

When Lines and Planes Are Parallel

Objectives

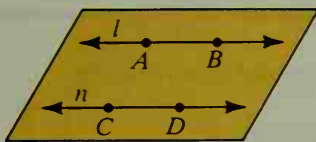
1. Distinguish between intersecting lines, parallel lines, and skew lines.
2. State and apply the theorem about the intersection of two parallel planes by a third plane.
3. Identify the angles formed when two lines are cut by a transversal.
4. State and apply the postulates and theorems about parallel lines.
5. State and apply the theorems about a parallel and a perpendicular to a given line through a point outside the line.

3-1 Definitions

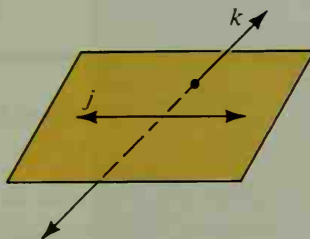
Two lines that do not intersect are either *parallel* or *skew*.

Parallel lines (\parallel lines) are coplanar lines that do not intersect.

Skew lines are noncoplanar lines. Therefore, they are neither parallel nor intersecting.



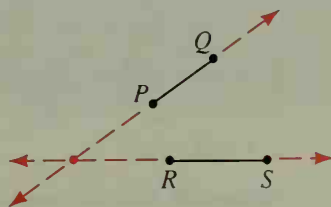
l and n are parallel lines.
 l is parallel to n ($l \parallel n$).



j and k are skew lines.

Segments and rays contained in parallel lines are also called parallel. For example, in the figure at the left above, $\overline{AB} \parallel \overline{CD}$ and $\overrightarrow{AB} \parallel \overrightarrow{CD}$.

In the diagram at the right, \overline{PQ} and \overline{RS} do not intersect, but they are parts of lines, \overleftrightarrow{PQ} and \overleftrightarrow{RS} , that do intersect. Thus \overline{PQ} is not parallel to \overline{RS} .



The box pictured below may help you understand the following definitions. Think of the top of the box as part of plane X and the bottom of the box as part of plane Y .

Parallel planes (\parallel planes) do not intersect.

Plane X is parallel to plane Y ($X \parallel Y$).

A line and a plane are parallel if they do not intersect.

For example, $\overleftrightarrow{EF} \parallel Y$ and $\overleftrightarrow{FG} \parallel Y$.

Also, $\overleftrightarrow{AB} \parallel X$ and $\overleftrightarrow{BC} \parallel X$.

