Chapter 2

Reasoning and Proof

2.1 Inductive Reasoning

- **Patterns**: Important to see relationships

- **Conjecture**: idea, unproven, based on observation
  – Use **inductive reasoning** to draw conclusion
- Disproving Conjectures: To prove….
  – True: must be true for all cases
  – False: one counter example

2.2 Conditional Statements

- **Conditional Statement**: logical statenment
  - 2 parts: hypothesis and conclusion
  - Written in: IF – THEN Form
  - If: the hypothesis
  - Then: the conclusion

- **Negation**: opposite the original
- **Conditional**: can be true or false
- **Converse**: exchange the hypothesis and conclusion
- **Inverse**: negate both in conditional
- **Contrapositive**: negate the converse

- **Definition**: If 2 lines intersect to form right angles, then they are perpendicular

- Converse: If 2 lines are perpendicular, then they form right angles

- **Biconditional**: uses 'if and only if'

2.3 Deductive Reasoning

- **Inductive**: uses examples, patterns, properties, logic
- **Deductive**: uses facts, definitions

- **Laws of Logic**
  - **Law of Detachment**: If hypothesis true….Then conclusion is true
  - **Law of Syllogism**: If hypothesis p, then q is true
    If hypothesis q, then r is true
    THEN…. If hypothesis p, then conclusion r is true

- Inductive Reasoning: Make conjectures
- Deductive Reasoning: Show conjectures are true or false

2.4 Use Postulates and Diagrams

- Copy Postulates #1-11 on notecard

- Perpendicular Figures:
  - A line is ⊥ (90°) to a plane iff the line is ⊥ to every line on the plane.

2.5 Reason Using Properties from Algebra

- Properties:
  - Addition
  - Subtraction
  - Multiplication
  - Division
  - Substitution
- Distributive: If a(b + c), then ab + ac

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

2.6 Prove Statements about Segments and Angles

- **Proof**: Logical argument to show a statement true

- **Reasons** to use: definitions, properties, postulates and…

- **Theorems**: accepted with proof

- Definitions:
  - **Congruence**: If angles/segments are equal, then they are congruent.

  - **Midpoint**: If M is a midpoint of AB, then $\overline{AM} \cong \overline{MB}$

2.7 Prove Angle Pair Relationships

- **Theorem: Right Angle Congruence**
  - All right angles are congruent

- **Theorem: Congruent Supplements**
  - If 2 angles are supplements to the same angle, then they are ≅.

- **Theorem: Congruent Complements**
  - If 2 angles are complements to the same angle, then they are ≅

- **Postulate 12**: If 2 angles are a linear pair, then they are supplementary

- **Theorem: Vertical Angle Congruence**
  – Vertical Angles are congruent.