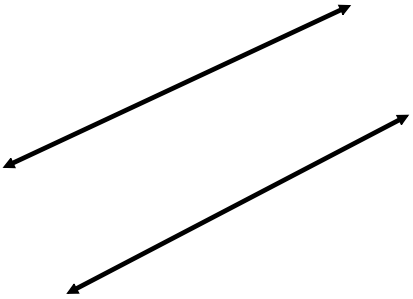
Lesson 2.3+: Postulates and Proof

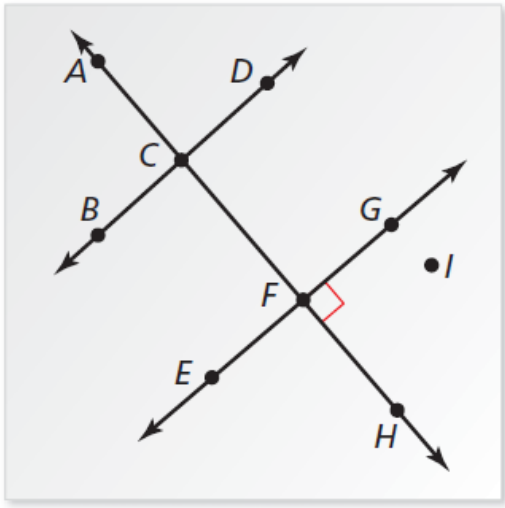
Essential Question

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



https://www.youtube.com/watch?v=RRnADhFcQ2I

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. $\overleftrightarrow{EG}$ and $\overleftrightarrow{AH}$ are perpendicular.

e. $\angle BCA$ and $\angle ACD$ are a linear pair.

f. $\overleftrightarrow{AF}$ and $\overleftrightarrow{BD}$ are perpendicular.

g. $\overleftrightarrow{EG}$ and $\overleftrightarrow{BD}$ are parallel.

h. $\overleftrightarrow{AF}$ and $\overleftrightarrow{BD}$ are coplanar.

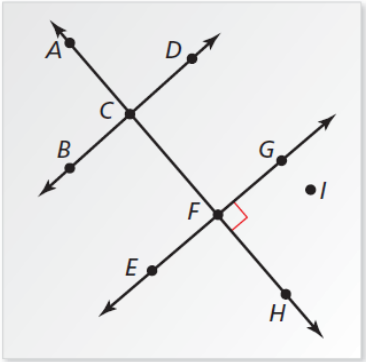
i. $\overleftrightarrow{EG}$ and $\overleftrightarrow{BD}$ do not intersect.

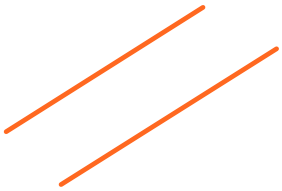
j. $\overleftrightarrow{AF}$ and $\overleftrightarrow{BD}$ intersect.

k. $\overleftrightarrow{EG}$ and $\overleftrightarrow{BD}$ are perpendicular.

l. $\angle ACD$ and $\angle BCF$ are vertical angles.

m. $\overleftrightarrow{AC}$ and $\overleftrightarrow{FH}$ are the same line.





Desmos Exploration

www.desmos.com/geometry

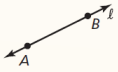
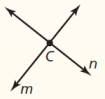
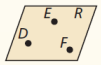
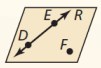
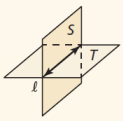
1. Plot 3 points with Desmos
2. What is the maximum number of lines you can draw through these points? Defend your answer.

3. What is the maximum number of angles that can be formed by these lines? Defend your answer.

4. Name the 3 angles inside the triangle.

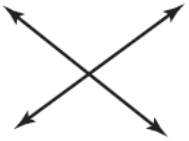
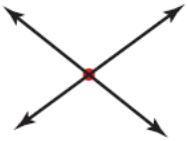
Postulates

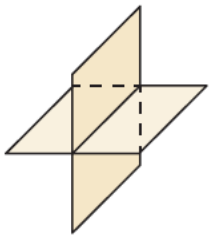
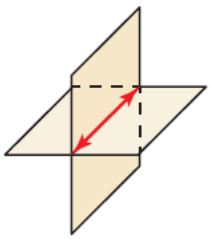
Point, Line, and Plane Postulates

Postulate	Example	
2.1 Two Point Postulate Through any two points, there exists exactly one line. **2.2 Line-Point Postulate** A line contains at least two points.		Through points A and B, there is exactly one line ℓ. Line ℓ 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. **2.5 Plane-Point Postulate** A plane contains at least three noncollinear points.		Through points D, E, and F, there is exactly one plane, plane R. Plane R contains at least three noncollinear points.
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 $\overleftrightarrow{DE}$ 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.

Example 1

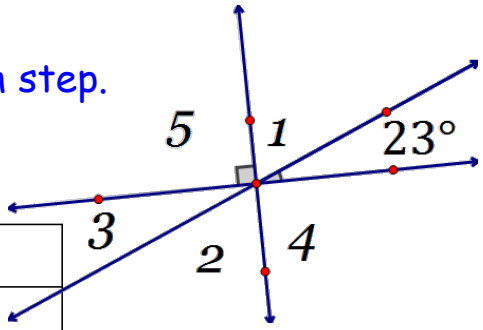
State the postulate illustrated by the diagram.

a. If  then 

b. If  then 

Example

Find the value of $\angle 2$ and justify each step.



What you know	Reason

Example 4

Which of the following statements *cannot* be assumed from the diagram?

Points *A*, *B*, and *F* are collinear.

Points *E*, *B*, and *D* are collinear.

$\overleftrightarrow{AB} \perp$ plane *S*

$\overleftrightarrow{CD} \perp$ plane *T*

$\overleftrightarrow{AF}$ intersects $\overleftrightarrow{BC}$ at point *B*.