

Lesson 2-2: "If-Then Statements and Postulates"

If p, then q

Examples from the book:

Statement:

Babies are illogical.

If-Then Form:

If a person is a baby, then the person is not logical.

Statement:

Nobody is despised who can manage a crocodile.

If-Then Form:

If a person can manage a crocodile, then that person is not despised.

Statement:

Illogical persons are despised.

If-Then Form:

If a person is not logical, then the person is despised.

If-then statements are called **Conditional Statements** or **Conditionals**.

The portion of the sentence following **If** is called the **hypothesis**.

The part of the sentence immediately following **then** is called the **conclusion**.

Example:

Write the statement *An angle of 40° is acute* in If-Then Form.

Example:

Identify the hypothesis and conclusion of the conditional: *If it is Tuesday, then Phil plays tennis.*

You can form another *If-Then Statement* by exchanging the hypothesis and conclusion of a conditional.

This new statement is called the **Converse** of the conditional.

The converse of $p \rightarrow q$ is $q \rightarrow p$

It may be easier to write a conditional *If-Then Statement* first before writing the converse.

Example:

Write the converse of the true conditional:
An angle that measures 120° is obtuse.

Determine if the converse is true or false.
If false give a counter example.

The denial of a statement is called a **negation**.

Example:

The **negation** of "*An angle is obtuse*" is "*An angle is not Obtuse*"

If a statement is true, then its **negation** is false. If a statement is false, then its **negation** is true.

$\sim p$ represents "not p" or the **negation** of p.

Given a conditional statement, its **inverse** can be formed by negating both the hypothesis and conclusion.

The **inverse** of a true statement is not necessarily true.

The inverse of $p \rightarrow q$ is $\sim p \rightarrow \sim q$

Example:

Write the inverse of the true conditional:

"A triangle has three sides"

Determine if the inverse is true or false. If false, give a counterexample.

Given a conditional statement, its **contrapositive** can be formed by negating the hypothesis and conclusion of the converse of the given conditional.

The contrapositive of $p \rightarrow q$ is $\sim q \rightarrow \sim p$.

Write the **contrapositive** of the true conditional *"If aliens have visited earth, then there is life on other planets."* Determine if the contrapositive is true or false.

- Conditional Statement "If \rightarrow Then"

$$p \rightarrow q$$

- Converse $q \rightarrow p$

$$\left[\text{Negation } \sim p \text{ or } \sim q \right]$$

- Inverse $\sim p \rightarrow \sim q$

- Contrapositive $\sim q \rightarrow \sim p$