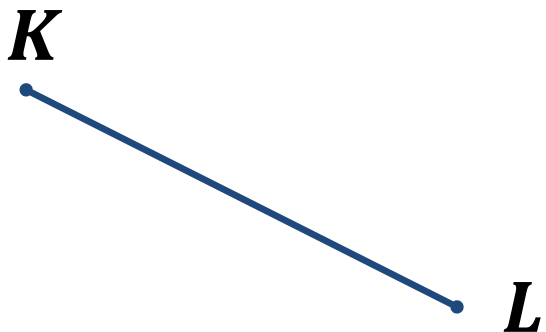**Sample Problem 1:** Use the figure to name each of the following.

b.

K

L

Line segment
Points

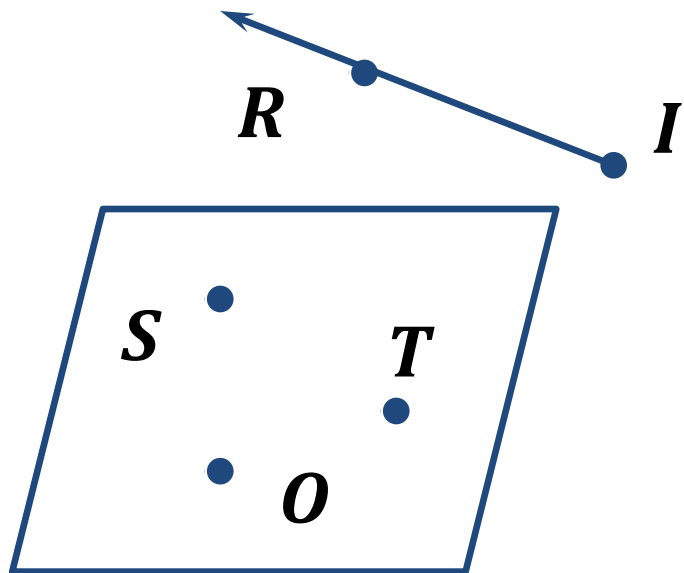**Sample Problem 1:** Use the figure to name each of the following.

b.

K

L

Line segment $\overline{KL}$
Points K, L

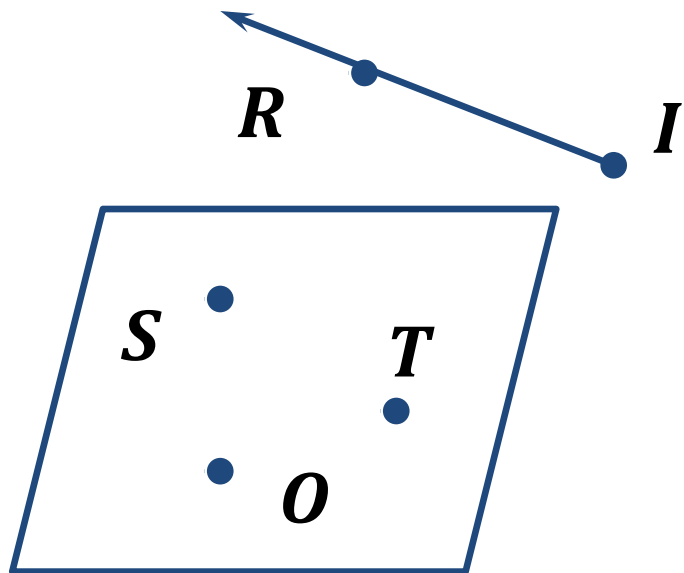**Sample Problem 1:** Use the figure to name each of the following.

c.

Plane

Ray

Points

Coplanar points

Non coplanar points

Points Lines and Planes

Sample Problem 1: Use the figure to name each of the following.

c.

Plane STO

Ray $\overrightarrow{IR}$

Points S, T, O, R and I

Coplanar points S, T, O

Non coplanar points R, I

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- Two or more geometric 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.

- **Postulate 1-1**   Through any two points there is exactly one line.

- **Postulate 1-2**   If two distinct lines intersect, then they intersect in exactly one point.

- **Postulate 1-3**   If two distinct planes intersect, then they intersect in exactly one line.

- **Postulate 1-4**   Through any three non collinear points there is exactly one plane.
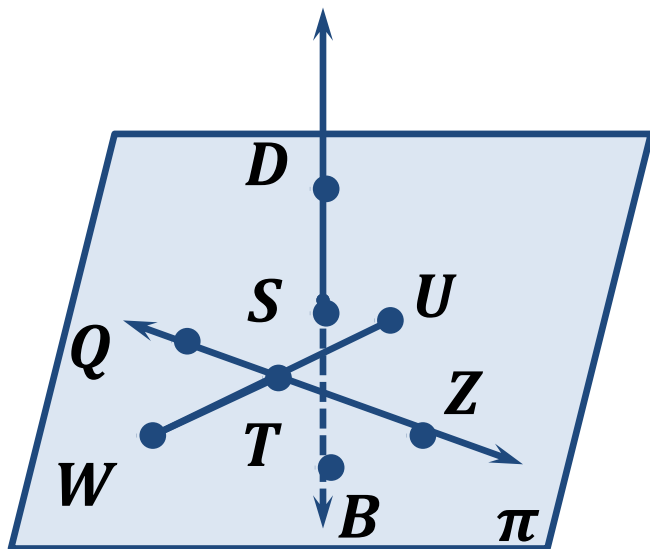
-

