

# Unit 3—Reasoning

## FACT SHEET

### Properties

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Algebra Properties: If given  $A = B$ , then

- Addition Property:  $A + C = B + C$
- Subtraction Property:  $A - C = B - C$
- Multiplication Property:  $(A)(C) = (B)(C)$
- Division Property:  $\frac{A}{C} = \frac{B}{C}$

- Substitution Property:

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

- Distributive Property:

If  $A(B + C) = D$ , then  $AB + AC = D$

### Other Properties

- Reflexive Property of Equality:  $A = A$   
Reflexive Property of Congruence:  $\angle A \cong \angle A$
- Symmetric Property of Equality: If  $A = B$ , then  $B = A$ .  
Symmetric Property of Congruence: If  $\overline{AB} \cong \overline{CD}$ , then  $\overline{CD} \cong \overline{AB}$ .
- Transitive Property of Equality: If  $A = B$  and  $B = C$ , then  $A = C$ .  
Symmetric Property of Congruence: If  $\overline{AB} \cong \overline{CD}$  and  $\overline{CD} \cong \overline{EF}$ , then  $\overline{AB} \cong \overline{EF}$ .

## Postulates:

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- **Segment or Angle Addition Postulate**

Part + Part = Whole

## Definitions:

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- **Midpoint**—gives you congruent segments
- **Angle Bisector**-gives you congruent angles
- **Perpendicular lines**—give you right angles
- **Right angles**—equal 90 degrees
- **Supplementary Angles**—sum to 180 degrees
- **Complementary Angles**—sum to 90 degrees
- **Linear Pair**—form a straight line
- **Straight angle**—equals 180 degrees
- **Congruent segments or angles**—have equal measures

## Theorems:

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- **Vertical Angles Congruence Thm:** Vertical angles are congruent.
- **Right Angles Congruence Thm:** All right angles are congruent.
- **Linear Pair Thm:** If two angles form a linear pair, then they are supplementary.
- **Congruent Complements Thm:** If two angles are complementary to the same angle or congruent angles, then the angles are congruent.
- **Congruent Supplements Thm:** If two angles are supplementary to the same angle or congruent angles, then the angles are congruent.

# Conditional Statements

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- Conditional Statement: If “p”, then “q”

where “p” is the hypothesis and “q” is the conclusion

- Inverse: If **not** “p”, then **not** “q”
- Converse: If “q”, then “p”
- Contrapositive: If **not** “q”, then **not** “p”
- Biconditional: “p if and only if q”

# Logic

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- Inductive Reasoning—based on observations
- Deductive Reasoning—based on facts, definitions, properties, postulates and theorems
- Conjecture—a statement you believe to be true based on inductive reasoning
- Counterexample—one example that proves a conjecture false

- **Law of Detachment**

Given: If a student passes his classes, then the student is eligible to play sports.

Hypothesis: Ramon passed his classes

Conjecture: Ramon is eligible to play sports.

- **Law of Syllogism**

If p then q. If q then r. Therefore, If p then r.

