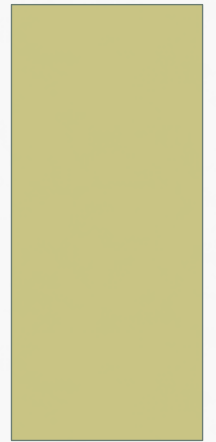


GEOMETRY UNIT 3: PROOFS

PROOF BUILDING FT.
PROPERTIES FROM ALGEBRA



WARMUP

- Give the hypothesis and conclusion of the following statements:

1. If two segments have equal measure, then they are congruent.

2. *If $a = b$ and $b = c$, then $a = c$*

3. *If $\sphericalangle D \cong \sphericalangle E$, then $\sphericalangle E \cong \sphericalangle D$*

PROOF BUILDING – PROPERTIES

- **Content Objective**: Students will be able to fill in algebraic and geometric proofs using properties of equality and congruence.
- **Language Objective**: Students will be able to state properties from Algebra, using them to construct two-column proofs.

PROPERTIES OF EQUALITY

- **Addition Property**: *If $a = b$ and $c = d$, then $a + c = b + d$*
- **Subtraction Property**: *If $a = b$ and $c = d$, then $a - c = b - d$*
- **Multiplication Property**: *If $a = b$, then $ca = cb$*
- **Division Property**: *If $a = b$, and $c \neq 0$, then $\frac{a}{c} = \frac{b}{c}$*
- **Distributive Property**: $a(b + c) = ab + ac$
- **Substitution Property**:
If $a = b$, then either a or b may be written in placed of the other in an equation

PROPERTIES OF EQUALITY (CONT.)

- **Reflexive Property**: $a = a$
- **Symmetric Property**: *If $a = b$, then $b = a$*
- **Transitive Property**: *If $a = b$ and $b = c$, then $a = c$*

PROPERTIES OF CONGRUENCE

- **Reflexive Property**: $\overline{DE} \cong \overline{ED}$ $\angle XYZ \cong \angle ZYX$
- **Symmetric Property**: *If $\overline{DE} \cong \overline{FG}$, then $\overline{FG} \cong \overline{DE}$*
Or *If $\angle D \cong \angle E$, then $\angle E \cong \angle D$*
- **Transitive Property**: *If $\overline{DE} \cong \overline{FG}$ and $\overline{FG} \cong \overline{JK}$, then $\overline{DE} \cong \overline{JK}$*
Or *If $\angle X \cong \angle Y$ and $\angle Y \cong \angle Z$, then $\angle X \cong \angle Z$*

SOLVING EQUATIONS

- Solve $2x = 10 - 3x$, and justify each step.