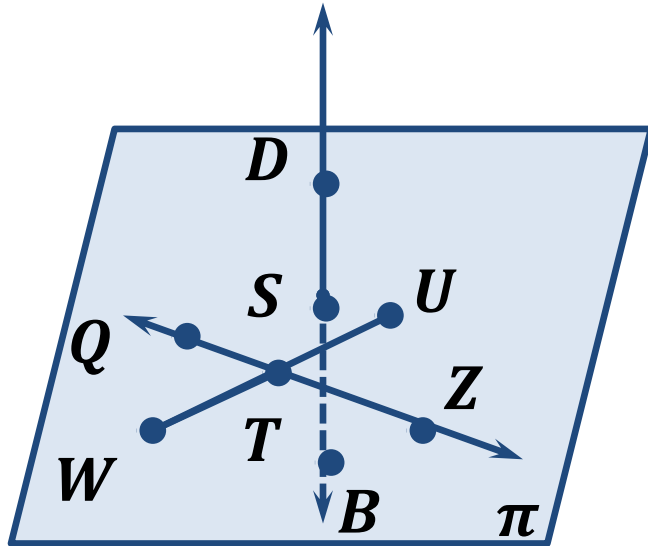## Sample Problem 2: **Refer to each figure.**

a.
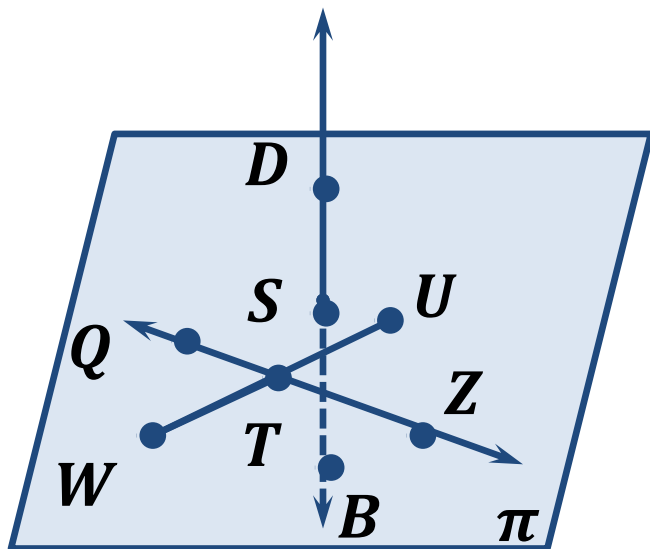
Name the intersection of line $\overleftrightarrow{QZ}$ and segment $\overline{WU}$.

Sample Problem 2: Refer to each figure.

a.

Name the intersection of line $\overleftrightarrow{QZ}$ and segment $\overline{WU}$.

Point T
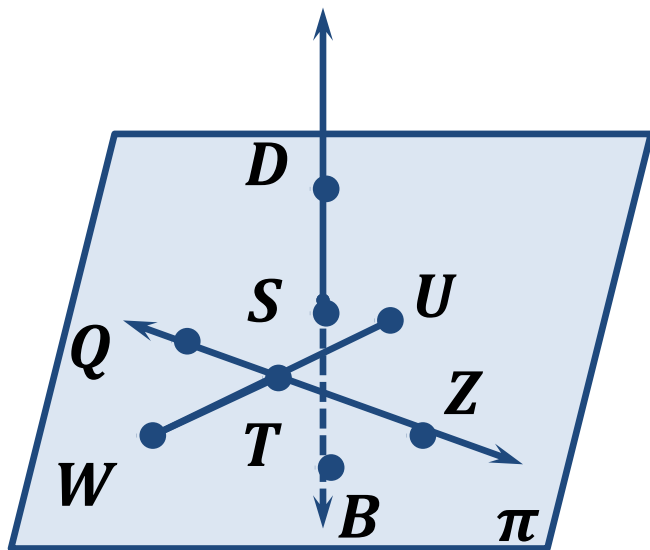
Sample Problem 2: Refer to each figure.

a.

Name the intersection of plane π and line $\overleftrightarrow{DB}$.
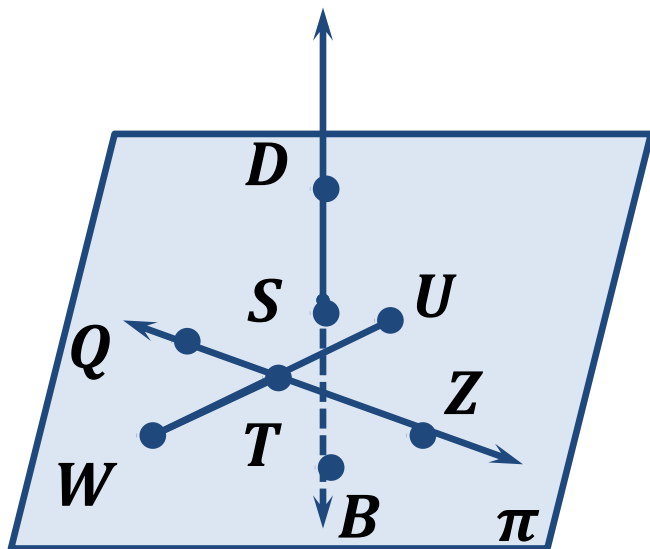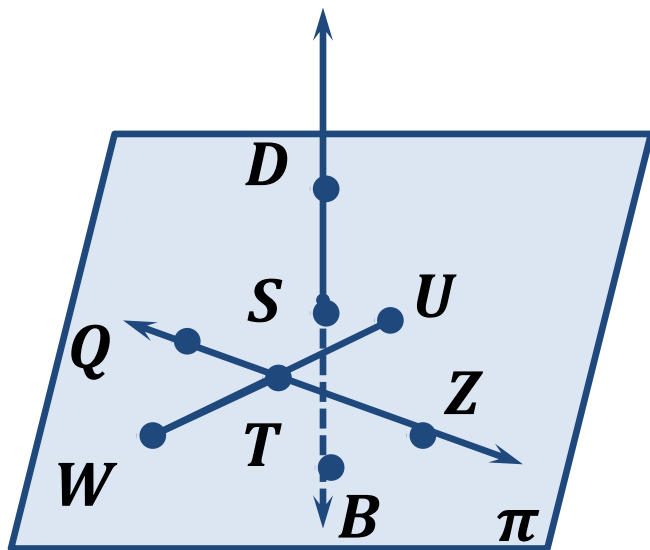
Sample Problem 2: Refer to each figure.

a.

Name the intersection of plane π and line $\overleftrightarrow{DB}$.

Point S

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Sample Problem 2: Refer to each figure.

a.

