Algebraic Proof & Simple Geometric Proof

ALGEBRAIC PROPERTIES OF EQUALITY

Let a, b, and c be real numbers.

Addition Property	If $a = b$, then $a+c=b+c$
Subtraction Property	If $a = b$, then $a-c=b-c$
Multiplication Property	If $a = b$, then $ac=bc$
Division Property	If $a = b$ and $c \neq 0$, then $\frac{a}{c}=\frac{b}{c}$.
Reflexive Property	For any real number a, $a=a$.
Symmetric Property	If $a = b$, then $b=a$.
Transitive Property	If $a = b$ and $b = c$, then $a=c$.
Substitution Property	If $a = b$, then we can replace a with b.

- **Two-Column Proof:** Statements | Reasons

* State the Given

Statements: work & EVERY step. | Reasons: Properties, postulates, Theorems, Definition

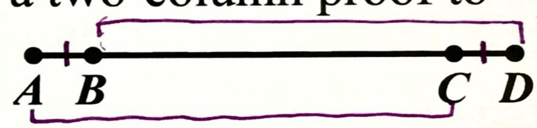
Ex. 1: Solve $5x - 18 = 3x + 2$ and write a reason for each step. Use a two-column proof to organize your reasons.

Statements	Reasons
1. $5x - 18 = 3x + 2$ $+18 \quad +18$	1. Given
2. $5x = 3x + 20$ $-3x \quad -3x$	2. Add prop
3. $2x = 20$	3. Subt prop
4. $x = 10$	4. Div prop

Ex. 2: Solve $55x-3(9x+12)=-64$ and write a reason for each step. Use a two-column proof to organize your reasons.

Statements	Reasons
55x − 3(9x + 12) = −64	Given
55x − 27x − 36 = −64	Dist. prop
28x − 36 = −64 +36 +36	Comb Like Terms
28x = −28	Add prop
x = −1	Division prop

Ex. 3: In the diagram, $AB = CD$. Use a two-column proof to prove that $AC = BD$.



Statements	Reasons
AB = CD	Given
AB + BC = AC	Seg. add post
BC + CD = BD	" " "
CD + BC = AC	Sub prop
AC = BD	trans prop

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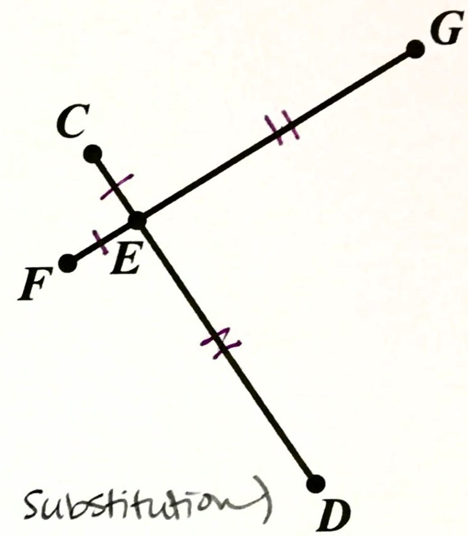
Algebraic Proof & Simple Geometric Proof

Ex. 4: Given: $\overline{CE} \cong \overline{FE}$ and $\overline{ED} \cong \overline{EG}$

Prove: $\overline{CD} \cong \overline{FG}$



(Sub= Substitution)

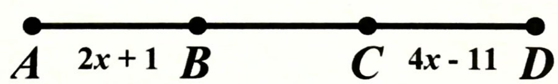
Statements	Reasons
$\overline{CE} \cong \overline{FE}$ & $\overline{ED} \cong \overline{EG}$	Given
* $CE = FE$ $ED = EG$	Def ≅
$CE + ED = CD$	Seg. add post
$FE + EG = FG$	" " "
$FE + ED = CD$	Sub prop
$FE + ED = FG$	Sub prop
$CD = FG$	trans prop
$\overline{CD} \cong \overline{FG}$	Def ≅

- **Definition of Congruence:**

  If $\overline{AB} \cong \overline{CD}$, then $AB = CD$

Ex. 5: Solve for the variable using the given information. Use a two-column proof to explain your steps.

Given: $\overline{AB} \cong \overline{BC}$, $\overline{CD} \cong \overline{BC}$



Statements	Reasons
$\overline{AB} \cong \overline{BC}$, $\overline{CD} \cong \overline{BC}$	Given
$AB = 2x+1$ $CD = 4x-11$	"
$AB = BC$ $CD = BC$	Def ≅
$AB = CD$	trans prop
$2x+1 = 4x-11$	Sub prop
$1 = 2x - 11$	Subt prop
$12 = 2x$	Add prop
$x = 6$	Div prop

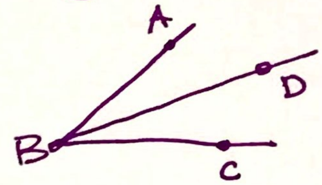
Sec 2 H — **Notes 7-2** — **Unit 7**

Algebraic Proof & Simple Geometric Proof

- Definition of midpoint:

If know that B is the midp., $\overline{AB} \cong \overline{BC}$

- Definition of bisects:



If D is on the bisector of ∠ABC, then ∠ABD ≅ ∠DBC

- Definition of supplementary:

2 ∠s that add to 180°. ∠A + ∠B = 180

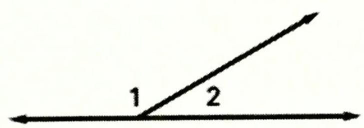
- Definition of complementary:

2 ∠s that add to 90°. ∠A + ∠B = 90

POSTULATE 12 LINEAR PAIR POSTULATE (supplementary)

If two angles form a linear pair, then they are supp.

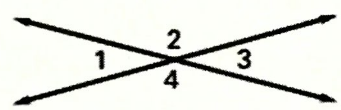
$m\angle 1 + m\angle 2 =$ 180°



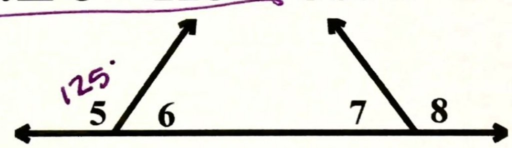
THEOREM 2.6 VERTICAL ANGLES THEOREM

Vertical angles are ≅.

∠1 ≅ ∠3 and ∠2 ≅ ∠4



Ex. 6: In the diagram, $m\angle 8 = m\angle 5$ and $m\angle 5 = 125°$. Use a two-column proof to show that $m\angle 7 = 55°$



Statements	Reasons
m∠8 = m∠5 & m∠5 = 125°	Given
m∠8 = 125°	Sub prop
m∠8 + m∠7 = 180	Linear pair post
125 + m∠7 = 180	Sub prop
m∠7 = 55°	Subt prop