

### 3.1 Identify Pairs of Lines and Angles

## Vocabulary

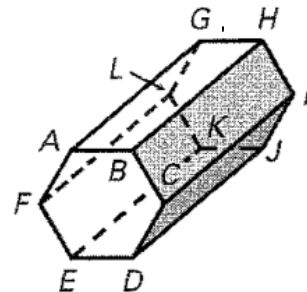
- **Parallel lines** – lines that do not intersect and are coplanar
- **Skew lines** – lines that do not intersect and are not coplanar
- **Parallel planes** – planes that do not intersect
- **Perpendicular lines** – two lines that intersect to form a right angle

### Example 1

## Identifying Relationships in Space

Think of each segment in the diagram as part of a line. Which of the lines appear to fit the description?

- parallel to  $\overleftrightarrow{AG}$  and contains  $C$
- perpendicular to  $\overleftrightarrow{AG}$  and contains  $B$
- skew to  $\overleftrightarrow{AG}$  and contains  $C$
- Name the plane that contains  $C$  and appears to be parallel to plane  $AFL$ .



### Solution

- Solution**
- a. There are 5 lines that are parallel to  $\overleftrightarrow{AG}$ , but only CI passes through C and is parallel to  $\overleftrightarrow{AG}$ .
- b. There are 4 lines that are perpendicular to  $\overleftrightarrow{AG}$ , but only AB passes through B and is perpendicular to  $\overleftrightarrow{AG}$ .
- c. There are 8 lines that are skew to  $\overleftrightarrow{AG}$ , but only BC and CD pass through C and are skew to  $\overleftrightarrow{AG}$ .
- d. The plane JDC contains C and is parallel to plane AFL.

- ✓ **Checkpoint** Think of each segment in the diagram as part of a line. Which of the lines appear to fit the description?

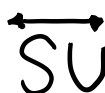
1. parallel to  $\overleftrightarrow{PQ}$  and contains S



2. perpendicular to  $\overleftrightarrow{PQ}$  and contains S

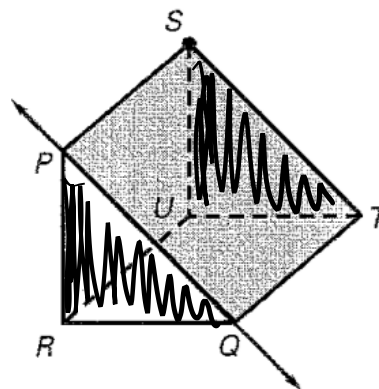


3. skew to  $\overleftrightarrow{PQ}$  and contains S



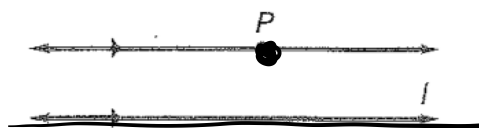
4. Name the plane that contains S and appears to be parallel to plane PQR.

SUT



### POSTULATE 13: PARALLEL POSTULATE

If there is a line and a point not on the line, then there is exactly 1 line through the point parallel to the given line.



There is exactly 1 line through P parallel to l.

### POSTULATE 14: PERPENDICULAR POSTULATE

If there is a line and a point not on the line, then there is exactly 1 line through the point perpendicular to the given line.

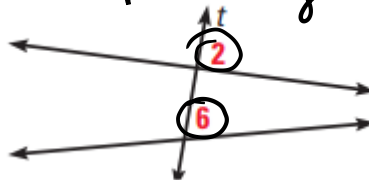


There is exactly 1 line through P perpendicular to l.

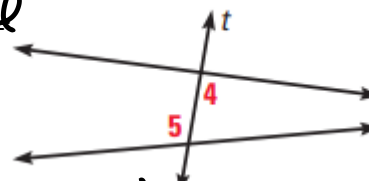
Vocabulary:

- **Transversal** – a line that intersects two or more coplanar lines at different points.