Name the two opposite rays at point T.
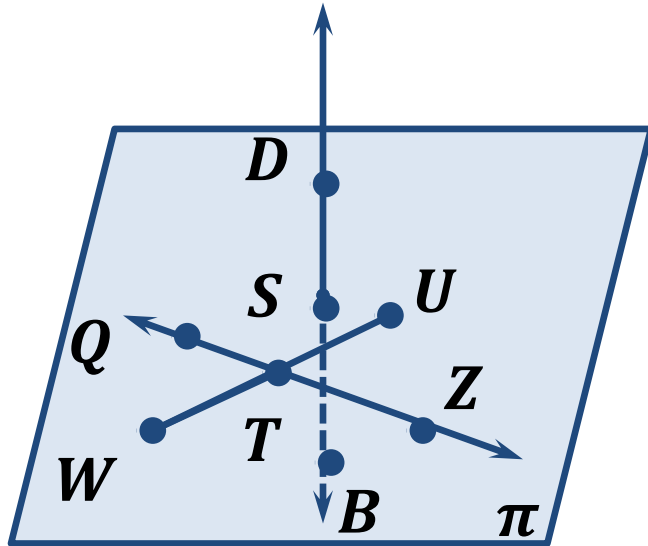
Sample Problem 2: Refer to each figure.

a.

Name the two opposite rays at point T.

$$\overrightarrow{TQ} \text{ and } \overrightarrow{TZ}$$

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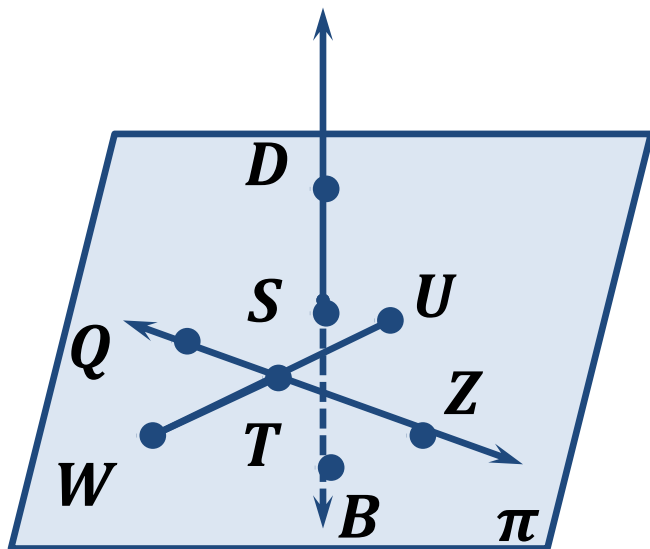
Sample Problem 2: Refer to each figure.

a.

What is another name for plane π?

Sample Problem 2: Refer to each figure.

a.
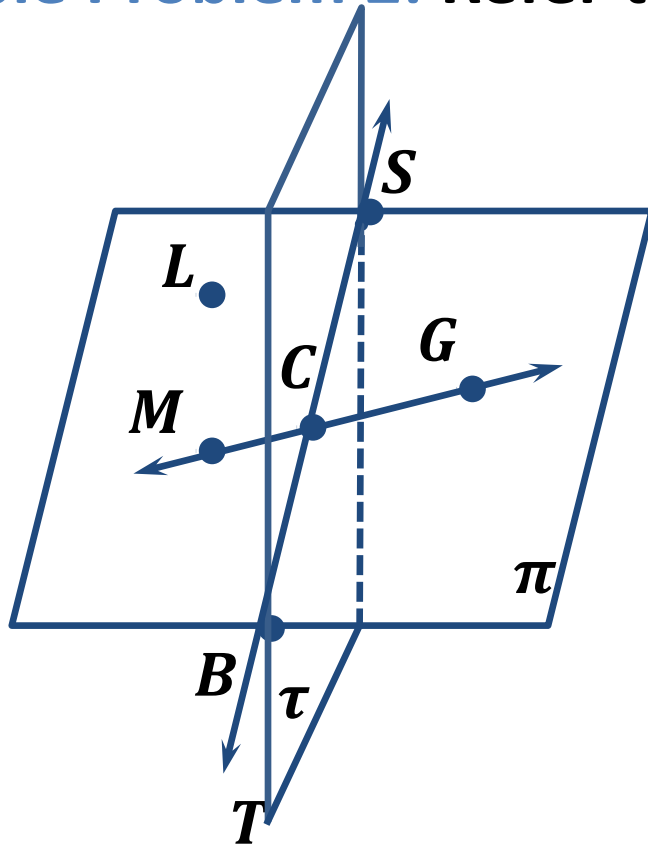

What is another name for plane π?
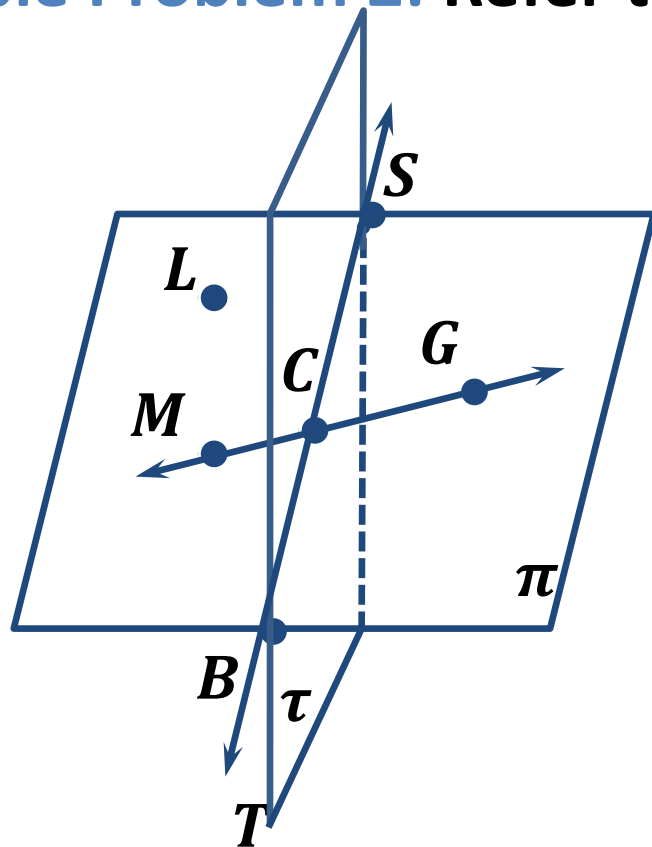
Plane *TSU*

Sample Problem 2: Refer to each figure.

b.

