Geometry   Name _____

Date _____ Period _____

Chapter 2 Reasoning and Proofs

Ch 2.1 Conditional Statements

If a snake _____,

then _____ .

Conditional statement:

                    If p, then q.   OR   p → q

For example: If an animal is a bird, then _____

Examples:

If today is Thanksgiving Day, then _____

A number is a rational number if _____

Write a conditional:

An obtuse triangle has exactly one obtuse angle.   _____

A **conditional statement** has a truth value of either _____

For example:

• If the animal is a bluejay, then _____

• If today is _____, then _____

• If I own a _____, then _____

Hypothesis p	Conclusion q	Conditional p -> q
T	T	T

Negation:

p   becomes   **~p**   OR   "**not p**"

Conditional: **If p, then q.**
          Example: If two angles are congruent, then they are acute.

Converse:

          If q, then p.   OR   **q ➞ p**

          Example: _____

Inverse:

          If ~p, then ~q.   OR   **~p ➞ ~q**

          Example: _____

Contrapositive:

          If ~q, then ~p.   OR   **~q ➞ ~p**

          Example: _____

Logically equivalent statements:

Statement	Example	Truth Value
Conditional		
Converse		
Inverse		
Contrapositive		

Example: Let p be "you are a guitar player" and let q be "you are a musician." Write the following:

1. the conditional statement

2. the converse

3. the inverse

4. the contrapositive

Biconditional statement:

   p if and only if q.

The biconditional form means **both** the _____ and its _____.

Example: "An angle is obtuse **if and only if** its measure is greater than 90 degrees and less than 180 degrees."

   Write the conditional:

   Write the converse:

Example: "A solution is neutral ⟷ its pH is 7.""

   Write the conditional:

   Write the converse:
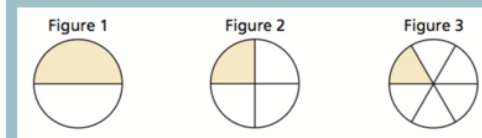
Ch 2.2 Inductive and Deductive Reasoning

Vocabulary

Conjecture:

Inductive reasoning:

Example: Describe how to sketch the next figure below.

Figure 1   Figure 2   Figure 3

Use Inductive Logic
What conclusion can you make about the sum of the interior angles of an n-sided polygon?

Polygon	Number of sides	Sum of interior angles
Triangle	3	180°
Quadrilateral	4	360°
Pentagon	5	540°
Hexagon	6	720°

Conjecture
• To show a conjecture is true, you must show _____

• To show a conjecture is false, you only have to _____

• A counterexample is a specific case in which _____.

Big Ideas Ch 2 Notes

Conjecture: The sum of two numbers is always greater than the bigger number. True or false?

Counterexample:

Deductive reasoning:

Example: There is a myth that the Great Wall of China is the only man-made
object visible from the moon. The Great Wall is barely visible in photographs taken from 180 miles
above Earth. The Moon is about 237,000 miles away. Therefore the myth can't be true.

Law of Detachment:

Example:
Conditional: If two segments have the same length, then _____

Hypothesis: You know that _____

Using the Law of Detachment, you can conclude _____

Law of Syllogism:

Try this:
If soccer practice is cancelled, then you can go to the mall after school. If it is raining today, then soccer practice is cancelled.
By the Law of Syllogism:

Logic Problem #1
A milkman has two empty jugs: a three gallon jug and a five gallon jug. How can he measure exactly one gallon without wasting any milk?

Logic Problem #2
You are in the dark, and on the floor there are six shoes of three colors, and a heap of twenty-four socks, black and brown. How many socks and shoes must you take into the light to be certain that you have a matching pair of socks and a matching pair of shoes?

Ch 2.3 Postulates and Diagrams

Vocabulary

- Undefined terms:

- Postulate:

- Theorem:

Postulates

1. Through any two points there exists exactly _____.

2. If two lines meet, they intersect at exactly _____.

3. Through any three non-collinear points there exists exactly _____.

4. If two points lie in a plane, then the line containing them _____.

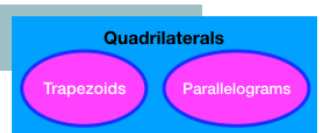5. If two planes meet, then their intersection is _____.

Identify the Postulate
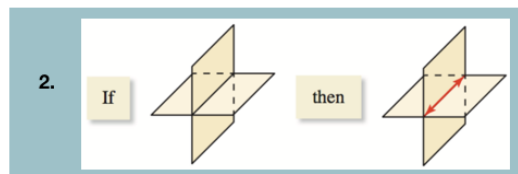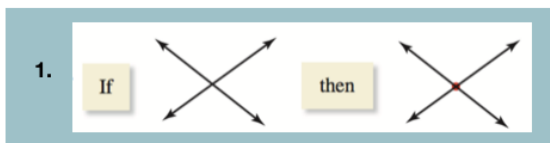
Using the diagram to the right, which of the following cannot be assumed?