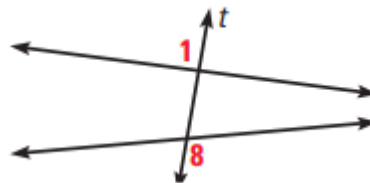
- **Corresponding angles** – two angles that have corresponding positions.
  - For example,  $\angle 2$  and  $\angle 6$  are above the lines and to the right of the transversal



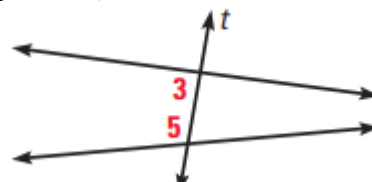
- **Alternate interior angles** – two angles that lie between the two lines and on opposite sides of the transversal



- **Alternate exterior angles** – two angles that lie outside the two lines and on opposite sides of the transversal



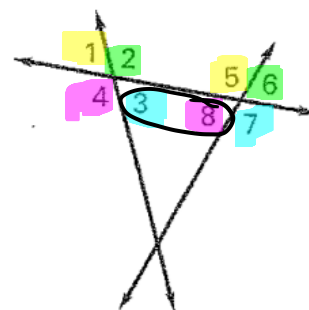
- **Consecutive interior angles** – two angles that lie between the two lines and on the same side of the transversal



**Example 2** *Identifying Angle Relationships*

List all pairs of angles that fit the description.

- |                       |                         |
|-----------------------|-------------------------|
| a. corresponding      | b. alternate exterior   |
| c. alternate interior | d. consecutive interior |

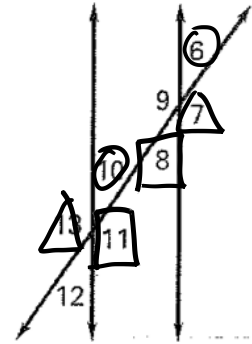


**Solution**

- |   |  |
|---|--|
| a. $\angle 1$ and $\angle 5$ , $\angle 3$ and $\angle 7$<br>$\angle 2$ and $\angle 6$ , $\angle 4$ and $\angle 8$ | b. $\angle 1$ and $\angle 7$ , $\angle 4$ and $\angle 6$ |
| c. $\angle 2$ and $\angle 8$ , $\angle 3$ and $\angle 5$  | d. $\angle 2$ and $\angle 5$ , $\angle 3$ and $\angle 8$ |

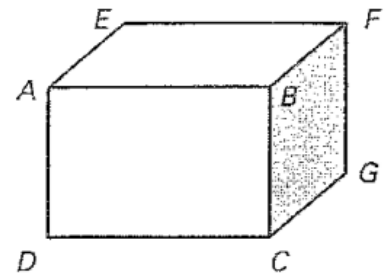
- ✓ **Checkpoint** Complete the statement using *corresponding*, *alternate exterior*, *alternate interior*, or *consecutive interior*.

5.  $\angle 9$  and  $\angle 11$  are alternate int. angles.  
 6.  $\angle 6$  and  $\angle 10$  are corresponding angles.  
 7.  $\angle 8$  and  $\angle 11$  are consecutive int angles.  
 8.  $\angle 7$  and  $\angle 13$  are alt ext angles.



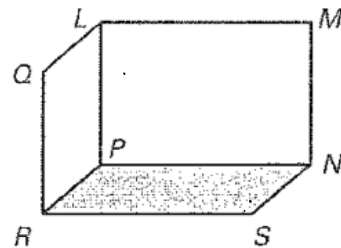
Think of each segment in the diagram as part of a line.  
 Fill in the blank with *parallel*, *skew*, or *perpendicular*.

- $\overleftrightarrow{AB}$  and  $\overleftrightarrow{DC}$  are ?.
- $\overleftrightarrow{AB}$  and  $\overleftrightarrow{BC}$  are ?.
- $\overleftrightarrow{BF}$  and  $\overleftrightarrow{FG}$  are ?.
- $\overleftrightarrow{AB}$  and  $\overleftrightarrow{FG}$  are ?.



Think of each segment in the diagram as part of a line.  
 There may be more than one correct answer.

- Name a line parallel to  $\overleftrightarrow{MN}$ .
- Name a line perpendicular to  $\overleftrightarrow{PR}$ .
- Name a line skew to  $\overleftrightarrow{SN}$ .
- Name a plane parallel to plane  $RPL$ .



Complete the statement with *corresponding*, *alternate interior*, *alternate exterior*, or *consecutive interior*.

- $\angle 3$  and  $\angle 7$  are ? angles.
- $\angle 4$  and  $\angle 10$  are ? angles.
- $\angle 5$  and  $\angle 8$  are ? angles.
- $\angle 8$  and  $\angle 6$  are ? angles.
- $\angle 9$  and  $\angle 5$  are ? angles.
- $\angle 5$  and  $\angle 7$  are ? angles.