Name the intersection of plane π and plane τ.

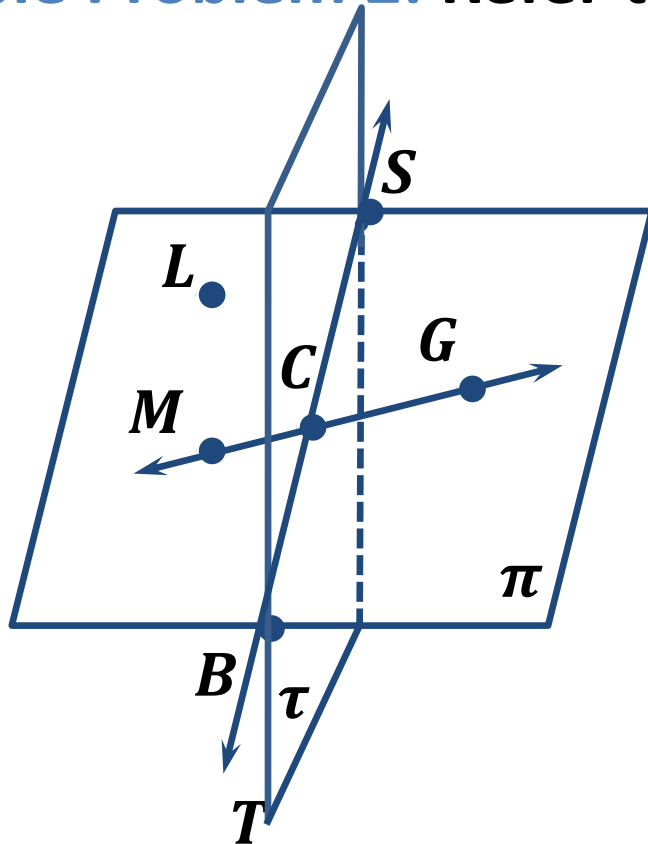## Sample Problem 2: Refer to each figure.

b.

Name the intersection of plane π and plane τ.

Line $\overleftrightarrow{BS}$
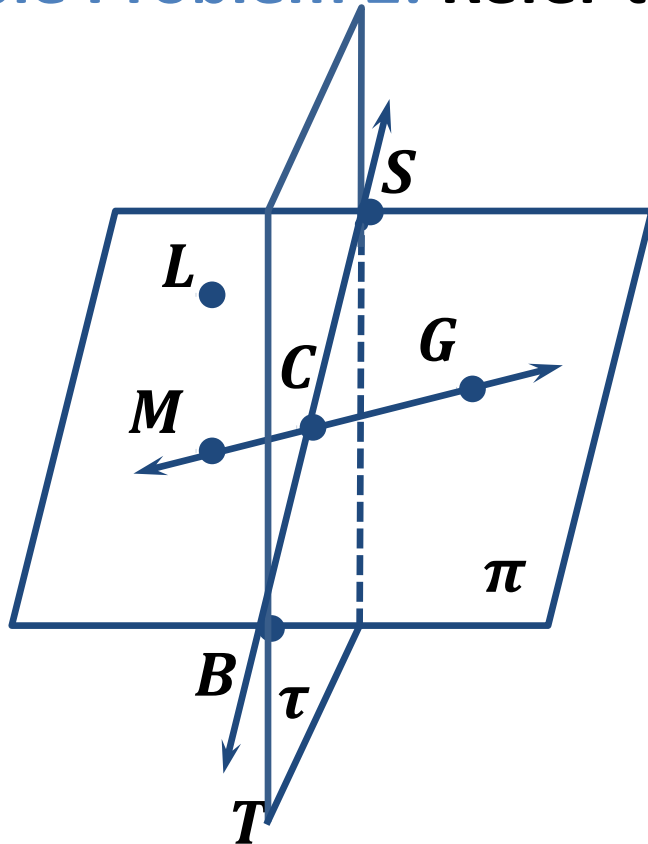
Sample Problem 2: Refer to each figure.

b.

What is another name for plane π?
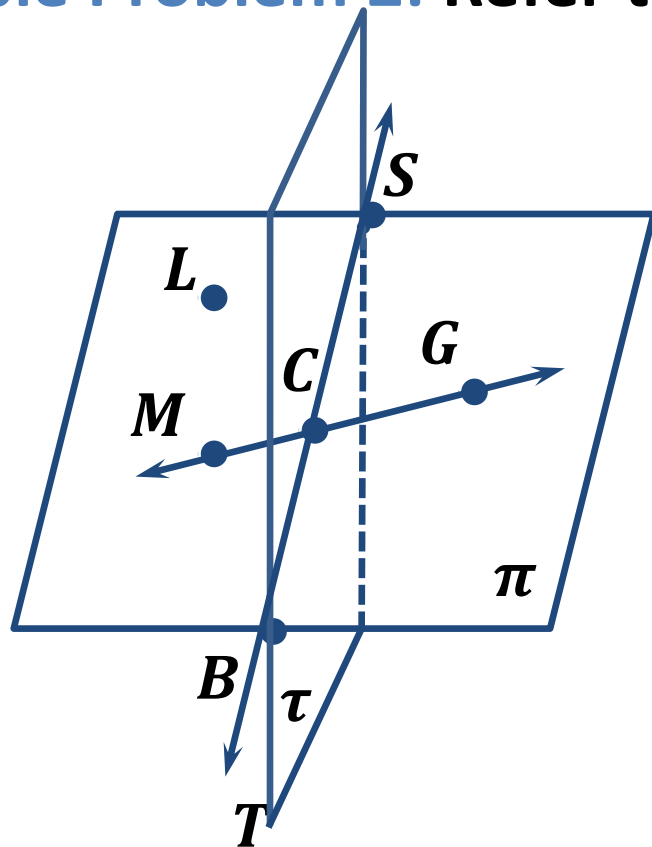
Sample Problem 2: Refer to each figure.

b.

