# The Conditional and Biconditional (Section 2.4)

The objectives for this section include:

1. Compute truth tables for conditionals and biconditionals.
2. Write the converse, inverse, and contrapositive of a conditional.
3. Use alternative words to write conditionals.
4. Identify equivalent forms of the conditionals.

Complete **Quiz Yourself 11** on p. 107

| $p$ | $q$ | $(p \wedge q) \rightarrow (\sim p \vee q)$ |
|---|---|---|
| T | T | |
| T | F | |
| F | T | |
| F | F | |

**Tautology** is a statement that is always true so that when a truth tables' final column is completed it is all TRUES.

2. **Class Practice**

Assume that $p$ represents a false statement, $q$ is a true statement, and $r$ is a false statement. Determine the truth value of each statement.

a. $\sim(p \vee q) \rightarrow q$

b. $(p \wedge q) \leftrightarrow \sim r$

3. **Class Practice**

| $p$ | $q$ | $(p \vee q) \rightarrow \sim q$ |
|---|---|---|
| T | T | |
| T | F | |
| F | T | |
| F | F | |

The **conditional statement p $\rightarrow$ q** has the following:

A *conman* does a switch

*Inverse* is the opposite, the additive inverse of 5 is -5

*Contrapositive* does both switch and take the opposite

| *Name* | *Symbols* |
|---|---|
| Converse | $q \rightarrow p$ |
| Inverse | $\sim p \rightarrow \sim q$ |
| Contrapositive | $\sim q \rightarrow \sim p$ |

4. **Class Practice-**Write in words the converse, inverse, and contrapositive

If you live in Moorhead, then you live in Minnesota.

Converse-_____

Inverse- _____

Contrapositve-_____

Complete **Quiz Yourself** **12** on p. 108

If the price of CDs increases, then people will burn them illegally.

| 5. **Class Practice** | Given statement | Rewritten in if…then form |
|---|---|---|
| When *if* is located half way in a statement often the then is not part of the original sentence. It can be rewritten with if starting your sentence as that is your hypothesis. | Today is Wednesday if you have confirmation. | |
| The *only if* $\neq$ *if* as the *only if* is the condition which is first part of the sentence forming the conclusion. | I will go to school only if I have class. | |

| 5. **Class Practice-cont.** | Given statement | Rewritten in if…then form |
|---|---|---|
| *p is sufficient* for *q* with the sufficient condition being the hypothesis. | To live in Minnesota, it is sufficient to live in Moorhead. | |
| *q is necessary* for *p* with the necessary condition being the conclusion. | To graduate from MSUM, it is necessary to complete a Math course. | |

Complete **Quiz Yourself** **13** on p. 110