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Points Lines and Planes Guide Notes

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

A point 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.

A plane 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.

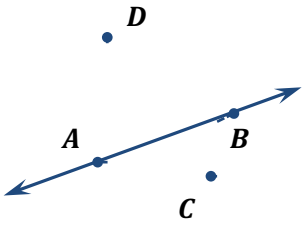
A ray is a set of points and extends in one dimension in one direction (not in two directions). It has no thickness or width, is usually represented by a straight line with one arrowhead to indicate that it extends without end in the direction of the arrowhead, and is named by two points on the ray with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

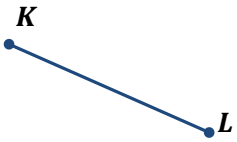
Sample Problem 1: **Use the figure to name each of the following.**

a.



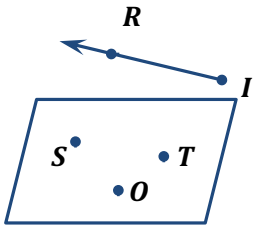
Line
Points
Collinear points
Non collinear points

b.



Line segment
Points

c.



Plane
Ray
Points
Coplanar points
Non coplanar points

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.

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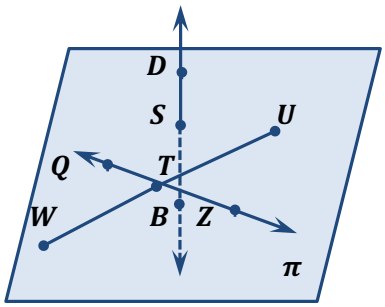
Sample Problem 2: **Refer to the each figure.**

a.



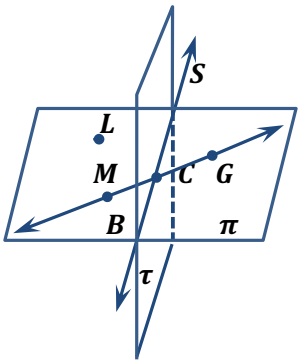
Name the intersection of line $\overleftrightarrow{QZ}$ and segment $\overline{WU}$.

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

Name the two opposite rays at point T.

What is another name for plane π?

b.



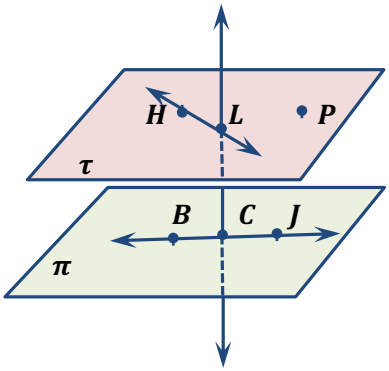
Name the intersection of plane π and plane τ.

What is another name for plane π?

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

Name a point that is collinear with M and C.

c.



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

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

Name a point that is coplanar with H and L.

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

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.

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

c. Plane $\boldsymbol{\pi}$ and plane $\boldsymbol{\tau}$ do not has intersect.
Plane $\boldsymbol{\varepsilon}$ intersect plane $\boldsymbol{\pi}$ in line $\overleftrightarrow{\boldsymbol{BC}}$.
Plane $\boldsymbol{\varepsilon}$ intersect plane $\boldsymbol{\tau}$ in line $\overleftrightarrow{\boldsymbol{ER}}$.