

Use the diagram.

1. What is another name for  $\overleftrightarrow{BD}$  ?

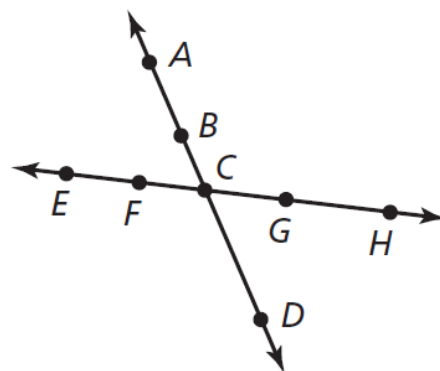
2. What is another name for  $\overleftrightarrow{EG}$  ?

3. What is another name for  $\overleftrightarrow{CH}$  ?

4. Name all segments with endpoint  $B$ .

5. Name one pair of opposite rays.

6. Name a point on  $\overleftrightarrow{AC}$  .



The midpoint  $M$  and one endpoint of  $\overline{JK}$  are given. Find the coordinates of the other endpoint.

1.  $M(5, 2)$  and  $J(6, -7)$

2.  $M(-14, -5)$  and  $K(-1, 8)$

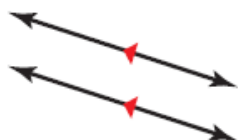
3.  $M(9, -1)$  and  $J(-3, 0)$

## **Essential Question**

What does it mean when two lines are parallel, intersecting, coincident, or skew?

**Work with a partner.** Write the number of points of intersection of each pair of coplanar lines.

**a.** parallel lines



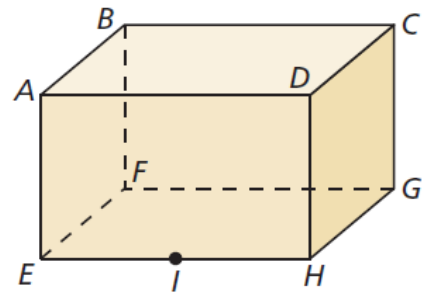
**b.** intersecting lines



**c.** coincident lines



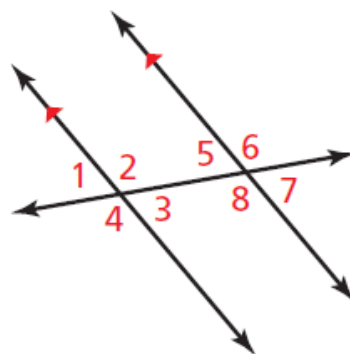
**Work with a partner.** The figure shows a *right rectangular prism*. All its angles are right angles. Classify each of the following pairs of lines as *parallel*, *intersecting*, *coincident*, or *skew*. Justify your answers. (Two lines are **skew lines** when they do not intersect and are not coplanar.)



Pair of Lines	Classification	Reason
a. $\overleftrightarrow{AB}$ and $\overleftrightarrow{BC}$		
b. $\overleftrightarrow{AD}$ and $\overleftrightarrow{BC}$		
c. $\overleftrightarrow{EI}$ and $\overleftrightarrow{IH}$		
d. $\overleftrightarrow{BF}$ and $\overleftrightarrow{EH}$		
e. $\overleftrightarrow{EF}$ and $\overleftrightarrow{CG}$		
f. $\overleftrightarrow{AB}$ and $\overleftrightarrow{GH}$		

**Work with a partner.** In the figure, two parallel lines are intersected by a third line called a *transversal*.

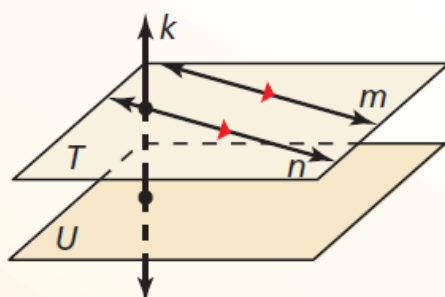
- Identify all the pairs of vertical angles.  
Explain your reasoning.
- Identify all the linear pairs of angles.  
Explain your reasoning.



## Core Concept

### Parallel Lines, Skew Lines, and Parallel Planes

Two lines that do not intersect are either *parallel lines* or *skew lines*. Two lines are **parallel lines** when they do not intersect and are coplanar. Two lines are **skew lines** when they do not intersect and are not coplanar. Also, two planes that do not intersect are **parallel planes**.



Lines  $m$  and  $n$  are parallel lines ( $m \parallel n$ ).

Lines  $m$  and  $k$  are skew lines.

Planes  $T$  and  $U$  are parallel planes ( $T \parallel U$ ).

Lines  $k$  and  $n$  are intersecting lines, and there is a plane (not shown) containing them.

Small directed arrows, as shown in red on lines  $m$  and  $n$  above, are used to show that lines are parallel. The symbol  $\parallel$  means “is parallel to,” as in  $m \parallel n$ .

Segments and rays are parallel when they lie in parallel lines. A line is parallel to a plane when the line is in a plane parallel to the given plane. In the diagram above, line  $n$  is parallel to plane  $U$ .

