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Logical Reasoning (Pages 37–42)

The statement *If it is raining outside, then I will wear my raincoat* is called a conditional statement. All **conditional statements** can be written in the form *If A, then B*. Statements of this form are known as **if-then statements**. *A*, the portion of the statement immediately following *if*, is called the **hypothesis**. *B*, the portion of the statement immediately following *then*, is called the **conclusion**.

The process of using definitions, rules, properties, or facts as a means of validating conditional statements is **deductive reasoning**. If a true conditional exists, with a known true hypothesis, then deductive reasoning permits the reader to acknowledge that the conclusion is true for the scenario. A counterexample can be used to show that a conditional is not correct. A **counterexample** is a specific situation in which a statement is false. Only one counterexample is necessary to show that a statement is incorrect.

Examples

- a. Identify the hypothesis and the conclusion.

If $3a + 12 = 24$, then $a = 4$.

Hypothesis: $3a + 12 = 24$

Conclusion: $a = 4$

- b. Write the conditional in if-then form.

I will attend the school play on Friday.

Hypothesis: *It is Friday*

Conclusion: *I will attend the school play*

If it is Friday, then I will attend the school play.

Try These Together

Identify the hypothesis and the conclusion. Write in if-then form.

- I will earn an A for a score of 90% or higher.
- Tom will play inside when the weather is bad.

Practice

Use deductive reasoning to verify whether each conditional is *true* or *false*. If it is false, provide a counterexample.

- If there is a rainbow, then it must have rained while the Sun was shining.
- If the flowers are wet, then it rained.

5. **Standardized Test Practice** Which numbers are counterexamples for the conditional statement.

If $x \cdot y = 60$, then x and y are positive numbers.

A $x = 10, y = 6$

B $x = 3, y = 20$

C $x = -2, y = -30$

D $x = 1, y = 60$

Answers: 1. H: score of 90% or higher; C: earn an A; I will earn an A. 2. H: weather is bad; C: Tom will play inside; I: the weather is bad, then Tom will play inside. 3. True. 4. False; an irrigation system could also cause flowers to be wet. 5. C