What is another name for plane π?

Plane LMG

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Sample Problem 2: Refer to each figure.

b.

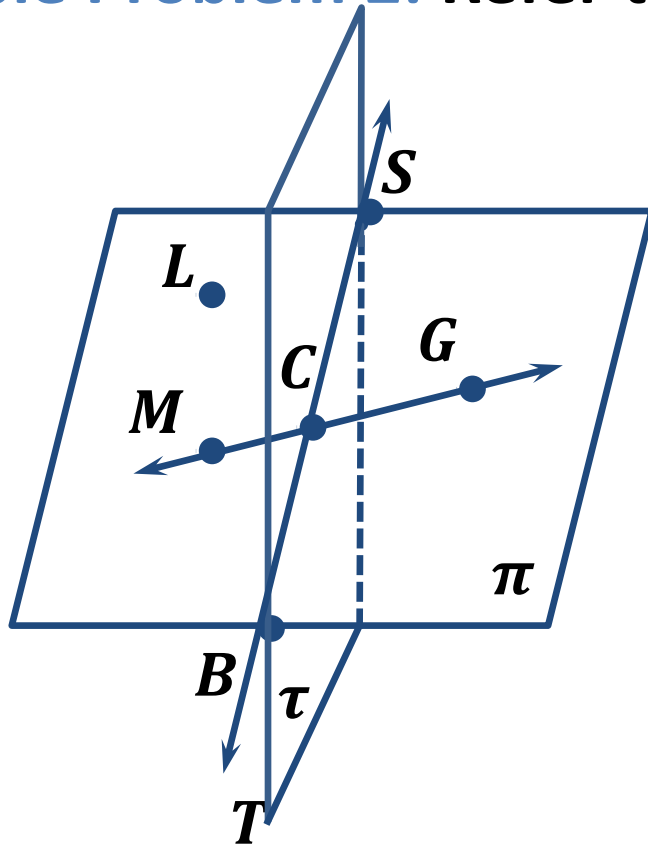Name the intersection of line $\overleftrightarrow{MG}$ and line $\overleftrightarrow{BS}$.

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Sample Problem 2: Refer to each figure.

b.
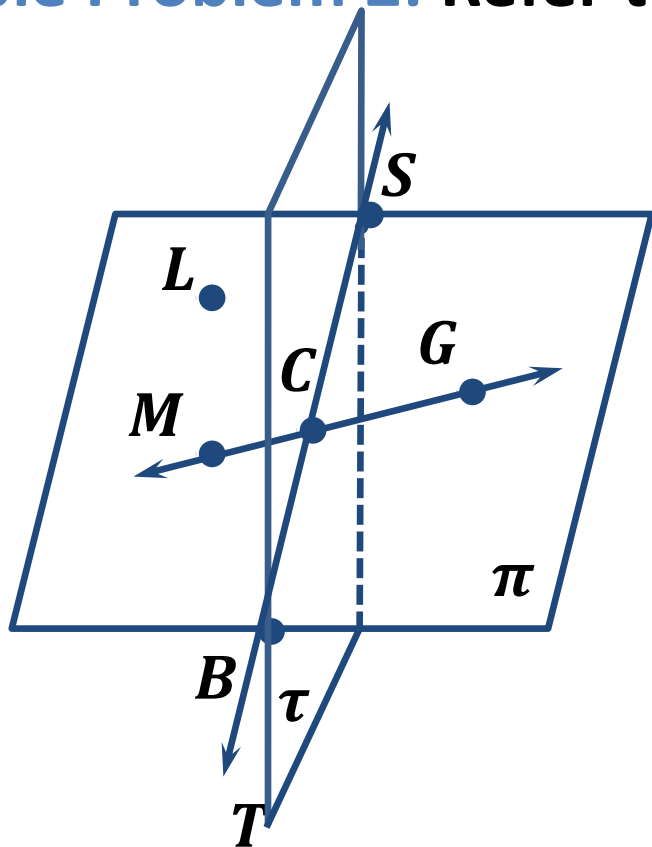
Name the intersection of line $\overleftrightarrow{MG}$ and line $\overleftrightarrow{BS}$.

Point C

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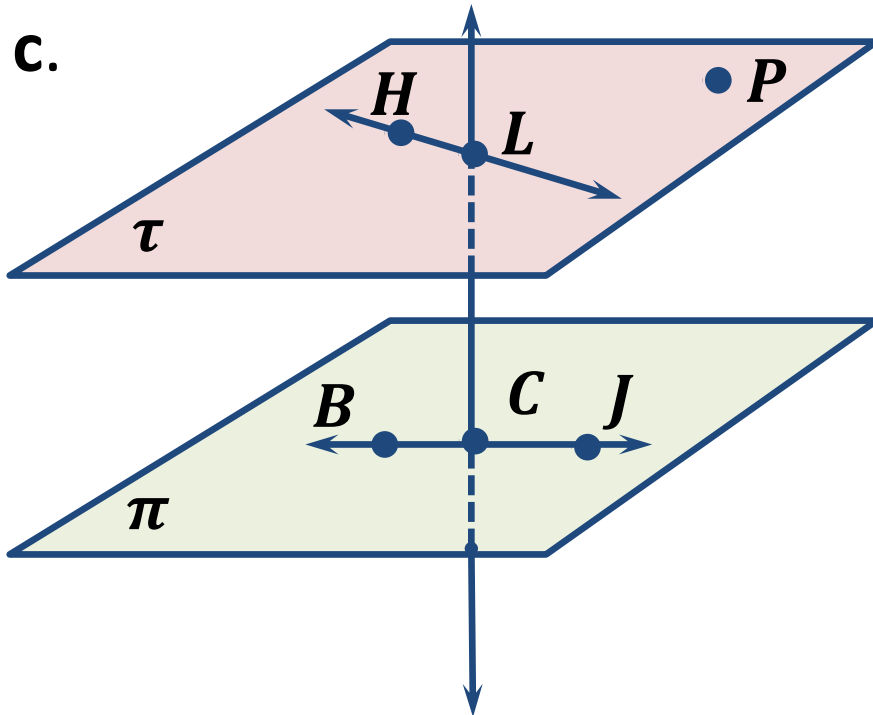
Sample Problem 2: Refer to each figure.

b.

