Help

- My office hour is Monday, Wednesday, and Friday afternoons, 2:00–3:00, in Blocker 601L.
- The posted Help Session is Monday and Tuesday evenings, 6:00–8:00, in Blocker 111.
- The secret help session with an undergraduate mentor is Monday and Wednesday evenings, 5:30–8:00, in Blocker 506A.

Some

In ordinary English, the word “some” means “at least two, but not all.”

In math speak, “some” means “at least one (and possibly all).”

Follow up on Exercises 8 and 14

8. Negate the statement "Exactly one of the integers n or m is odd."
Rephrased: "Either n is odd and m is even; or n is even and m is odd; (but not both—the two cases are mutually exclusive, so they actually cannot both happen)."
The original statement is exclusive or: "Either n is odd $\oplus$ m is odd."
Negation: "Both n and m are even; or both n and m are odd."
14. Characterize all real numbers such that $x > 1$ or $|x| < 3$.
Solution: One characterization is $x > -3$.

Logical equivalence

Two statements are logically equivalent if they have the same truth table.
Example: $P \lor (Q \land R)$ and $(P \lor Q) \land (P \lor R)$ are logically equivalent.

Check with a truth table

Verify that $P \vee (Q \wedge R)$ and $(P \vee Q) \wedge (P \vee R)$ are logically equivalent.

P	Q	R	$Q \wedge R$	$P \vee Q$	$P \vee R$	$P \vee (Q \wedge R)$	$(P \vee Q) \wedge (P \vee R)$
T	T	T					
T	T	F					
T	F	T					
T	F	F					
F	T	T					
F	T	F					
F	F	T					
F	F	F					

The completed truth table

P	Q	R	$Q \wedge R$	$P \vee Q$	$P \vee R$	$P \vee (Q \wedge R)$	$(P \vee Q) \wedge (P \vee R)$
T	T	T	T	T	T	T	T
T	T	F	F	T	T	T	T
T	F	T	F	T	T	T	T
T	F	F	F	T	T	T	T
F	T	T	T	T	T	T	T
F	T	F	F	T	F	F	F
F	F	T	F	F	T	F	F
F	F	F	F	F	F	F	F

More terminology

- An always true statement is a *tautology*.
  Example: $P \vee \neg P$.
- An always false statement is a *contradiction*.
  Example: $P \wedge \neg P$.

Implication

The following sentences are synonyms.

- If P is true, then Q is true.
- $P \implies Q$.
- P implies Q.
- If P then Q.

P	Q	$P \implies Q$
T	T	T
T	F	F
F	T	T
F	F	T

P is the *hypothesis* or *premise* or *assumption*, and Q is the *conclusion*.

Negating an implication

P	Q	$P \implies Q$	$\neg(P \implies Q)$
T	T	T	F
T	F	F	T
F	T	T	F
F	F	T	F

Assignment to hand in next time

- Revise and correct the assignment originally due today.
- Exercise D3 on page 28.
- Exercise 12 on page 36.