2.4 Use Postulates and Diagrams

postulate - rule accepted without proof (also known as an ***axiom***)

theorem - rule that is proven

* Unlike the converse of a definition, the converse of a postulate or theorem cannot be assumed to be true.

We have already seen 4 postulates:
Postulate 1 - Ruler Postulate
Postulate 2 - Segment Addition Postulate
Postulate 3 - Protractor Postulate
Postulate 4 - Angle Addition Postulate

POSTULATES — *For Your Notebook*

Point, Line, and Plane Postulates

POSTULATE 5	Through any two points there exists exactly one line.
POSTULATE 6	A line contains at least two points.
POSTULATE 7	If two lines intersect, then their intersection is exactly one point.
POSTULATE 8	Through any three noncollinear points there exists exactly one plane.
POSTULATE 9	A plane contains at least three noncollinear points.
POSTULATE 10	If two points lie in a plane, then the line containing them lies in the plane.
POSTULATE 11	If two planes intersect, then their intersection is a line.

Algebra Connection

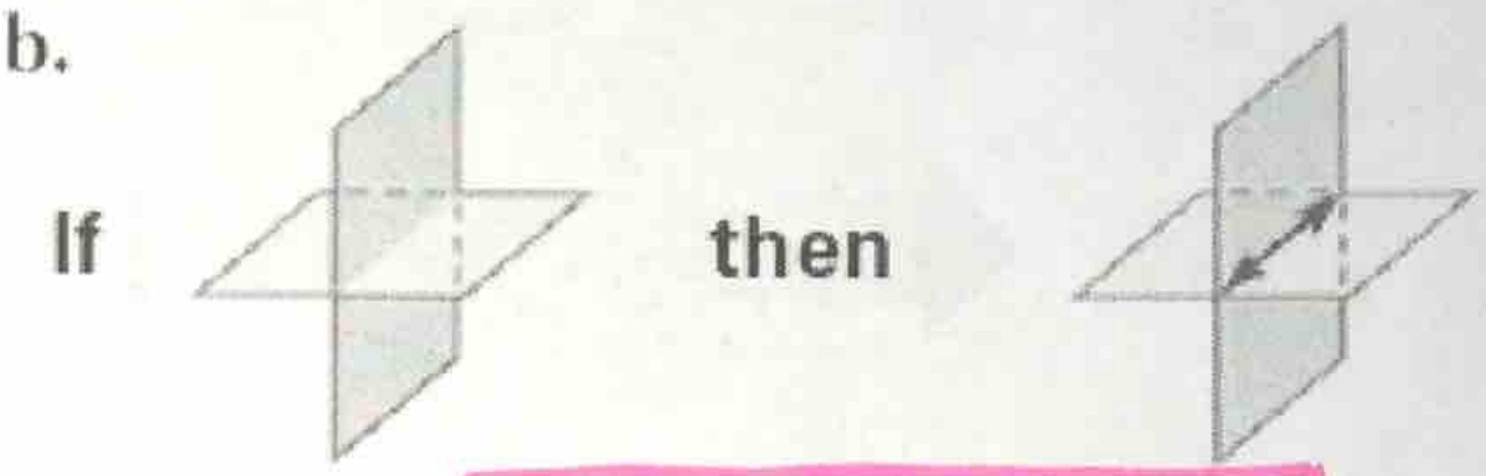
- One way to graph a linear equation is to plot two points whose coordinates satisfy the equation and then connect them with a line. Postulate 5 guarantees that there is exactly one such line.
- One way to find a solution of two linear equations is to graph the lines and find the coordinates of their intersection. This process is guaranteed to work by Postulate 7.

Ex 1: State the postulate illustrated by the diagram.

a.

