Geometry 2.5
Identify and use basic postulates about points, lines, planes
Write paragraph proofs

postulate (axiom)
theorem $a^2 + b^2 = c^2$
deductive argument
→ paragraph proof (informal)
→ 2-column proof (formal)
working backward (CSI)

Quiz 2.3-2.4 Wed.

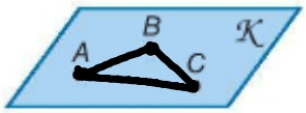
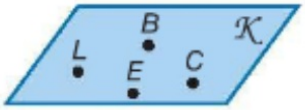
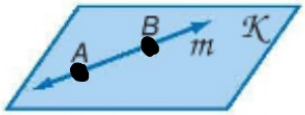
Projects due today (APPS) by 3:30

Reflections (2 paragr) due Wed.

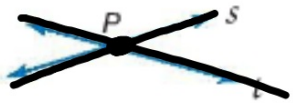
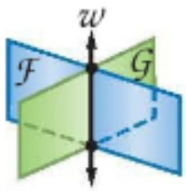
Postulate: Self-evident
Basic idea/example about a point, line, plane...
Sort of like a definition...
"...duh"
It just IS. Like gravity.

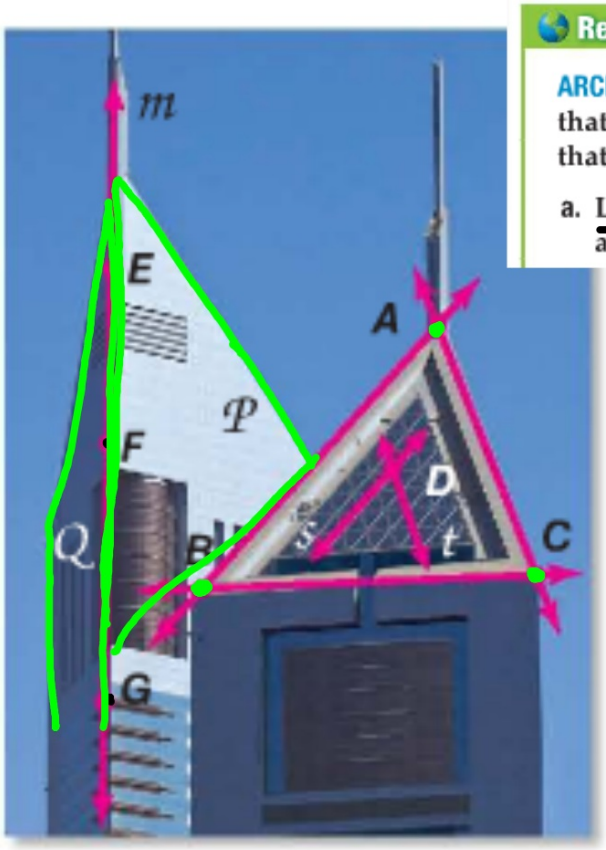
1 Points, Lines, and Planes A **postulate** or **axiom** is a statement that is accepted as true without proof. Basic ideas about points, lines, and planes can be stated as postulates.

Postulates Points, Lines, and Planes

Words	Example
Through any two points, there is exactly one line.	 Line n is the only line through points P and R.
Through any three noncollinear points, there is exactly one plane.	 Plane $\mathcal{K}$ is the only plane through noncollinear points A, B, and C.
A line contains at least two points. (inf. many)	 Line n contains points P, Q, and R.
A plane contains at least three noncollinear points.	 Plane $\mathcal{K}$ contains noncollinear points L, B, C, and E.
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	
[redacted] If two lines intersect, then their intersection is exactly one point.		Lines s and t intersect at point P.
[redacted] 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.

it depends

T ↓ F

A S N

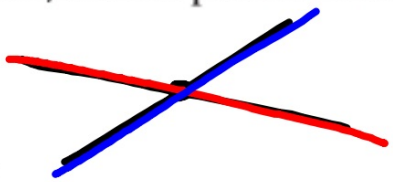
Always, sometimes, never
True = A
Maybe (it depends) = S
False = N

Example 2 Analyze Statements Using Postulates

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

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

A



b. Four points are noncollinear.

S

2A. Two lines determine a plane.

A

2B. Three lines intersect in two points.

S

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.

Proofs are:
airtight
logical
convincing
chain of reasoning
each statement has a justification

$2x + 3 = 13$
$-3 \quad -3$

1. Subtract 3 from both

$\frac{2x}{2} = \frac{10}{2}$

2. Divide both by 2

(reason)

3. Substitution

$x = 5$

p. 129 GPS

KeyConcept The Proof Process

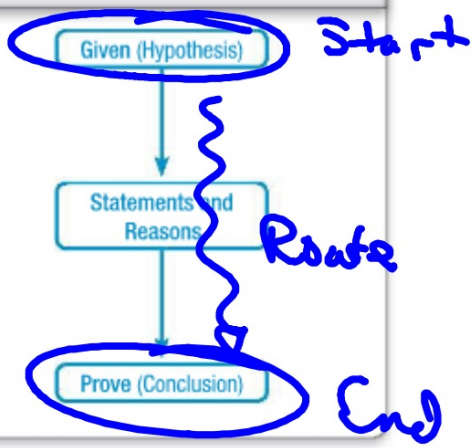
Step 1 List the given information and, if possible, draw a diagram to illustrate this information.

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:

1. Given: Start
2. To prove: destination
3. Drawing (if applicable):
4. Chain of reasoning (explain) using statements & reasons GPS

Given: C is between A & B
$\overline{AC} \cong \overline{CB}$

Prove: C is mp of AB

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

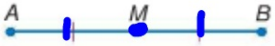
3. Given that C is between A and B and $\overline{AC} \cong \overline{CB}$, write a paragraph proof to show that C is the midpoint of $\overline{AB}$.

Given AC=CB so C is in middle (equal dist from each end) which is def of mp.

Once a conjecture has been proven true, it can be stated as a theorem and used in other proofs. The conjecture in Example 3 is known as the Midpoint Theorem.

Theorem 2.1 Midpoint Theorem

If M is the midpoint of $\overline{AB}$, then $\overline{AM} \cong \overline{MB}$.



$2B + 4S$

32. CCSS **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.

4 bikes
7 sk.b.

B	S	
11	0	
10	1	
9	2	
8	3	16+12
7	4	14+16
6	5	12+20
5	6	10+24
4	7	8+28

Given 36 wheels, 11 total

Prove: 4 bikes; 7 SB.

← Use table $2 \cdot B + 4 \cdot S$

$2 \cdot 4 + 4 \cdot 7$

$8 + 28 = 36$ (total)

2.5
17-31. p131
2 pargr. (GCR - no print)