Name a point that is collinear with M and C.
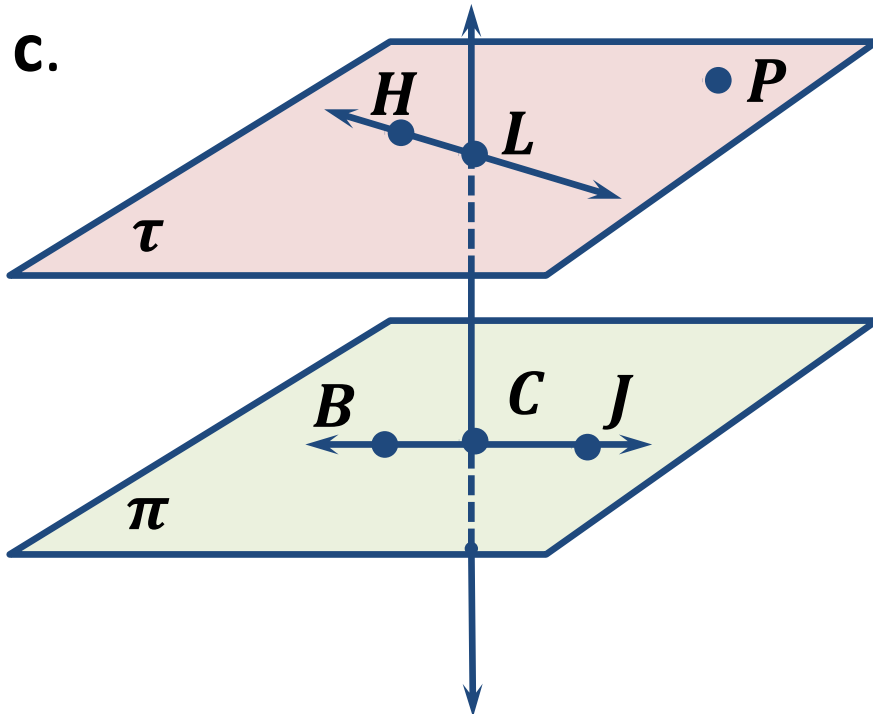
Point G

Sample Problem 2: Refer to each figure.

c.

Name the intersection of plane π and line $\overleftrightarrow{LC}$.

Sample Problem 2: Refer to each figure.
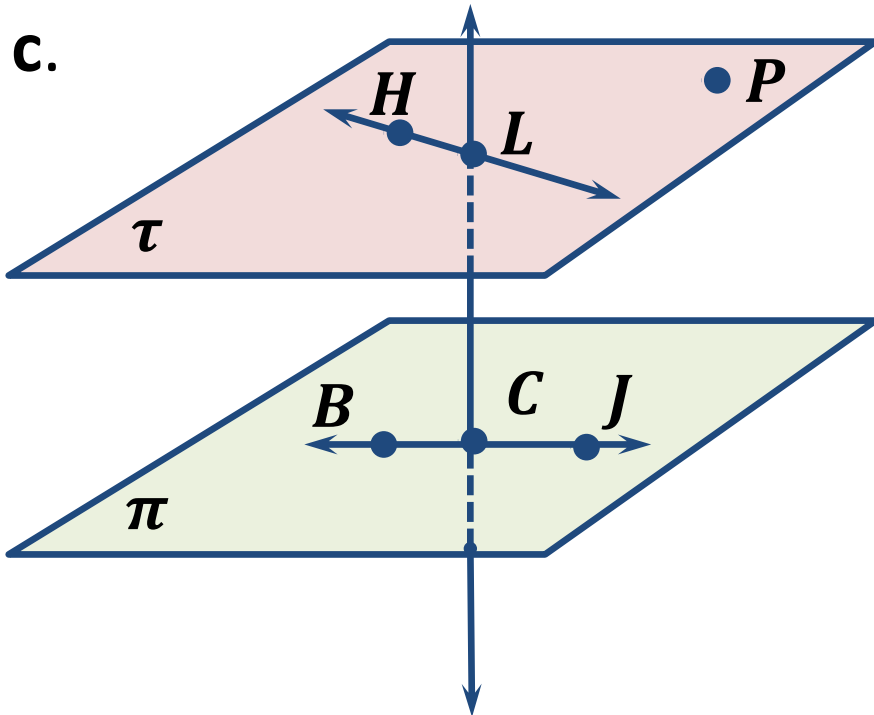
c.

Name the intersection of plane π and line $\overleftrightarrow{LC}$.

Point C

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Sample Problem 2: Refer to each figure.

c.

Name the intersection of plane τ and line $\overleftrightarrow{LC}$.

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Sample Problem 2: Refer to each figure.

c.

Name the intersection of plane τ and line $\overleftrightarrow{LC}$.

Point L

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Sample Problem 2: Refer to each figure.

c.

Name a point that is coplanar with H and L.

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Sample Problem 2: Refer to each figure.

