

# 2.3

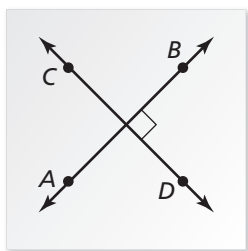
## Postulates and Diagrams

For use with Exploration 2.3

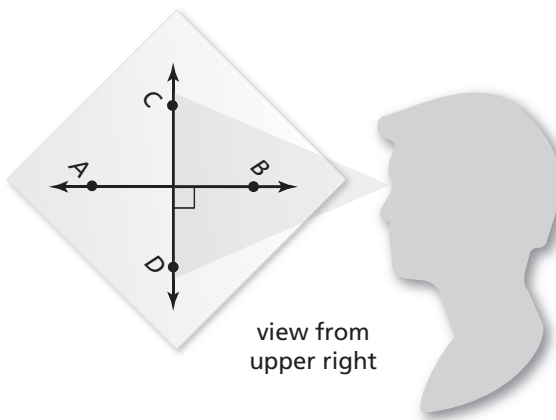
**Essential Question** In a diagram, what can be assumed and what needs to be labeled?

### 1 EXPLORATION: Looking at a Diagram

**Work with a partner.** On a piece of paper, draw two perpendicular lines. Label them  $\overline{AB}$  and  $\overline{CD}$ . Look at the diagram from different angles. Do the lines appear perpendicular regardless of the angle at which you look at them? Describe *all* the angles at which you can look at the lines and have them appear perpendicular.



view from above

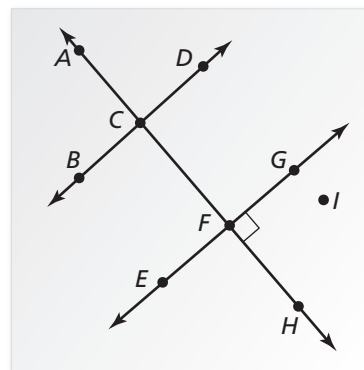


view from upper right

### 2 EXPLORATION: Interpreting a Diagram

**Work with a partner.** When you draw a diagram, you are communicating with others. It is important that you include sufficient information in the diagram. Use the diagram to determine which of the following statements you can assume to be true. Explain your reasoning.

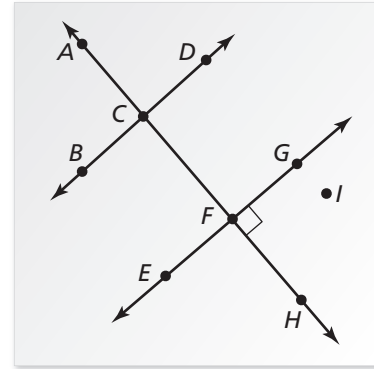
- a. All the points shown are coplanar.
- b. Points  $D$ ,  $G$ , and  $I$  are collinear.
- c. Points  $A$ ,  $C$ , and  $H$  are collinear.
- d.  $\overline{EG}$  and  $\overline{AH}$  are perpendicular.



**2.3 Postulates and Diagrams (continued)**

**2 EXPLORATION: Interpreting a Diagram (continued)**

- e.  $\angle BCA$  and  $\angle ACD$  are a linear pair.
- f.  $\overline{AF}$  and  $\overline{BD}$  are perpendicular.
- g.  $\overline{EG}$  and  $\overline{BD}$  are parallel.
- h.  $\overline{AF}$  and  $\overline{BD}$  are coplanar.
- i.  $\overline{EG}$  and  $\overline{BD}$  do not intersect.
- j.  $\overline{AF}$  and  $\overline{BD}$  intersect.
- k.  $\overline{EG}$  and  $\overline{BD}$  are perpendicular.
- l.  $\angle ACD$  and  $\angle BCF$  are vertical angles.
- m.  $\overline{AC}$  and  $\overline{FH}$  are the same line.



**Communicate Your Answer**

- 3. In a diagram, what can be assumed and what needs to be labeled?
- 4. Use the diagram in Exploration 2 to write two statements you can assume to be true and two statements you cannot assume to be true. Your statements should be different from those given in Exploration 2. Explain your reasoning.

**2.3**

**Notetaking with Vocabulary**  
For use after Lesson 2.3

In your own words, write the meaning of each vocabulary term.

line perpendicular to a plane

**Postulates**

**Point, Line, and Plane Postulates**

**Postulate**

**Example**

**2.1 Two Point Postulate**

Through any two points, there exists exactly one line.