• *Steps*

1. $2x = 10 - 3x$

2. $5x = 10$

3. $x = 2$

Reasons

1. Given Equation

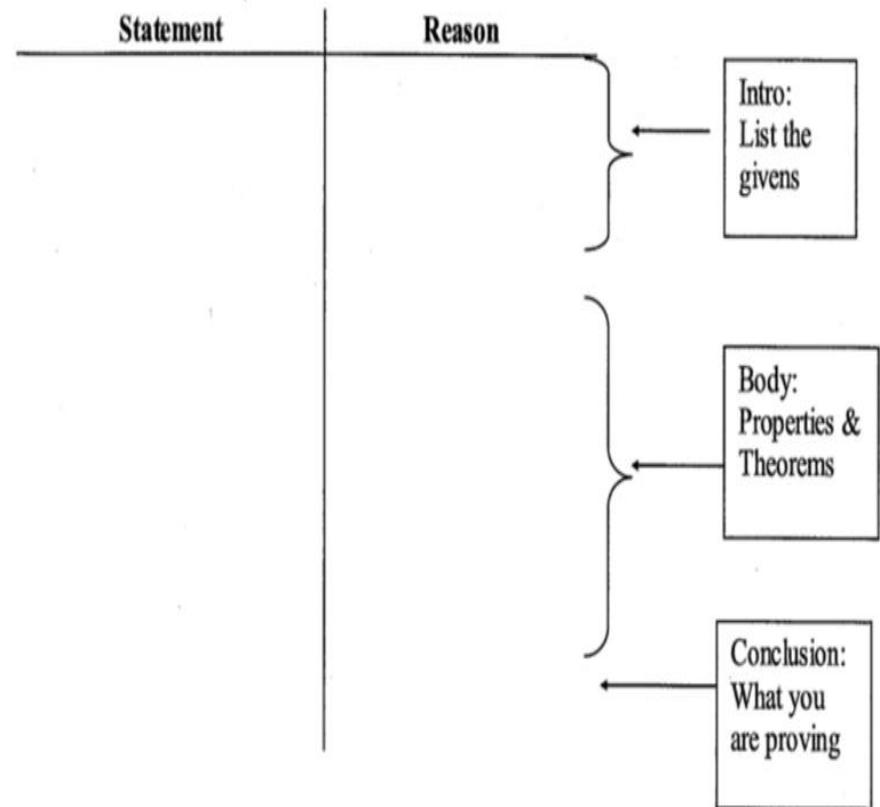
2. Addition Property

3. Division Property

TWO-COLUM PROOFS

- Begin with what you are Given.
- End with what you are trying to Prove.
- Make logical statements in between.
- Justify each statement with a Reason.

How to set up a proof:



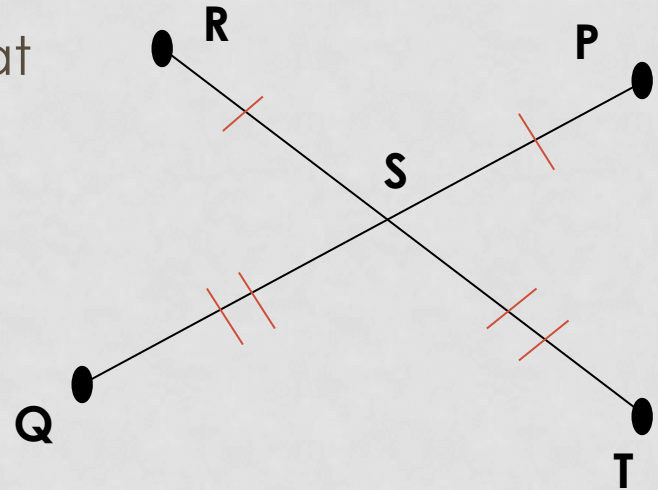
USING A TWO-COLUMN PROOF

Given: \overline{RT} and \overline{PQ} intersecting at S so that

$$RS = PS \text{ and } ST = SQ$$

Prove: $RT = PQ$

Proof:



Statements

Reasons

1. $RS = PS; ST = SQ$
2. $RS + ST = PS + SQ$
3. $RS + ST = RT; PS + SQ = PQ$
4. $RT = PQ$

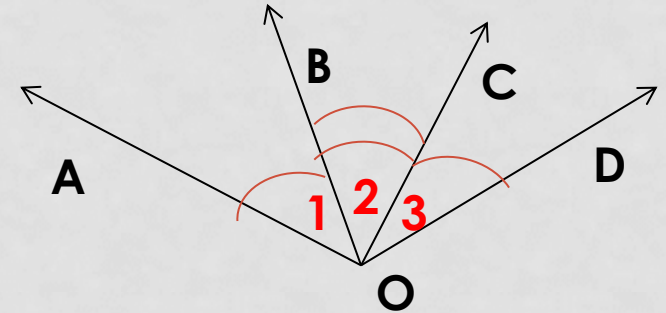
1. Given
2. Addition Property
3. Segment Addition Post.
4. Substitution Property

USING A TWO-COLUMN PROOF

Given: $m \angle AOC = m \angle BOD$

Prove: $m \angle 1 = m \angle 3$

Proof:



Statements

Reasons

1. $m \angle AOC = m \angle BOD$

1. Given

2. $m \angle AOC = m \angle 1 + m \angle 2$;
 $m \angle BOD = m \angle 2 + m \angle 3$

2. Angle Addition Post.

3. $m \angle 1 + m \angle 2 = m \angle 2 + m \angle 3$

3. Substitution Property

4. $m \angle 2 = m \angle 2$

4. Reflexive Property

5. $m \angle 1 = m \angle 3$

5. Subtraction Property

FINAL WORD

- You can always use Substitution instead of Transitivity.
- You cannot always use Transitivity instead of Substitution.
- Safer to stick with Substitution.