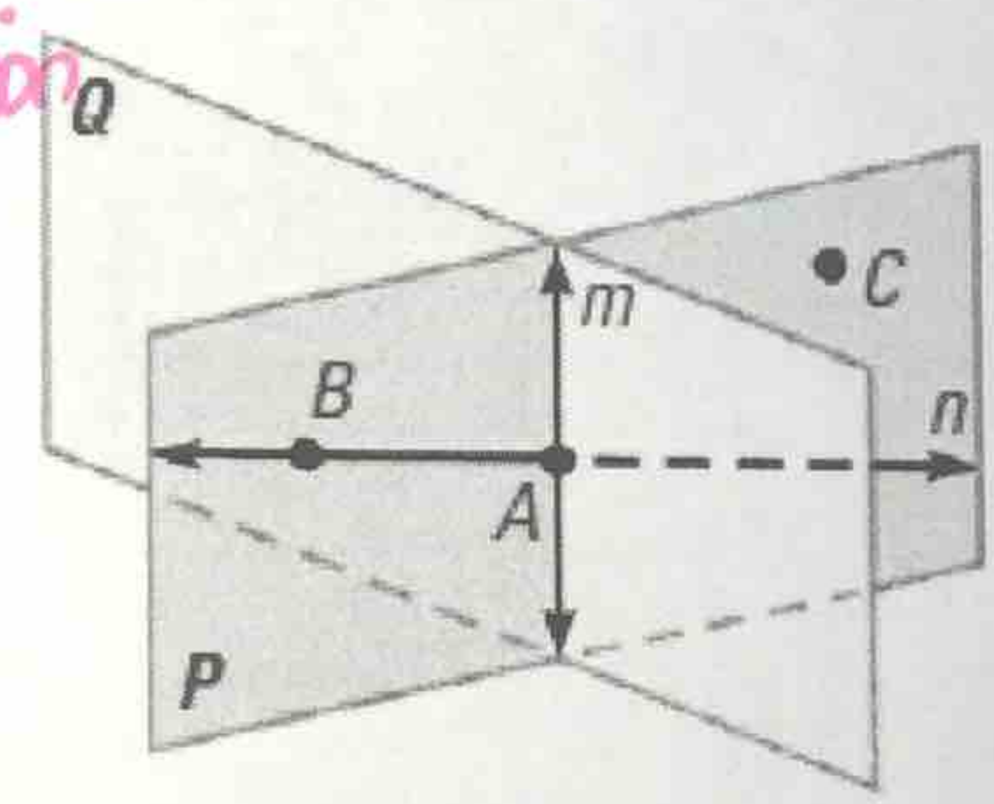
Postulate 7

b.



Postulate 11

Ex 2: Use the diagram to write examples of postulates 7, 8, 10, 11.



Postulate 7: (If 2 lines intersect, the intersection is exactly one point.)

line m & line n intersect at point A.

Postulate 8: (Through any 3 noncollinear points there exists exactly one plane.)

Points B, A, and C there exists point P.

Postulate 10: (If 2 points lie in a plane, then the line containing them lies in the plane.)

B and A lie in plane P, line n contains points B and A and lies in plane P.

Postulate 11: (If 2 planes intersect, their intersection is a line.)

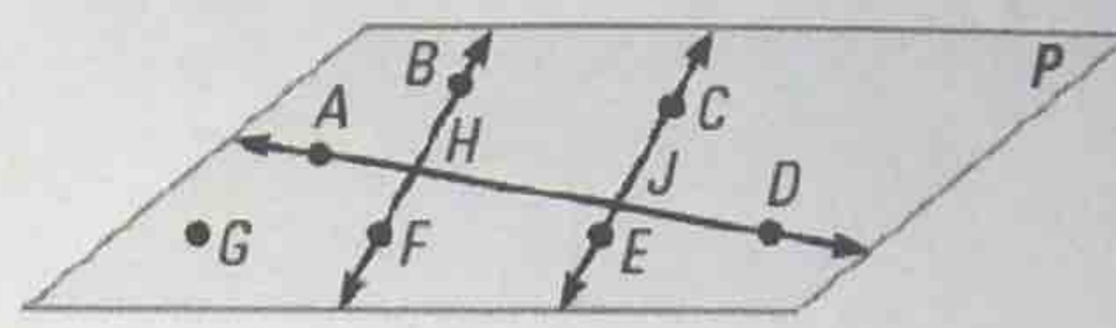
Plane P and Plane Q intersect in line m.

CONCEPT SUMMARY

For Your Notebook

Interpreting a Diagram

When you interpret a diagram, you can only assume information about size or measure if it is marked.



YOU CAN ASSUME

All points are coplanar.

$\angle AHB$ and $\angle BHD$ are a linear pair.

$\angle AHF$ and $\angle BHD$ are vertical angles.

A, H, J, and D are collinear.

$\overleftrightarrow{AD}$ and $\overleftrightarrow{BF}$ intersect at H.

YOU CANNOT ASSUME

G, F, and E are collinear.

$\overleftrightarrow{BF}$ and $\overleftrightarrow{CE}$ intersect.

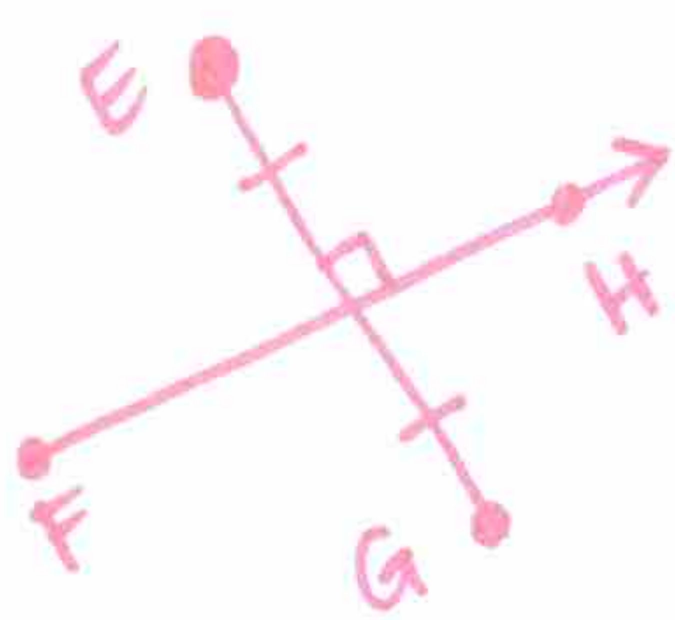
$\overleftrightarrow{BF}$ and $\overleftrightarrow{CE}$ do not intersect.