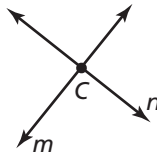
Through points  $A$  and  $B$ , there is exactly one line  $l$ . Line  $l$  contains at least two points.

**2.2 Line-Point Postulate**

A line contains at least two points.

**2.3 Line Intersection Postulate**

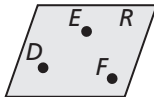
If two lines intersect, then their intersection is exactly one point.



The intersection of line  $m$  and line  $n$  is point  $C$ .

**2.4 Three Point Postulate**

Through any three noncollinear points, there exists exactly one plane.



Through points  $D$ ,  $E$ , and  $F$ , there is exactly one plane, plane  $R$ . Plane  $R$  contains at least three noncollinear points.

**2.5 Plane-Point Postulate**

A plane contains at least three noncollinear points

**Notes:**

**2.3** Notetaking with Vocabulary (continued)

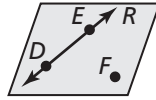
**Point, Line, and Plane Postulates (continued)**

**Postulate**

**Example**

**2.6 Plane-Line Postulate**

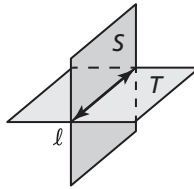
If two points lie in a plane, then the line containing them lies in the plane.



Points  $D$  and  $E$  lie in plane  $R$ , so  $\overline{DE}$  lies in plane  $R$ .

**2.7 Plane Intersection Postulate**

If two planes intersect, then their intersection is a line.



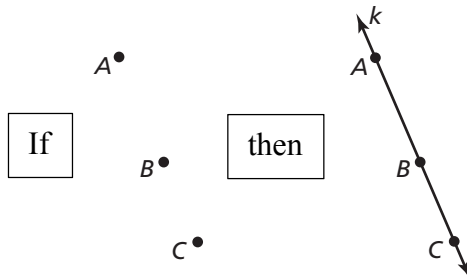
The intersection of plane  $S$  and plane  $T$  is line  $l$ .

**Notes:**

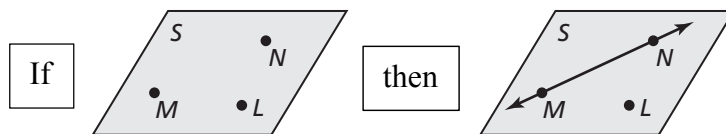
**Extra Practice**

In Exercises 1 and 2, state the postulate illustrated by the diagram.

1.



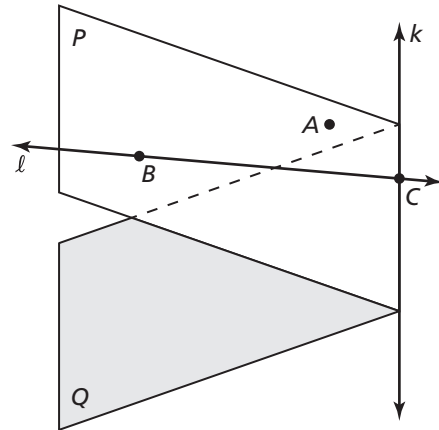
2.



**2.3** Notetaking with Vocabulary (continued)

In Exercises 3–6, use the diagram to write an example of the postulate.

3. Two Point Postulate (Postulate 2.1)
4. Line-Point Postulate (Postulate 2.2)
5. Plane-Point Postulate (Postulate 2.5)
6. Plane Intersection Postulate (Postulate 2.7)



In Exercises 7 and 8, sketch a diagram of the description.

7.  $\overline{RS}$  bisecting  $\overline{KL}$  at point  $R$
8.  $\overline{AB}$  in plane  $U$  intersecting  $\overline{CD}$  at point  $E$ , and point  $C$  not on plane  $U$

In Exercises 9–14, use the diagram to determine whether you can assume the statement.

9. Planes  $A$  and  $B$  intersect at  $\overline{EF}$ .
10. Points  $C$  and  $D$  are collinear.
11.  $\overline{HJ}$  and  $\overline{ID}$  are perpendicular.
12.  $\overline{GD}$  is a bisector of  $\overline{EF}$  at point  $D$ .
13.  $\overline{IH} \cong \overline{HG}$
14.  $\angle HJD$  and  $\angle HDJ$  are complementary angles.

