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. It is named by two points on the line, or by 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. It 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 and is usually represented by a straight line with no arrowheads to indicate that it has a fixed length. It is 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 and is usually represented by a straight line with one arrowhead to indicate that it extends without end in the direction of the arrowhead. It 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$$$ A B $$$$ C$$ | **b.** | $$ K $$$$ L$$ | **c.** | $ R$$$ I$$$ S T$$ O$ |
|  | Line $ \overleftrightarrow{AB}$Points $ A, B,C and D$Collinear points $A, B$Non collinear points $A,C,D$ |  | Line segment$ \overbar{KL}$Points $K and L$ |  | Plane $ STO$Ray $\vec{IR}$Points $ S, T,O,R and I$Coplanar points $S, T,O$Non coplanar points $R,I$ |

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.** | $ D$$S U$ $Q$$ T$$ W B Z $$π$ | Name the intersection of line $\overleftrightarrow{QZ}$and segment $\overbar{WU}.$ | Point$ T$ |
| Name the intersection of plane$ π$ and line$ \overleftrightarrow{DB.}$ | Point$ S$ |
| Name the two opposite rays at point $ T.$ | $$\vec{TQ} and \vec{TZ}$$ |
| What is another name for plane$ π?$ | Plane$ TSU $ |
| **b.** | $$ S$$$L$$M C G $$ B $$π$$ τ$ | Name the intersection of plane$ π$ and plane $ τ.$ | Line$\overleftrightarrow{BS.}$ |
| What is another name for plane$ π?$ | Plane$ LMG $ |
| Name the intersection of line $\overleftrightarrow{MG}$and line $\overleftrightarrow{BS}.$ | Point$ C$ |
| Name a point that is collinearwith$M and C$**.** | Point$ G$ |
| **c.** | $ $$ H$$ L$$ P$$ τ$$ $$ B C$$J$$ π$ | Name the intersection of plane$ π$ and line $\overleftrightarrow{LC}.$ | Point$ C$ |
| Name the intersection of plane$ τ$ and line $\overleftrightarrow{LC}.$ | Point$ L$ |
| Name a point that is coplanarwith$H and L$**.** | Point$ P$ |
| Name the opposite ray of ray $\vec{CB}.$ | Ray $\vec{CJ}$ |

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

|  |  |  |
| --- | --- | --- |
| **a.** | Plane $ ABS$contains lines$\overleftrightarrow{AB}$ **,** $\overleftrightarrow{CD}$**,** and $\overleftrightarrow{AK}$**.**Lines $\overleftrightarrow{AB}$and $\overleftrightarrow{CD}$intersect at point$ G.$Lines $\overleftrightarrow{CD}$and $\overleftrightarrow{AK}$intersect at point$ S.$Lines $\overleftrightarrow{AB}$and $\overleftrightarrow{AK}$intersect at point$ A$**.** | $ $$ S K$ $ A$$ D$$ C G B $ |
| **b.** | Plane $ π$ contains line$\overleftrightarrow{AB}$and point $ L.$Plane $ τ$ contains line$\overleftrightarrow{EF}$and point$ S$**.**Lines $\overleftrightarrow{AB}$and $\overleftrightarrow{EF}$intersect at point$ H.$The intersection of plane$ π$ and plane $ τ$isline$\overleftrightarrow{ LU}.$ | $ S$$ U$$ E $$ $$A H B $$ π$$ L F $$ τ$ |
| **c.** | Plane $ π$and plane$ τ$do not intersect.Plane $ε$intersects plane$ π $at line$\overleftrightarrow{BC}$**.**Plane $ε$intersects plane$ τ $at line$\overleftrightarrow{ER}$**.** | $ $$ B$$ $$ $$ $$ π C $$ E $$$ $$$ τ R $$$ ε$$ |