

Equivalent Statements

Math 1001

Quantitative Skills and Reasoning



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Equivalent Statements

- Two statements are **equivalent** if they both have the same truth value for all possible truth values of their simple statements.
- Equivalent statements have identical truth values in the final columns of their truth tables.
- The notation $p \equiv q$ is used to indicate that the statements p and q are equivalent.

Verify that Two Statements are Equivalent

- Show that $\sim(\sim p \vee q)$ and $p \wedge \sim q$ are equivalent statements.

p	q	1 \sim	2 $(\sim p$	3 \vee	4 $q)$
T	T	F	F	T	T
T	F	T	F	F	F
F	T	F	T	T	T
F	F	F	T	T	F

p	q	1 p	2 \wedge	3 $\sim q$
T	T	T	F	F
T	F	T	T	T
F	T	F	F	F
F	F	F	F	T

logically equivalent

De Morgan's Laws for Statements

- For any statements p and q ,
 - $\sim(p \vee q) \equiv \sim p \wedge \sim q$
 - $\sim(p \wedge q) \equiv \sim p \vee \sim q$
- De Morgan's laws can be used to restate certain English sentences in an equivalent form.

De Morgan's Laws for Statements

- Use De Morgan's Laws to restate:
 - It is not true that, [I did the laundry] or [I did the dishes].
 $\sim p \wedge \sim q$
- Equivalent Form:
 - I did not do the laundry and I did not do the dishes.