c.
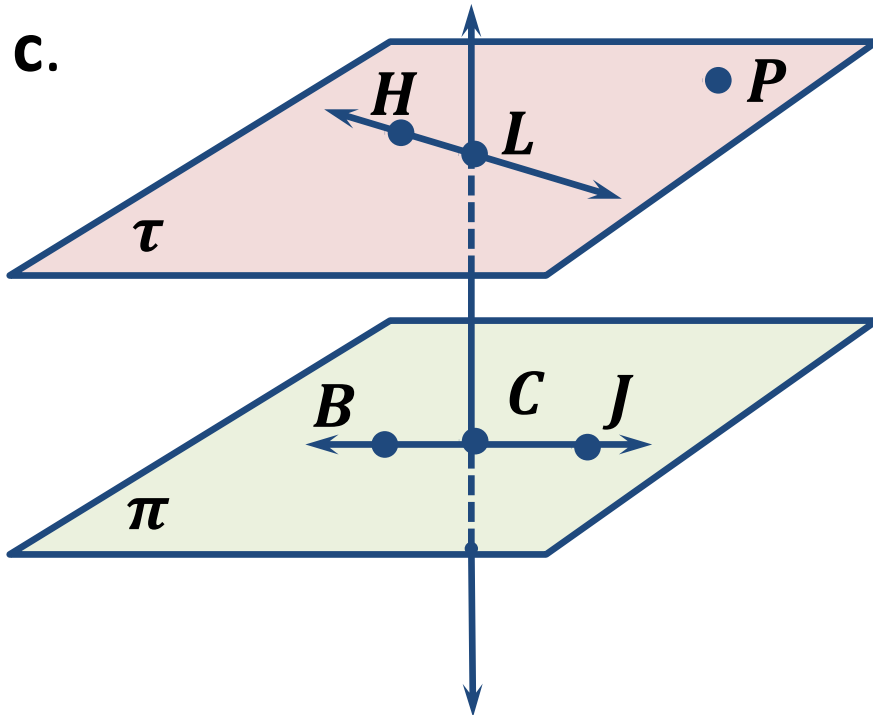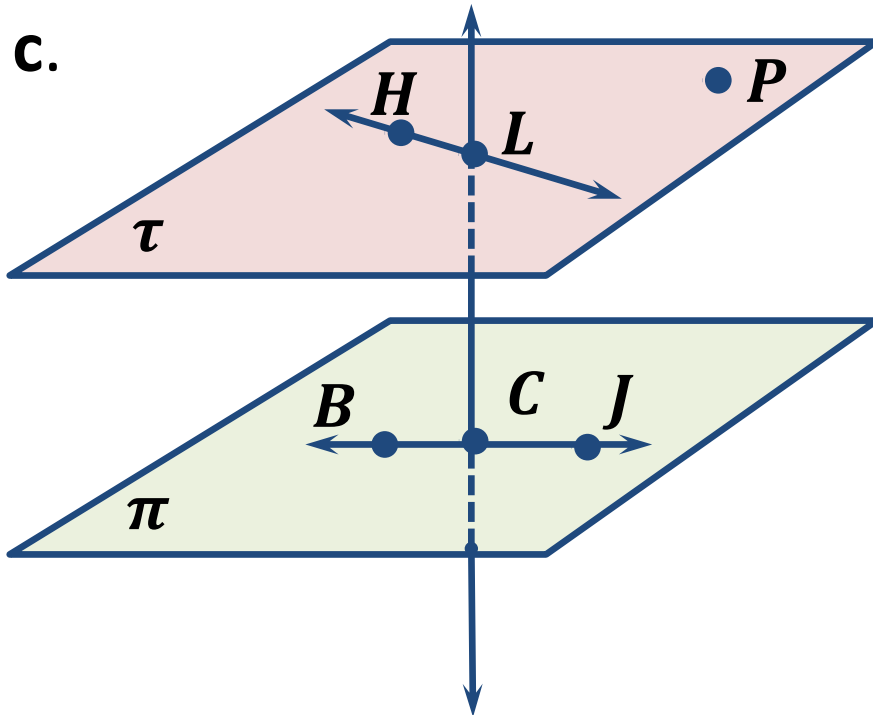
Name a point that is coplanar with H and L.

Point P

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Sample Problem 2: **Refer to each figure.**

c.
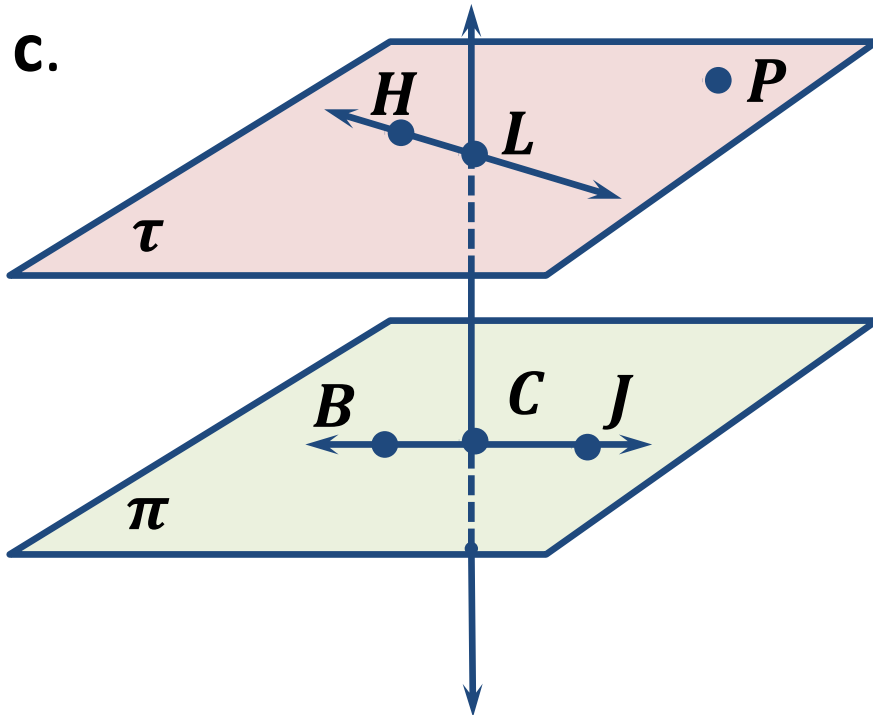
Name the opposite ray of ray $\overrightarrow{CB}$.

Sample Problem 2: Refer to each figure.

c.

Name the opposite ray of ray $\overrightarrow{CB}$.

