Geometry 2.5
Identify and use basic postulates about points, lines, planes
Write paragraph proofs
(a way to organize/explain your reasoning)

postulate (axiom) Starting place "accepted"
theorem prove
* deductive argument
paragraph proof (informal)
2-column proof formal
working backward (CSI)

Quiz 2.3-2.4

Postulate: Self-evident & usually obvious
Basic idea/example about a point, line, plane...
Sort of like a definition... "duh"
It just IS. Like gravity.

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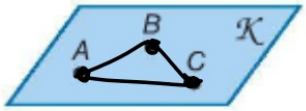
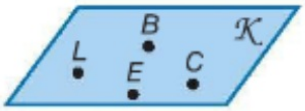
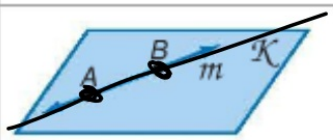
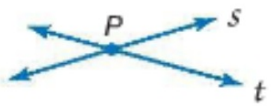
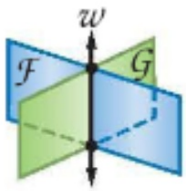
1 Points, Lines, and Planes

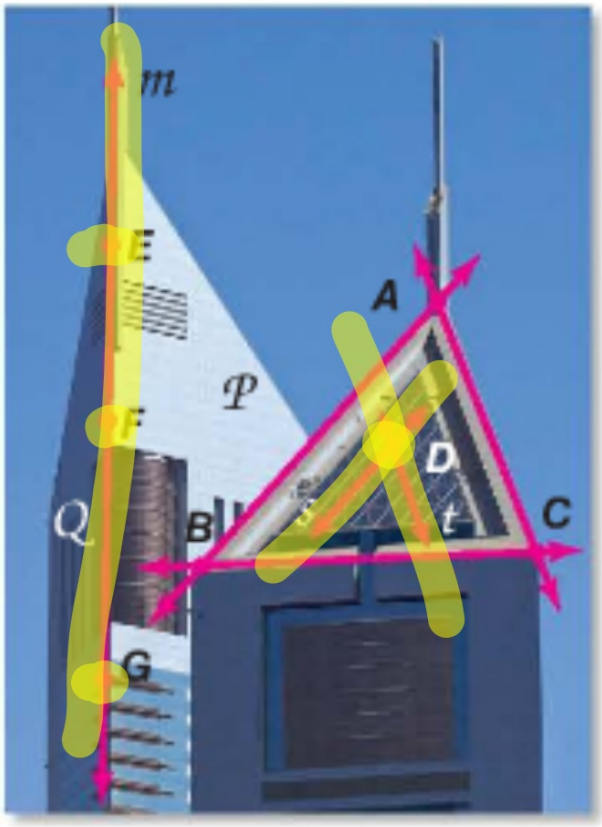
A **postulate** or ~~axiom~~ is a statement that is accepted as true without proof. Basic ideas about points, lines, and planes can be stated as postulates.

Postulates Points, Lines, and Planes

Words	Example
1 Through any two points, there is exactly one line.	 Line n is the only line through points P and R.
2 Through any three noncollinear points, there is exactly one plane.	 Plane $\mathcal{K}$ is the only plane through noncollinear points A, B, and C.
3 A line contains at least two points.	 Line n contains points P, Q, and R.
4 A plane contains at least three noncollinear points.	 Plane $\mathcal{K}$ contains noncollinear points L, B, C, and E.
5 If two points lie in a plane, then the entire line containing those points lies in that plane.	 Points A and B lie in plane $\mathcal{K}$, and line m contains points A and B, so line m is in plane $\mathcal{K}$.

KeyConcept Intersections of Lines and Planes

Words	Example
2.6 If two lines intersect, then their intersection is exactly one point.	 Lines s and t intersect at point P.
2.7 If two planes intersect, then their intersection is a line.	 Planes $\mathcal{F}$ and $\mathcal{G}$ intersect in line w.



Real-World Example 1 Identifying Postulates

ARCHITECTURE Explain how the picture illustrates that each statement is true. Then state the postulate that can be used to show each statement is true.

a. Line m contains points F and G. Point E can also be on line m.

b. Lines s and t intersect at point D.

1A. Points A, B, and C determine a plane.

1B. Planes $\mathcal{P}$ and Q intersect in line m.

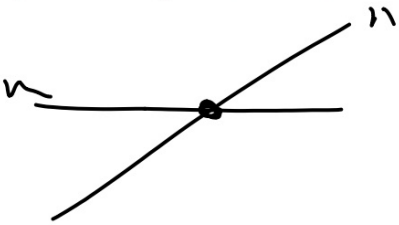
Always, sometimes, never
True = A
Maybe (it depends) = S
False = N

Example 2 Analyze Statements Using Postulates

Determine whether each statement is *always, sometimes,* or *never* true. Explain your reasoning.

A S N

a. If two coplanar lines intersect, then the point of intersection lies in the same plane as the two lines.



b. Four points are noncollinear.

2A. Two lines determine a plane.

2B. Three lines intersect in two points.

2 Paragraph Proofs To prove a conjecture, you use deductive reasoning to move from a hypothesis to the conclusion of the conjecture you are trying to prove. This is done by writing a **proof**, which is a logical argument in which each statement you make is supported by a statement that is accepted as true.

$2x + 3 = 13$

2. S
17-29 o
51-65 o

Proofs are:
airtight
logical
convincing
chain of reasoning
explain each step
(each statement has a justification: reason)

KeyConcept The Proof Process

Step 1 List the given information and, if possible, draw a diagram to illustrate this information.

Step 2 State the theorem or conjecture to be proven.

Step 3 Create a deductive argument by forming a logical chain of statements linking the given to what you are trying to prove.

Step 4 Justify each statement with a reason. Reasons include definitions, algebraic properties, postulates, and theorems.

Step 5 State what it is that you have proven.

Just like CSI: you have to PROVE it.

REQUIRED elements:
Given:
To prove:
Drawing (if applicable):
Chain of reasoning (explain) using statements & reasons

Required elements:
Given:
To prove:
Drawing (sketch):
Chain of reasoning (explain) using statements & reasons

3. Given that C is between A and B and $\overline{AC} \cong \overline{CB}$, write a paragraph proof to show that C is the midpoint of $\overline{AB}$.

32. **ARGUMENTS** Last weekend, Emilio and his friends spent Saturday afternoon at the park. There were several people there with bikes and skateboards. There were a total of 11 bikes and skateboards that had a total of 36 wheels. Use a paragraph proof to show how many bikes and how many skateboards there were.