Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples
CONDITIONAL Statements	• A statement that can be written in if-then form. **Symbolic Form:** $p \rightarrow q$ ← Read as "if p, then q" or, "p implies q". • The hypothesis is the phrase that immediately follows if. • The conclusion is the phrase that immediately follows then.
EXAMPLES	**Identify the hypothesis and conclusion of the following conditional statements:**
	1. If you live in Nashville, then you live in Tennessee. **Hypothesis:** You live in Nashville. **Conclusion:** You live in Tennessee.
	2. If the sum of the measures of two angles is 90°, then they are complementary angles. **Hypothesis:** The sum of the measures of 2 angles is 90°. **Conclusion:** They are complementary angles.
	3. If a quadrilateral is a square, then it has four right angles. **Hypothesis:** A quadrilateral is a square. **Conclusion:** It has 4 right angles.

Writing Conditional Statements: Write each statement in if-then form.

4. An obtuse angle has a measure greater than 90°.

If an angle is obtuse, then it has a measure greater than 90°.

5. All numbers divisible by 4 are also divisible by 2.

If a number is divisible by 4, then it is also divisible by 2.

6. States on the east coast border the Atlantic Ocean.

If a state is on the east coast, then it borders the Atlantic Ocean.

7. Valentine's Day is in February.

If it is Valentine's Day, then it is February.

8. Prime numbers only have two factors, 1 and itself.

If a number is prime, then it only has 2 factors, 1 and itself.

RELATED CONDITIONAL	DEFINITION	SYMBOLIC FORM
INVERSE	Formed by negating the hypothesis and conclusion.	$\sim p \rightarrow \sim q$
CONVERSE	Formed by switching the hypothesis and conclusion.	$q \rightarrow p$
CONTRAPOSITIVE	Formed by negating and switching the hypothesis and conclusion.	$\sim q \rightarrow \sim p$

Directions: Write the inverse, converse, and contrapositive of the following conditional statements. Determine the truth value. If false, provide a counterexample.

9. If it is Saturday, then there is no school.

- **Inverse:** If it is not Saturday, then there is school.
  Truth Value: false; Sunday
- **Converse:** If there is no school, then it is Saturday.
  Truth Value: false; Sunday
- **Contrapositive:** If there is school, then it is not Saturday.
  Truth Value: true

10. If the product of two numbers is odd, then both numbers must be odd.

- **Inverse:** If the product of two numbers is even, then the numbers cannot be both odd. **Truth Value:** true
- **Converse:** If two numbers are odd, then their product is odd. **Truth Value:** true
- **Contrapositive:** If two numbers are not both odd, then their product is even. **Truth Value:** true

11. If the temperature is 25°F, then it is below freezing.

- **Inverse:** If the temperature is not 25°F, then it is not below freezing **Truth Value:** false; 20°F
- **Converse:** If it is below freezing, then the temperature is 25°F. **Truth Value:** false; 20°F
- **Contrapositive:** If it is not below freezing, then the temperature is not 25°F. **Truth Value:** true

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BICONDITIONAL Statements	• **Definition:** The conjunction of the conditional an its converse. • **Symbolic Form:** $(p \rightarrow q) \wedge (q \rightarrow p)$: $p \leftrightarrow q$ • **Read as "** p if and only if q **"** • **Truth Value:** Biconditional statements are true when both conditional and converse are true!

Directions: Given the biconditional statement below, write both the conditional and converse. Determine the truth value of the biconditional. Explain why it is true or false.

1. Two angles are supplementary if and only if the sum of their measures is 180°.

Conditional: If two angles are supplementary, then the sum of their measures is 180°.

Converse: If the sum of two angles' measures is 180°, then they are supplementary.

Truth Value? True; both are true.

2. I wear my snow boots if and only if it snows.

Conditional: If I wear my snow boots, then it snows.

Converse: If it snows, then I wear my snow boots.

Truth Value? False; conditional is false.

3. $x^2 = 25$ if and only if $x = 5$.

Conditional: If $x^2 = 25$, then $x = 5$.

Converse: If $x = 5$, then $x^2 = 25$.

Truth Value? False; conditional is false.

4. I will get 10% off if and only if I spend at least $75.

Conditional: If I get 10% off, then I spent at least $75.

Converse: If I spend at least $75, then I get 10% off.

Truth Value? True; both are true.

MIND YOUR P's & Q's!

(A graphic organizer for logic statements)

COMPOUND STATEMENTS

Directions: Use the statements below to write the compound statements.

***p*:** Vertical angles are congruent ***q*:** 15 is a prime number.

Conjunction $p \wedge q$	Vertical angles are congruent and 15 is a prime number. **Truth value:** F
Disjunction $p \vee q$	Vertical angles are congruent or 15 is a prime number. **Truth value:** T

CONDITIONAL STATEMENTS

Directions: Use the statements below to write the conditional statements.

***p*:** It is St. Patrick's Day. ***q*:** It is March.

Conditional $p \rightarrow q$	If it is St. Patrick's Day, then it is March. **Truth value:** T
Inverse $\sim p \rightarrow \sim q$	If it is not St. Patrick's Day, then it is not March. **Truth value:** F
Converse $q \rightarrow p$	If it is March, then it is St. Patrick's Day. **Truth value:** F
Contrapositive $\sim q \rightarrow \sim p$	If it is not March, then it is not St. Patrick's Day. **Truth value:** T
Biconditional $p \leftrightarrow q$	It is St. Patrick's Day if and only if it is March. **Truth value:** F