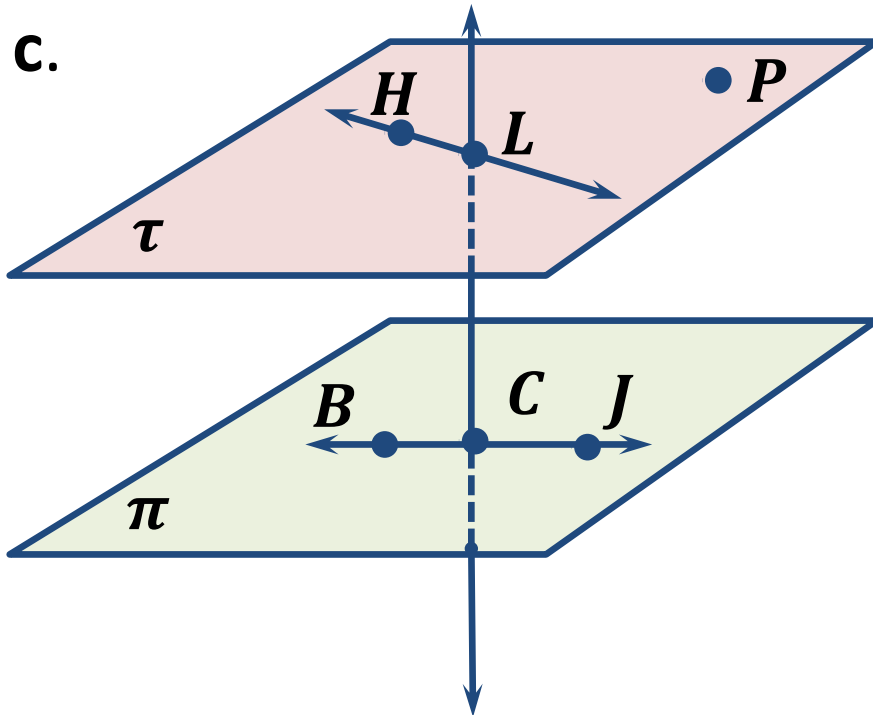Ray $\overrightarrow{CJ}$

Sample Problem 3: **Draw and label figure for each relationship.**

a. • Plane ABS contains lines $\overleftrightarrow{AB}$, $\overleftrightarrow{CD}$, and $\overleftrightarrow{AK}$.

• Lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ intersect in point G.

• Lines $\overleftrightarrow{CD}$ and $\overleftrightarrow{AK}$ intersect in point S.

• Lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{AK}$ intersect in point A.
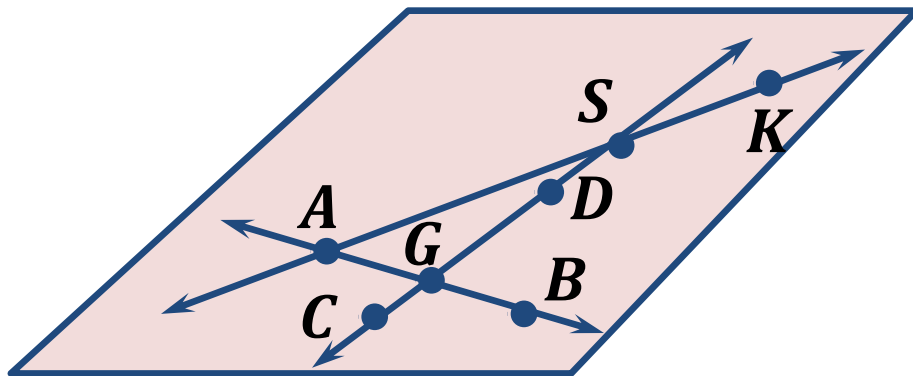
Sample Problem 3: Draw and label figure for each relationship.

a.
- Plane ABS contains lines $\overleftrightarrow{AB}$, $\overleftrightarrow{CD}$, and $\overleftrightarrow{AK}$.
- Lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ intersect in point G.
- Lines $\overleftrightarrow{CD}$ and $\overleftrightarrow{AK}$ intersect in point S.
- Lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{AK}$ intersect in point A.

Sample Problem 3: Draw and label figure for each relationship.

b.
- Plane π contains line $\overleftrightarrow{AB}$ and point L.
- Plane τ contains line $\overleftrightarrow{EF}$ and point S.
- Lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{EF}$ intersect in point H.
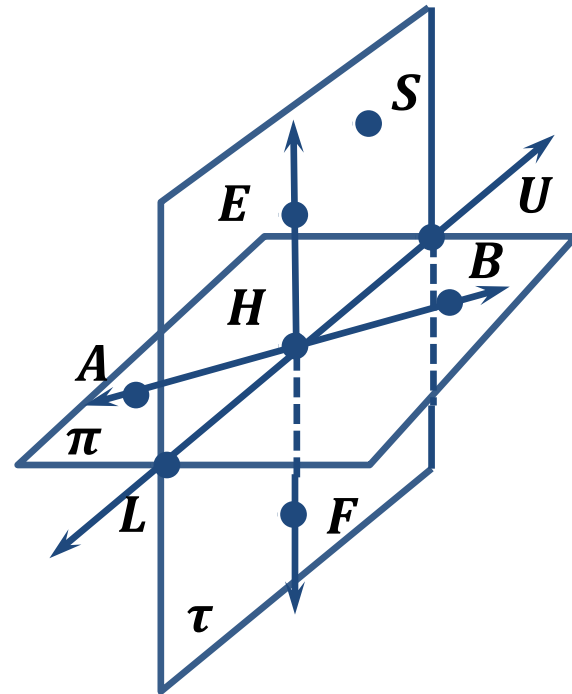- The intersection of plane π and plane τ is line $\overleftrightarrow{LU}$.

Sample Problem 3: Draw and label figure for each relationship.

b.
- Plane π contains line $\overleftrightarrow{AB}$ and point L.
- Plane τ contains line $\overleftrightarrow{EF}$ and point S.
- Lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{EF}$ intersect in point H.
- The intersection of plane π and plane τ is line $\overleftrightarrow{LU}$.

Sample Problem 3: Draw and label figure for each relationship.

c.
- Plane π and plane τ do not has intersect.
- Plane ε intersect plane π in line $\overleftrightarrow{BC}$.
- Plane ε intersect plane τ in line $\overleftrightarrow{ER}$.

Sample Problem 3: Draw and label figure for each relationship.

c.
- Plane π and plane τ do not has intersect.
- Plane ε intersect plane π in line $\overleftrightarrow{BC}$.
- Plane ε intersect plane τ in line $\overleftrightarrow{ER}$.

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