**Chapter 2 – Deductive Reasoning**

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| Topics, Vocabulary | Details | |
| Conditionals | Conditional Statements: If p, then q. If **hypothesis**, then **conclusion.** | |
| Forms | If p, then q. If 6x = 18 then x = 3  p implies q ( All p are q.) 6x = 18 implies x = 3  p only if q. 6x = 18 only if x = 3  q if p. x = 3 if 6x = 18 The “if” is not always at the beginning. | |
| Converse | If q, then p. | |
| Truth | Conditionals can be true or false.  If true then the conclusion holds for ALL cases. False with 1 counterexample.  **Counterexample**; Hypothesis is true but conclusion is false. | |
| Biconditional | (IFF) If a conditional and its converse are BOTH true, they can combine to make a single statement with “if and only if” p if and only if q  Definitions are biconditionals. | |
| Properties of Equality | From Algebra | |
| Addition Property  Subtraction Prop  Multiplication Prop  Division Prop  Substitution Prop  Reflexive Property  Symmetric Prop  Transitive Property  Distributive Prop | If a = b and c = d then a + c = b + d Equal quantities added to each side.  If a = b and c = d then a – c = b – d Equal quantities subtracted  If a = b then ac = bc  If a = b and c ≠ 0 then a/c = b/c  If a = b then either a or b may substituted for the other in an equation or inequality.  a = a A thing or a quantity is equal to itself.  If a = b then b = a  If a = b and b = c then a = c. Two things both equal to the same thing equal each other.  a(b + c) = ab + ac (Remember that it also works the in other direction.) | |
| Properties of Equality/Congruence  Reflexive Property  Symmetric Property  Transitive Property | Segment Length  For any segment AB, AB = BA  If AB = CD then CD = AB  If AB = CD and CD = EF  then AB = EF | Angle Measure  For any ∠A, m∠A = m∠A  If m∠A = m∠B then m∠B = m∠A  If m∠A = m∠B and m∠B = m∠c then m∠A = m∠C |
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| Summary | | |
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| Topics, Vocabulary | Details | |
| Justify each step | Justify – give a mathematical reason – for each step. 🡪 PROOF | |
|  | Polya – How to Solve It, point 1 (Make notes not among the chapters) | |
| Examples of Proof |  | |
| Examples of Proof | Proving the Midpoint Theorem and Angle Bisector Theorems | |
| Important Points | Theorems are statements that can be proved.  Deduced from postulates (statement accepted without proof.)  Principles of Equality (POE) treated as postulates  Deductive Reasoning uses postulates, definitions, other theorems and given. | |
| 4 Reasons used in Proofs | Given Information  Definitions  Postulates and POEs  Theorems already proven | |
| Prove the Midpoint Theorem | How it the theorem different from the definition? Th uses “1/2” | |
| Prove Angle Bisector Theorem | How is the theorem different from the definition? Th uses “1/2” | |
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|  | Other Proofs: Vertical Angles & Origami proof of Pythagorean Theorem. | |
| Special Angles |  | |
| Complementary  Supplementary  Vertical | Two angles whose Measures add to 90  The two acute angles in a right triangle are complements of each other.  Two angles whose measures add to 180.  Two angles formed on opposite sides of the lines when two lines intersect. | |
| Vertical Angles Th | Vertical angles are congruent. | |
| Perpendicular Lines | Defined: Two lines that intersect to form a right angle.  Using the definition: From ⏊ to right angles or from right angles to ⏊ | |
| Th 2-4  Th 2-5  Th 2-6 | If two lines are ⏊ then they form congruent adjacent angles.  If two lines form congruent adjacent angles then they are ⏊  If the exterior sides of two adjacent angles are ⏊ then the angles are complementary. | |
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| Tips for Proof | | 1. Copy the diagrams or make your own  Mark the givens on the diagram  What information can you deduce from the diagram?  2. Plan your proof by thinking logically. Say the steps and point to the diagram as you go.  3. Start with a given you can deduce more information from. Use that information in step 2.  - Try putting in arbitrary numbers to make talking about the parts easier.  - Use past proofs as patterns  4. Approach the statements column like an algebraic equation. Which properties of equality can you use?  5. Try reasoning BACKWARD from the end.  6. If stuck, try writing a paragraph explaining why the statement must be true. Supply names of definition, postulates, theorems, etc.  7. Fill in as much as you can. Start with a “given” end with the “prove” | |
| Theorem:  And Theorem | | Supplements of congruent angles (or the same angle) are congruent.  Complements of congruent angles (or the same angle) are congruent. | |
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|  | | **How To Solve It - G. Polya**  **Outline of method**  1. Understand the Problem  What is the unknown?  What are the data?  What is the condition? Is it possible to satisfy the condition?  Is the condition sufficient to determine the unknown?  Is it insufficient? Redundant? Contradictory?  Draw a figure. Introduce suitable notation  Separate parts of the condition. Can they be written down? | |
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| Summary | | | |
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