

Geometry 2.5

Identify and use basic postulates about points, lines, planes

Write paragraph proofs

(a way to organize/explain your reasoning)

postulate ("axiom")

theorem

deductive argument -

[paragraph proof (informal)

2-column proof

working backward (CSI)

starting place "self evident"

prove it

Quiz 2.3-2.4

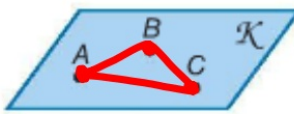
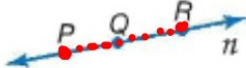
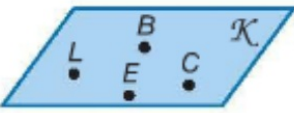
Tues.

Projects due today

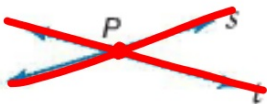
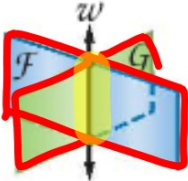
3:30 (APPS folder)

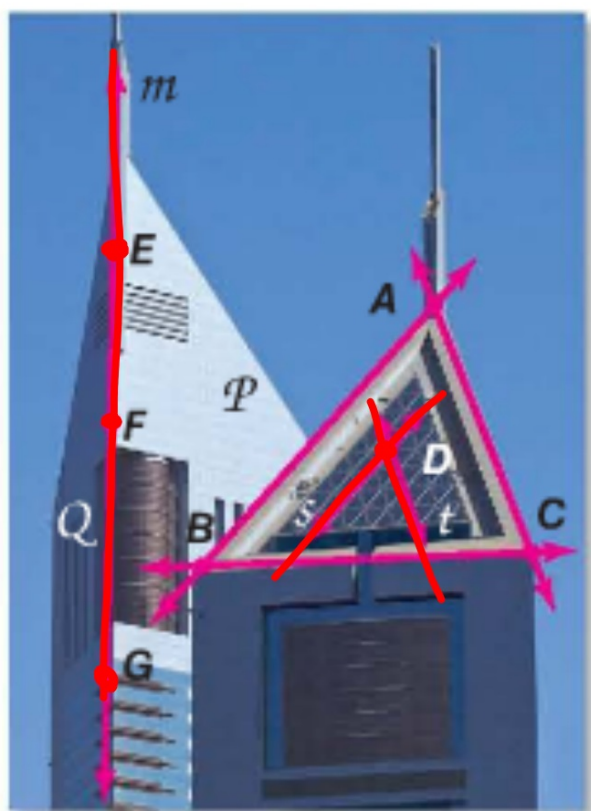
Postulate: Self-evident & usually obvious
 Basic idea/example about a point, line, plane...
 Sort of like a definition... "duh"
 It just IS. Like gravity.

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.		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	
 If two lines intersect, then their intersection is exactly one point.		Lines s and t intersect at point P .
 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 .

Line contains at least two points

- b. Lines s and t intersect at point D .

2 lines int. in a pt.

- 1A.** Points A , B , and C determine a plane. **1B.** Planes P and Q intersect in line m .

T it depends F
A S N

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

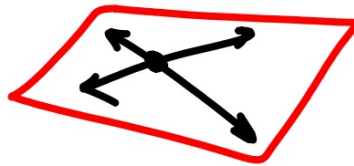


Example 2 Analyze Statements Using Postulates

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.

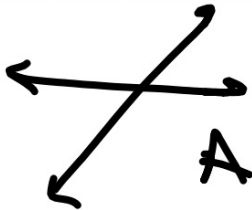
A



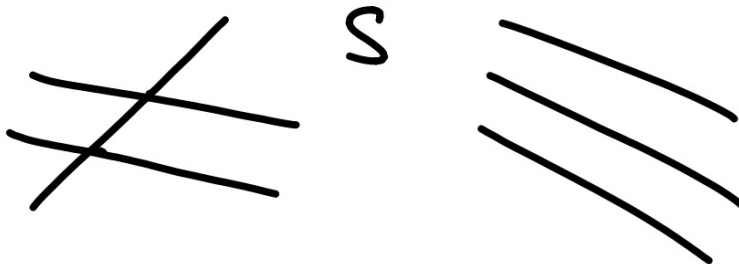
- b. Four points are noncollinear.



- 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.

2-column proof

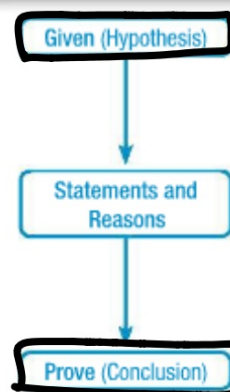
$$\begin{array}{ll}
 * & 2x + 3 = 13 \quad \text{given} \\
 & \quad -3 \quad -3 \quad \text{subtr. prop.} \\
 & \underline{2x} = \underline{10} \quad \text{subst.} \\
 & \quad \underline{2} \quad \underline{2} \quad \text{div prop.} \\
 & x = 5 \quad \text{subst.}
 \end{array}$$

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

p. 129

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:

Chain of reasoning (explain) using statements & reasons

Given: ()

Prove: ()

statement

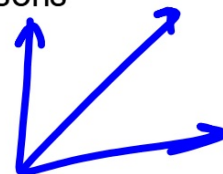
Reason

1. ()

1. given

()

never "prove"



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

- | | |
|--|----------------|
| 1. C is between A & B
$\overline{AC} \cong \overline{CB}$ | 1. given |
| 2. $\overline{AB}$ is divided
into 2 equal parts | 2. def $\cong$ |
| 3. C is mp of $\overline{AB}$ | 3. def mp |

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 $\overline{AB}$.



Required elements:

Given:

To prove:

Drawing:

Chain of reasoning (explain) using statements & reasons

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.

B	S
0	11
1	10
2	9
3	8
4	7

$$2 + 40$$

$$4 + 36$$

$$6 + 32$$

$$8 + 28$$

$$= 36$$

Given 11 bikes & SB
36 wheels total

Prove how many of each