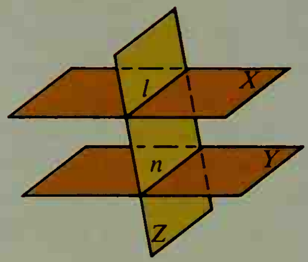
Our first theorem about parallel lines and planes is given below. Notice the importance of definitions in the proof.

Theorem 3-1

If two parallel planes are cut by a third plane, then the lines of intersection are parallel.

Given: Plane $X \parallel$ plane Y;
plane Z intersects X in line l;
plane Z intersects Y in line n.

Prove: $l \parallel n$



Proof:

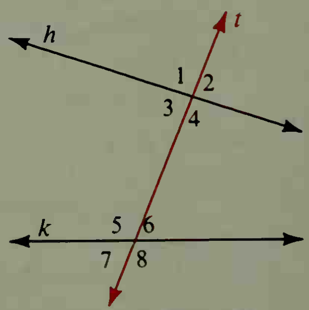
Statements	Reasons
1. l is in Z; n is in Z.	1. Given
2. l and n are coplanar.	2. Def. of coplanar
3. l is in X; n is in Y; $X \parallel Y$.	3. Given
4. l and n do not intersect.	4. Parallel planes do not intersect. (Def. of $\parallel$ planes)
5. $l \parallel n$	5. Def. of $\parallel$ lines (Steps 2 and 4)

The following terms, which are needed for future theorems about parallel lines, apply only to coplanar lines.

A **transversal** is a line that intersects two or more coplanar lines in different points. In the next diagram, t is a transversal of h and k. The angles formed have special names.

Interior angles: angles 3, 4, 5, 6

Exterior angles: angles 1, 2, 7, 8



Alternate interior angles (alt. int. $\angle$s) are two nonadjacent interior angles on opposite sides of the transversal.

$\angle 3$ and $\angle 6$ $\quad$ $\angle 4$ and $\angle 5$

Same-side interior angles (s-s. int. $\angle$s) are two interior angles on the same side of the transversal.

$\angle 3$ and $\angle 5$ $\quad$ $\angle 4$ and $\angle 6$

Corresponding angles (corr. $\angle$s) are two angles in corresponding positions relative to the two lines.

$\angle 1$ and $\angle 5$ $\quad$ $\angle 2$ and $\angle 6$ $\quad$ $\angle 3$ and $\angle 7$ $\quad$ $\angle 4$ and $\angle 8$