1. Points A, B, and F are collinear.

2. Points E, B, and D are collinear.

3. $\overrightarrow{AB} \perp plane\ S$

4. $\overrightarrow{CD} \perp plane\ T$

5. $\overrightarrow{AF}$ intersects $\overrightarrow{BC}$ at point B.
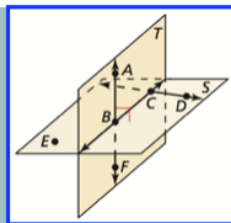
Interpret the meaning of the Venn diagram on the right.

Interpret the meaning of the Venn diagram on the left.

Ch 2.4 Algebraic Reasoning

Solve: 3x + 2 = 23 - 4x

      <u>Statement</u>   <u>Reason</u>

Algebraic Properties of Equality (POE)

Addition Property of Equality	
Subtraction Property of Equality	
Multiplication Property of Equality	
Division Property of Equality	
Substitution Property of Equality	
Distributive Property of Equality	

Solve: -2p - 9 = 10p - 17

      <u>Statement</u>   <u>Reason</u>

Solve: -4 = -10b + 6 (2 - b)

      <u>Statement</u>   <u>Reason</u>

More Algebraic Properties of Equality (POE)

Reflexive Property of Equality	
Symmetric Property of Equality	
Transitive Property of Equality	

Name the property of equality:

1) If $m\angle 6 = m\angle 7$, then $m\angle 7 = m\angle 6$.

2) $37° = 37°$

3) If $AB = CD$ and $CD = EF$, then $AB = EF$.
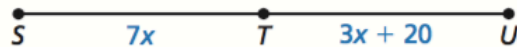
Ch 2.5 Proving Statements about Segments and Angles

Vocabulary

Proof:

Two-column proof:

Complete the Proof

Given T is the midpoint of $\overline{SU}$.

Prove $x = 5$

$S \quad 7x \quad T \quad 3x + 20 \quad U$

STATEMENTS	REASONS
1. T is the midpoint of $\overline{SU}$.	1. _____
2. $\overline{ST} \cong \overline{TU}$	2. Definition of midpoint
3. $ST = TU$	3. Definition of congruent segments
4. $7x = 3x + 20$	4. _____
5. _____	5. Subtraction Property of Equality
6. $x = 5$	6. _____

Vocabulary

Definitions: used in a proof to _____

_____

_____

Geometric Term	Algebraic Term
congruent segments $\overline{AB} \cong \overline{CD}$	
supplementary angles	
complementary angles	

Vocabulary - Geometric Definitions

midpoint:

bisector:

$$\overline{EF} \cong \overline{FG}$$
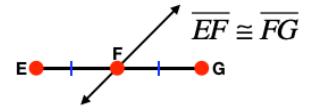
Geometry **Algebra**

congruent	
supplementary angles	
complementary angles	
right angle	

Geometric Properties of Congruence (POC)

Reflexive Property of Congruence	
Symmetric Property of Congruence	
Transitive Property of Congruence	

Complete the Proof:

Given M is the midpoint of $\overline{AB}$.

Prove $AB = 2AM$, $AM = \frac{1}{2}AB$
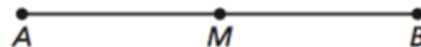
Statement   Reason

Ch 2.6 Proving Geometric Relationships

Theorems

Right Angles Congruence Theorem	
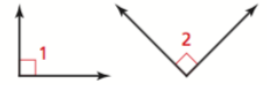
Congruent Supplements Theorem	
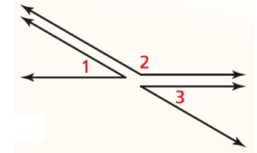
Congruent Complements Theorem	
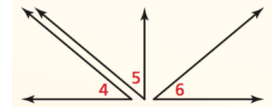
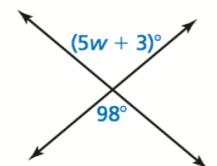|	
Linear Pair Postulate	
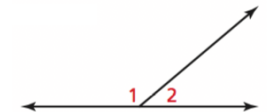
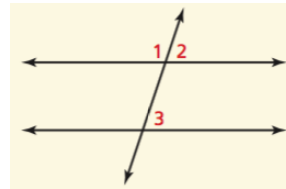|	
Vertical Angles Theorem	
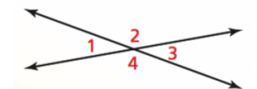
Compute the angles:

1) Use the vertical angles diagram above. If m∠1 = 53˚ above, compute the values of angles 2, 3, and 4.

2) Compute the value of w in the diagram on the right.

$(5w + 3)°$

$98°$

Complete the Proof:

Given ∠1 and ∠2 are supplementary.
∠1 and ∠3 are supplementary.
Prove ∠2 ≅ ∠3

Statement	Reason

Complete the Proof:

Given $AB = DE, BC = CD$

Prove $\overline{AC} \cong \overline{CE}$

STATEMENTS	REASONS
1. $AB = DE, BC = CD$	1. Given
2. $AB + BC = BC + DE$	2. Addition Property of Equality
3. _____	3. Substitution Property of Equality
4. $AB + BC = AC, CD + DE = CE$	4. _____
5. _____	5. Substitution Property of Equality
6. $\overline{AC} \cong \overline{CE}$	6. _____