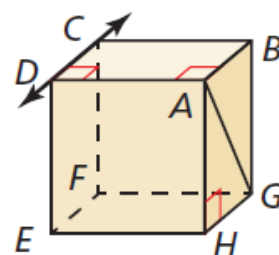
Think of each segment in the figure as part of a line. Which line(s) or plane(s) appear to fit the description?

a. line(s) parallel to  $\overleftrightarrow{CD}$  and containing point  $A$

b. line(s) skew to  $\overleftrightarrow{CD}$  and containing point  $A$

c. line(s) perpendicular to  $\overleftrightarrow{CD}$  and containing point  $A$

d. plane(s) parallel to plane  $EFG$  and containing point  $A$





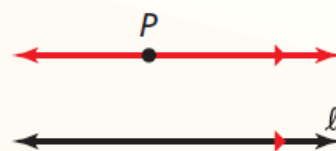
1. Look at the diagram in Example 1. Name the line(s) through point  $F$  that appear skew to  $\overleftrightarrow{EH}$ .

## Postulates

### Postulate 3.1 Parallel Postulate

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

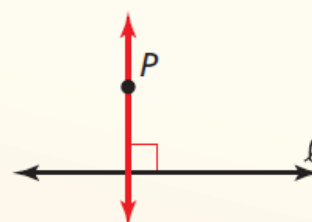
There is exactly one line through  $P$  parallel to  $\ell$ .



### Postulate 3.2 Perpendicular Postulate

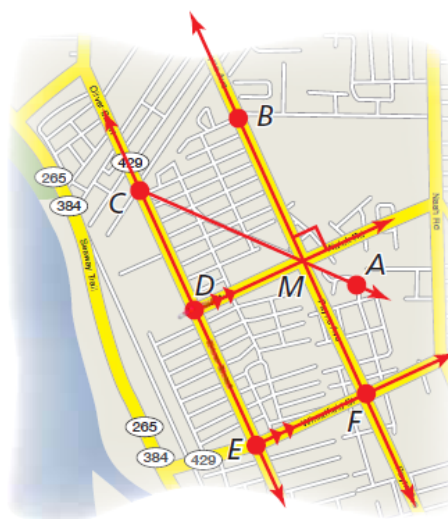
If there is a line and a point not on the line, then there is exactly one line through the point perpendicular to the given line.

There is exactly one line through  $P$  perpendicular to  $\ell$ .



The given line markings show how the roads in a town are related to one another.

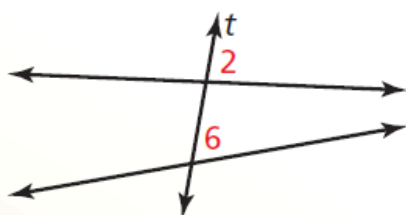
- Name a pair of parallel lines.
- Name a pair of perpendicular lines.
- Is  $\overline{FE} \parallel \overline{AC}$  ? Explain.



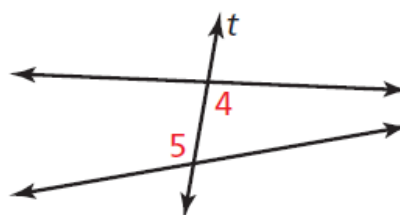
2. In Example 2, can you use the Perpendicular Postulate to show that  $\overleftrightarrow{AC}$  is *not* perpendicular to  $\overleftrightarrow{BF}$ ? Explain why or why not.

## Core Concept

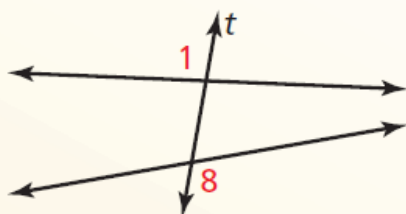
### Angles Formed by Transversals



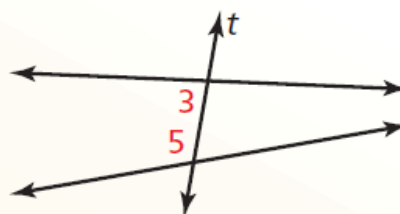
Two angles are **corresponding angles** when they have corresponding positions. For example,  $\angle 2$  and  $\angle 6$  are above the lines and to the right of the transversal  $t$ .



Two angles are **alternate interior angles** when they lie between the two lines and on opposite sides of the transversal  $t$ .



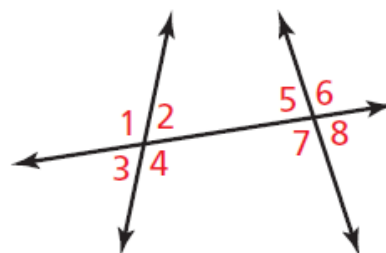
Two angles are **alternate exterior angles** when they lie outside the two lines and on opposite sides of the transversal  $t$ .



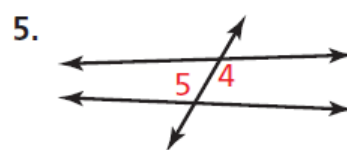
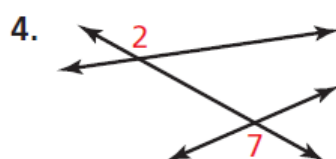
Two angles are **consecutive interior angles** when they lie between the two lines and on the same side of the transversal  $t$ .

Identify all pairs of angles of the given type.

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



Classify the pair of numbered angles.



**Exit Ticket:** Sketch a right triangular prism with the vertices labeled.  
Identify:

a pair of parallel lines

a pair of perpendicular lines

a pair of skew lines

