Name: _____

Hour: _____

Unit A: Logic

Geometry 1st Semester

Lesson 2-2: "If-Then" Statements

Proposition — Implication

If _____, **then** _____.

Antecedent — Consequent

Vocabulary

Conditional: _____

_____

Instance: _____

_____

Counterexample: _____

_____

⇒: _____

⇔: _____

Practice

a = It is a rabbit
b = It has four legs
c = It has floppy ears

Write the sentence symbolized by each statement.

1. $a \Rightarrow b$

2. If *b*, then *a*.

3. *c* implies *a*

Write the proposition and implication of the conditional.

4. If a network has four nodes, then it has six arcs.

   Proposition: _____

   Implication: _____

Rewrite the following statements as conditionals.

5. A person that is 14 years old is a teenager.

6. A Doberman is a dog.

Given the conditional, "If $c \geq 3$, then $c < 10$."

7. Give an instance of the conditional.

8. Give a counterexample to the conditional.

Lesson 2-3: Converses & Biconditionals

Vocabulary

Converse: _____

_____

Biconditional (⇔): _____

_____

_____

Practice

1. If you are in Grand Rapids, then you are in Michigan.

   Converse:

2. If you have a Doberman, then you have a dog.

   Converse:

3. If $x > 1$, then $x \geq -2$.

   Converse:

4. If $x = 2$, then $3x + 1 = 7$.

   Converse:

5. If a person is driving 100mph on a U.S. highway, then the person is speeding.

   a. Write the converse of the conditional.

   b. Is the original statement true? Is the converse true?

6. Let p be the statement $x < 5$. Let q be the statement $x < 4$.

   a. Write $p \rightarrow q$.

   b. Is $p \rightarrow q$ true? Explain your answer.

   c. Write the converse of the statement $p \rightarrow q$.

   d. Is the converse true?

7. Let p = "A country is democratic". Let q = "The power resides in the people".

   Write $p \Leftrightarrow q$ in words.

8. Given the statement: "A right angle is an angle whose measure is 90."

   a. Write a conditional (if-then statement) for this statement.

   b. Write the converse of your statement in part a.

   c. Are both *a* and *b* true? If so, write the definition of a right angle as a biconditional.

Lesson 11-2: Negations

Vocabulary

Negation: _____

_____

Inverse: _____

_____

Contrapositive: _____

_____

Practice

1. If you live in California, then you need a mountain bike.

   Converse:

   Inverse:

   Contrapositive:

2. If you live in an air-conditioned home, then you have the opportunity to be cool in the summer.

   Converse:

   Inverse:

   Contrapositive:

3. Write your own "If...then" Statement:

_____

_____

Converse:

Inverse:

Contrapositive:

4. Make a conclusion from these two statements.
   (a) Riley cannot become an eagle scout.
   (b) If a person is a boy scout, he can become an eagle scout.

Lesson 11-1: Logic of Making Conclusions

Vocabulary

Law of Detachment: _____

_____

Law of Transitivity: _____

_____

Law of Contrapositive: _____

_____

Law	Symbols	Example
Law of Detachment		(1) If x = 10, then y = 6. (2) x = 10. Conclude:
Law of Transitivity		(1) If x = 10, then y = 6. (2) If y = 6, then z = 21. Conclude:
Law of Contrapositive		(1) If x = 10, then y = 6. (2) y = 3. Conclude:

Practice

1. A commercial states: *If you want to be popular, you must dress well.*
If you want to dress well, you wear Brand X jeans.
What conclusion(s) can you make (if any)?

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2. (1) Every rhombus is a kite.
(2) The diagonals of a kite are perpendicular.
(3) MBUS is a rhombus.

What conclusion(s) can you make (if any)?

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3. (1) Some bracelets are valuable jewelry.
(2) All bracelets are made of gold.

What conclusion(s) can you make (if any)?

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4. (1) If you own a Doberman, then you own a dog.
(2) You own a dog.

What conclusion(s) can you make (if any)?

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5. (1) My gardener is well worth listening to on military subjects.
(2) No one can remember the battle of Waterloo, unless he is very old.
(3) Nobody is really worth listening to on military subjects, unless he can remember the battle of Waterloo.

What conclusion(s) can you make (if any)?

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6. (1) If $a = 2$, then $b = 17$.
(2) $b \neq 17$.

What conclusion(s) can you make (if any)?

Lesson 11-4: Indirect Proofs

Vocabulary

Direct Reasoning: _____

_____

Direct Proofs: _____

_____

Indirect Reasoning: _____

_____

1. If you want to prove a statement to be false, start by reasoning from it.
   Example: Prosecutors thought the defendant was guilty, the lawyer reasoned from this.

2. Using valid logic, try to make the reasoning lead to a contradiction or other false statements.
   Example: The lawyer argued that the defendant would have been in two places at once.

3. If the reasoning leads to a contradiction or other false statements, the assumed statement must be false.
   Example: The lawyer concluded that the defendant was not guilty.

Contradictory: _____

_____

Law of Indirect Reasoning: _____

_____

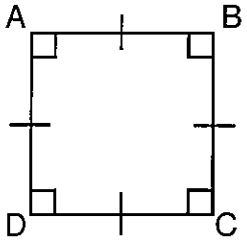
Practice

1. Let *p* be the statement "$\angle V$ is acute." Let statement *q* be the statement "$\angle V$ is right." Are *p* and *q* contradictory? Explain your answer.

   _____

   _____

2. In the figure below, let p = ABCD is a rhombus. Let q = ABCD is a rectangle. Are p and q contradictory? Explain your answer.



3. Show that $3(4 + 2x) = 6(x + 1)$ is never true.

4. Write an indirect proof argument to show that $\sqrt{22,200} \neq 149$.

Given: The real numbers $\sqrt{22,200}$ and 149.

Prove: $\sqrt{22,200} \neq 149$