NOTES 2.7

TRANSITIVE & SUBSTITUTION

PROPERTIES

Transitive Property

- If **two** quantities are equal (or congruent) to the **same quantity**, then they are equal (or congruent) to each other.

Transitive Property

- Notice: Transitive is much like the Chain Reasoning….

- John is taller than Kevin and Kevin is taller than Louis.

- How do the heights of John and Louis compare?

Transitive Property

- EQUALITY EXAMPLE: If AB = CD and CD = EF, then AB = EF

- CONGRUENCE EXAMPLE: If ∠ X ≅ ∠ Y ∠and ∠ Y≅ ∠ Z,

  then ∠ X ≅ ∠ Z

Substitution Property

- This is when an equivalent amount (or measure) may **replace** another expression in an equation (or congruence situation).
  - we may only substitute equals in equations,
  - we do NOT have a substitution property of congruence.

- EQUALITY EXAMPLE: If a + 4 = b and a = 5, then 5 + 4 = b

- CONGRUENCE EXAMPLE: m ∠X + m ∠ Y = 90° and m ∠ X = 30°, then 30° + m ∠Y = 90°.

Example # 1
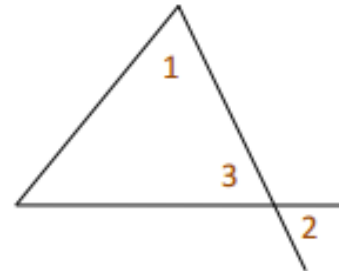# Transitive or Substitution?

Example #1

Given: $\angle 1 \cong \angle 2$

$\angle 2 \cong \angle 3$

Concl: $\angle 1 \cong \angle 3$

Reason: ?

Solution: **Transitive Property.**   Since both angles 1 and 2 are congruent to the same angle (angle 2), they must be congruent to each other.

Example # 2
Transitive or Substitution?
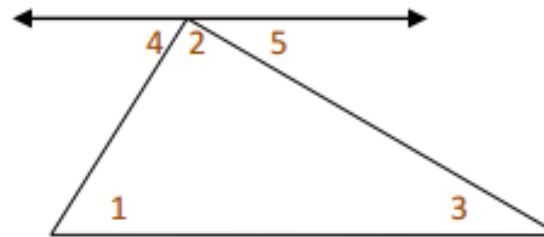

Example #2

Given: $m\angle 1 \cong m\angle 4$,

$m\angle 3 \cong m\angle 5$,

$m\angle 4 + m\angle 2 + m\angle 5 = 180$

Conclusion: $m\angle 1 + m\angle 2 + m\angle 3 = 180$

Reason: ?

Solution: **Substitution Property**. In the equation stated lastly in the givens, the measures of angles 4 and 5 are replaced by their equals, the measures of angles 1 and 3, respectively.
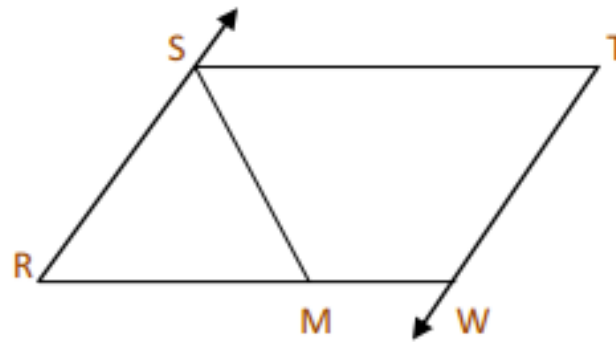
Example # 3
Transitive or Substitution?

Example #3

Given: RS = **SM** (equation 1)

TW = **SM** (equation 2)

Conclusion: RS = TW

Reason: ?

Solution: **Transitive or Substitution.**   Could be either one due to =.

Example # 4
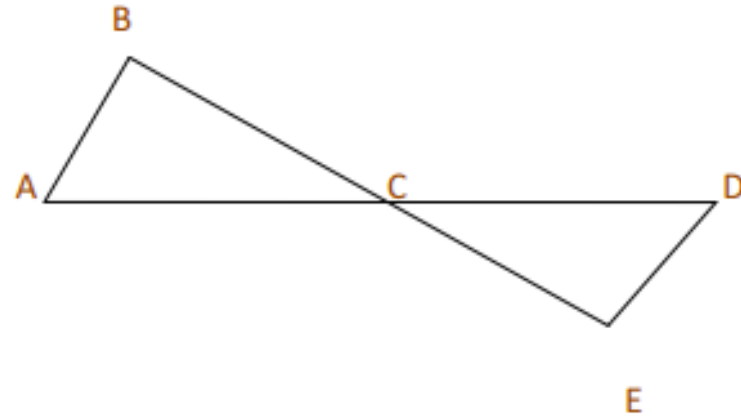## Transitive or Substitution?

Example #4

Given: C is the midpoint of $\overline{AD}$

$\qquad$ AC = CE

Conclusion: CD = CE

$\qquad$ **Reason:** $\qquad$?

Solution: $AC = CD,$ since point C is the midpoint of $\overline{AD}.$

We now have the set of relationships: AC = CD (equation 1) AC = CE (equation 2)
 Since CD and CE are both equal to the same quantity (AC) they must be equal to each other. Therefore, CD = CE by the transitive property of equality ~or~ We may replace AC by CE in Equation (1), also reaching the desired conclusion.