Geometry R – Mrs. Cowen
Unit 3 – Day 6 Notes

Name: ____________________
Date: ______________

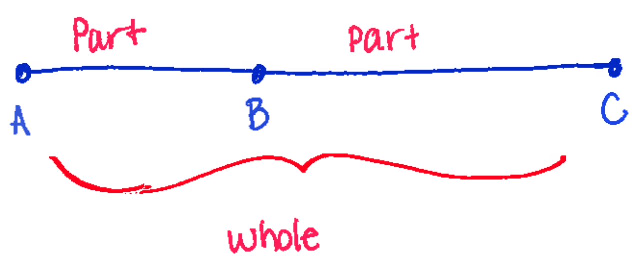
Segment & Angle Addition

Segment/Angle Addition Postulates: "Part + Part = Whole"

1. Draw a picture to represent each postulate and identify the "Parts" and the "Whole".

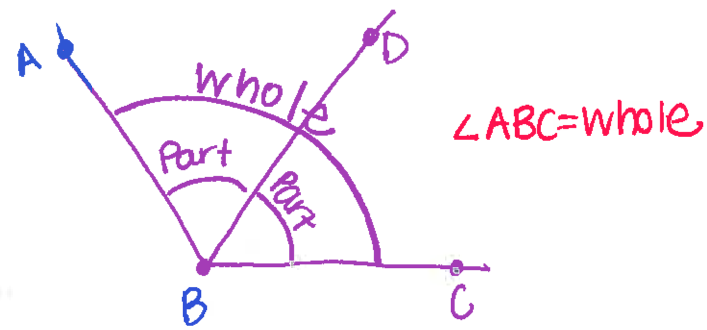
Segment Addition Postulate:

If points A, B, and C are *colinear* with B between A and C then AB + BC = AC.



Angle Addition Postulate:

If point D is in the interior of ∠ABC, then m∠ABD + m∠DBC = m∠ABC.



Properties of Equality: These properties will support our Angle & Segment Addition postulates.

Addition

If $A=B$, then $A+X=B+X$

"add x to both sides"

Subtraction

If $A+X=B+X$, then $A=B$

"subtract x from both sides"

Substitution

If $A=B$ and $A+X=C$, then $B+X=C$

"replaced A with B"

Reflexive

$A=A$

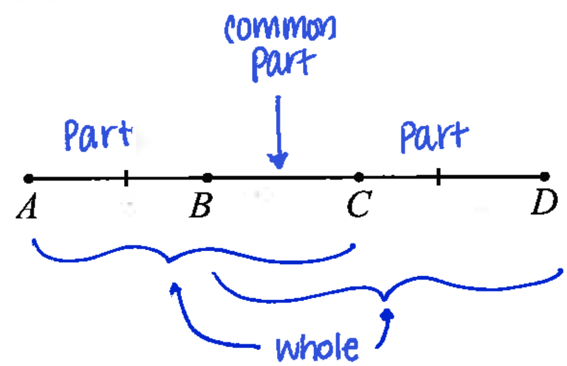
"something is equal to itself."

The Addition Method: *"Going from Small to Big"*

2. Example: In this example, two equal parts are connected by a **common part**.

Given: $\overline{ABCD}$
$\overline{AB} \cong \overline{CD}$ ← Equal Parts (Small)

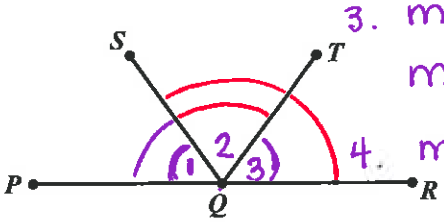
Prove: $\overline{AC} \cong \overline{DB}$ ← Equal Wholes (Big)



	Statements	Reasons
	1. $\overline{ABCD}$	1. Given
(Part = Part)	$\overline{AB} \cong \overline{CD}$; $AB = CD$	
(Add the parts) (Part + Part = Part + Part)	2. $AB + BC = BC + CD$	2. add prop. of equality
(Parts = Whole)	3. $AB + BC = AC$ $BC + CD = BD$	3. segment addition
(Whole = Whole)	4. $AC = BD$; $\overline{AC} \cong \overline{BD}$	4. Substitution.

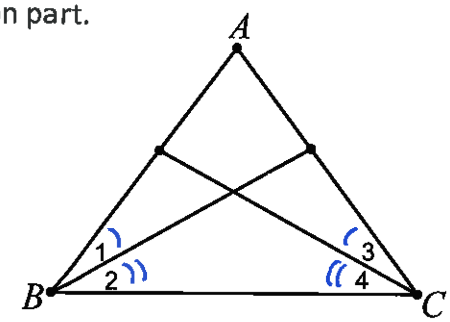
3. Example:

Given: $\angle PQS \cong \angle RQT$
Prove: $\angle PQT \cong \angle RQS$



statements	Reasons
1. $\angle PQS \cong \angle RQT$; $m\angle 1 = m\angle 3$	1. Given
2. $m\angle 1 + m\angle 2 = m\angle 2 + m\angle 3$	2. add prop of eq.
3. $m\angle 1 + m\angle 2 = m\angle PQT$ $m\angle 2 + m\angle 3 = m\angle RQS$	3. Angle Addition
4. $m\angle PQT = m\angle RQS$; $\angle PQT \cong \angle RQS$	4. substitution

4. Example: In this example equal parts are not connected by a common part.



Given: $\angle 1 \cong \angle 3$
$\angle 2 \cong \angle 4$ ⟵ Equal Parts (Small)

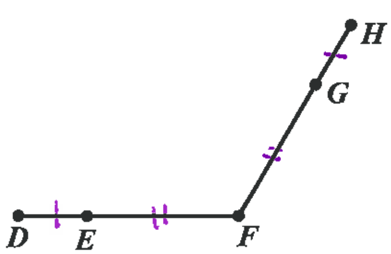
Prove: $\angle ABC \cong \angle ACB$ ⟵ Equal Wholes (Big)

	Statements	Reasons
(Part = Part)	1. $\angle 1 \cong \angle 3$; $m\angle 1 = m\angle 3$	1. Given
(Part = Part)	$\angle 2 \cong \angle 4$; $m\angle 2 = m\angle 4$	
(Part + Part = Part + Part)	2. $m\angle 1 + m\angle 2 = m\angle 3 + m\angle 4$	2. add prop of eqr
	3. $m\angle 1 + m\angle 2 = m\angle ABC$	3. Segment Addition
(Parts = Whole)	4. $m\angle 3 + m\angle 4 = m\angle ACB$	4. Segment Addition
(Whole = Whole)	5. $m\angle ABC = m\angle ACB$; $\angle ABC \cong \angle ACB$	5. Substitution

5. Example:

Given: $\overline{DE} \cong \overline{HG}$
$\overline{GF} \cong \overline{EF}$

Prove: $\overline{DF} \cong \overline{HF}$



Statements	Reasons
① $\overline{DE} \cong \overline{HG}$; $DE = HG$ $\overline{GF} \cong \overline{EF}$; $GF = EF$	① Given
② $DE + EF = HG + GF$	② add prop of equality
③ $DE + EF = DF$ $HG + GF = HF$	③ segment addition
④ $DF = HF$; $\overline{DF} \cong \overline{HF}$	④ Substitution

The Subtraction Method: *"Going from Big to Small"*

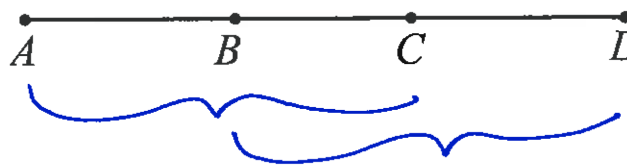
*There is **NO** segment/angle subtraction postulate!*

6. Example:

Given: $\overline{ABCD}$

$\overline{AC} \cong \overline{DB}$ ← Equal Wholes (Big)

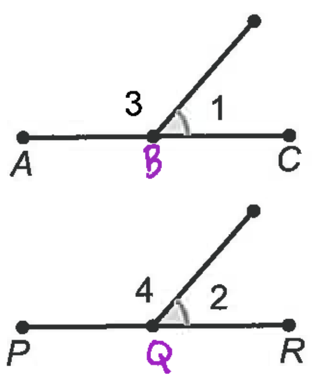
Prove: $\overline{AB} \cong \overline{CD}$ ← Equal Parts (Small)



	Statements	Reasons
	1. $\overline{ABCD}$	1. Given
(Whole = Whole)	$\overline{AC} \cong \overline{DB}$; $AC = DB$	
(Parts = Whole)	2. $AC = AB + BC$ $BD = BC + CD$	2. segment addition
(Part + Part = Part + Part)	3. $AB + \underline{BC} = \underline{BC} + CD$	3. substitution (subst)
(Part = Part)	4. $AB = CD$; $\overline{AB} \cong \overline{CD}$	4. subtr. prop of eq.

7. Use the **Subtraction Method** to complete the proof of the following theorem:

"If 2 angles are congruent, then their supplements are congruent."



Statement	Reason
1. $\angle 1 \cong \angle 2$; $\angle ABC = 180; \angle PQR = 180$	1. Given
2. $m\angle ABC = m\angle PQR$	2. ~~supp~~ straight ∠s have 180°
3. $m\angle 1$ supp $m\angle 3$ $m\angle 2$ supp $m\angle 4$	3. adj ∠s that form a straight line are supp.
4. $m\angle 1 + m\angle 3 = 180$ $m\angle 2 + m\angle 4 = 180$	4. Supp ∠s have 180°
5. $m\angle 1 + m\angle 3 = m\angle 2 + m\angle 4$	5. substitution
6. $m\angle 1 + m\angle 3 = m\angle 1 + m\angle 4$	6. substitution
7. $\angle 3 \cong \angle 4$	7. subtr. prop of eq.