$\angle BHA \cong \angle CJA$

$\overleftrightarrow{AD} \perp \overleftrightarrow{BF}$

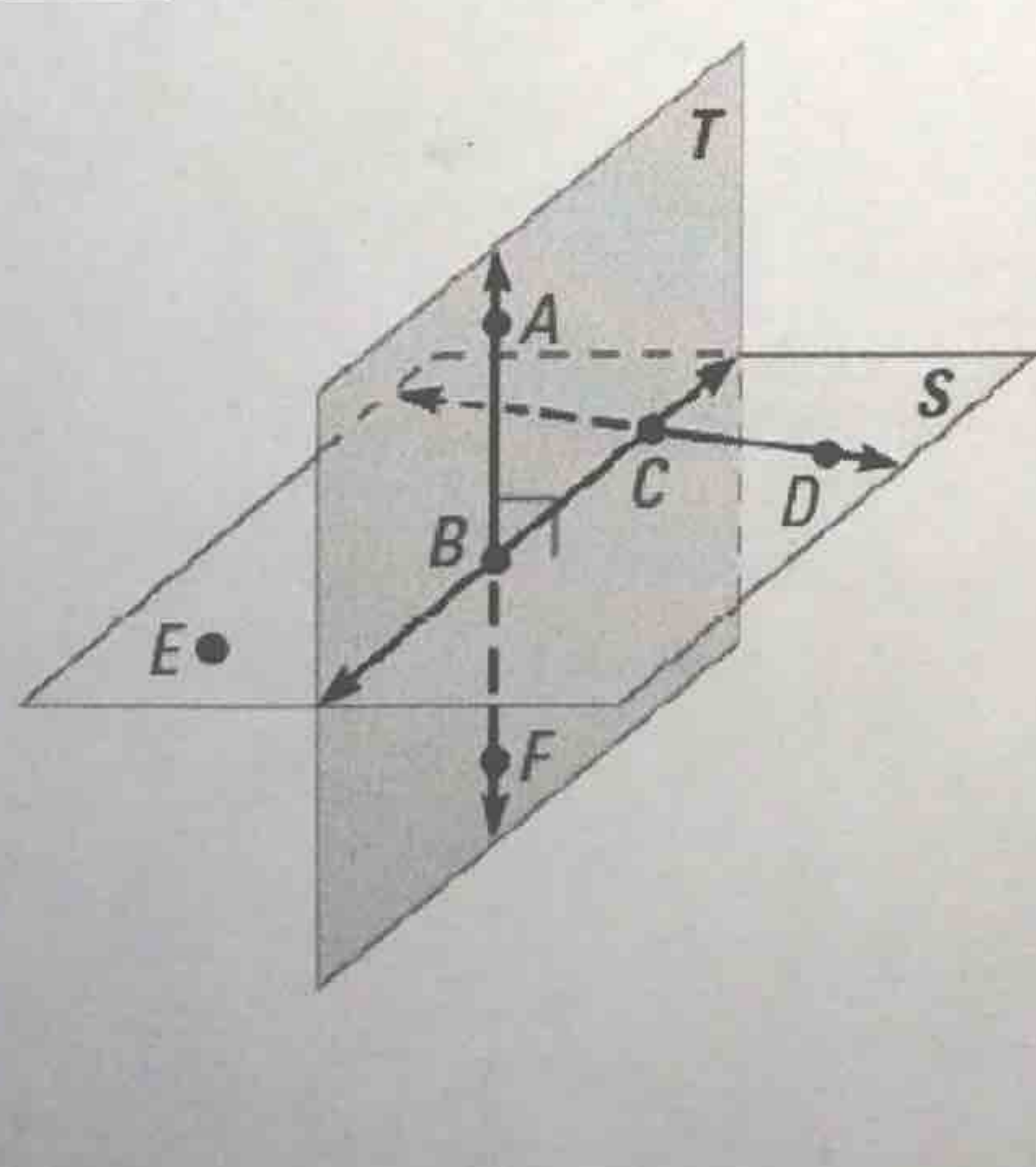
$m\angle AHB = 90°$

Ex 3: Sketch a diagram showing $\overrightarrow{FH} \perp \overline{EG}$ at its midpoint M.



line perpendicular to a plane – if and only if the line intersects the plane in a point and is perpendicular to even line in the plane that intersects it at that point

Ex 4: Which of the following cannot be assumed from the diagram?



A, B, and F are collinear

E, B, and D are collinear

$\overline{AB} \perp$ plane S

$\overline{CD} \perp$ plane T

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