Related Conditionals

Conditional Statements

Conditional Statement

- A statement that can be written in *if-then* form.
- An *if-then* statement is of the form *if p, then q* ($p \rightarrow q$).
- The hypothesis is the phrase following the word *if* (*p*).
- The conclusion is the phrase following the word *then* (*q*).

Examples

- Identify the hypothesis and conclusion of each conditional statement.

- If the Cowboys are playing, then Tony Romo is hurt.

- You will have to take a retest if you do not make a passing grade.

Examples

- Identify the hypothesis and conclusion of each conditional statement.

- If the Cowboys are playing, then Tony Romo is hurt.
- H: The Cowboys are playing
- C: Tony Romo is hurt

- You will have to take a retest if you do not make a passing grade.
- H: You do not make a passing grade
- C: You will have to take a retest

Examples

- Identify the hypothesis and conclusion of each conditional statement.
- If a polygon has 4 sides, then it is a trapezoid.
- No credit will be given if you fail to show your work.

Examples

- Identify the hypothesis and conclusion of each conditional statement.

- If a polygon has 4 sides, then it is a trapezoid.
- H: A polygon has 4 sides
- C: It is a trapezoid

- No credit will be given if you fail to show your work.
- H: You fail to show work
- C: No credit is given

Conditional Statements

- Some conditional statements are written without using the words *if* and *then*.
- "Rectangles have four sides."
- "Bald people are awesome."

Examples

- Identify the hypothesis and conclusion for each conditional statement. Then write the statement in if-then form.

- 18 year olds are able to vote.

- Tickets are issued to people that speed.

Examples

- Identify the hypothesis and conclusion for each conditional statement. Then write the statement in if-then form.

- 18 year olds are able to vote.
- If you are 18 years old, then you are able to vote
- Tickets are issued to people that speed.
- If you speed, then you will be issued a ticket.

Examples

- Identify the hypothesis and conclusion for each conditional statement. Then write the statement in if-then form.

- Freshmen can attend high school.

- Good grades are for those that study.

Examples

- Identify the hypothesis and conclusion for each conditional statement. Then write the statement in if-then form.

- Freshmen can attend high school.
- If you are a freshman, then you can attend high school

- Good grades are for those that study.
- If you study, then you get good grades.

Truth Values

If **Tom finishes his homework**, then **he will clean his room**.

Hypothesis	Conclusion	Conditional	
Tom finishes his homework.	Tom cleans his room.	If Tom finishes his homework, then he will clean his room.	
T	T	T	If Tom *does* finish his homework and he *does* clean his room, then the conditional is true.
T	F	F	If Tom does *not* clean his room after he *does* finish his homework, then he has not fulfilled his promise and the conditional is false.
F	T	?	The conditional only indicates what will happen if Tom *does* finish his homework. He could clean his room or not clean his room if he does *not* finish his homework.
F	F	?	

Truth Values

- When the hypothesis of a conditional is not met, the truth of a conditional cannot be determined. Then the conditional statement is considered true by default.

- "If a triangle has four sides, then it is concave."
- The hypothesis is false, since a triangle cannot have four sides, however, the statement is still true.

Related Conditionals

- Conditionals: $p \rightarrow q$
- Converse: $q \rightarrow p$
- Inverse: $\sim p \rightarrow \sim q$
- Contrapositive: $\sim q \rightarrow \sim p$

Related Conditionals

- A conditional and its contrapositive are either both true or both false.
- The converse and inverse are either both true or both false.
- Statements with the same truth values are said to be *logically equivalent*.

Examples

- Write the converse, inverse, and contrapositive of each true conditional statement. Determine whether each related conditional is *true* or *false*. If a statement is false, find a counterexample.

- *Conditional:* If you live in Dallas, then you live in Texas.

Examples

- *Converse:*
- If you live in Texas, then you live in Dallas; F
- *Inverse:*
- If you don't live in Dallas, then you don't live in Texas; F
- *Contrapositive:*
- If you don't live in Texas, then you don't live in Dallas; True