$$1 \qquad 0$$
$$T \qquad \bot$$

A *proposition* is a statement (communication) that is either true or false.

P: $2+2=3$
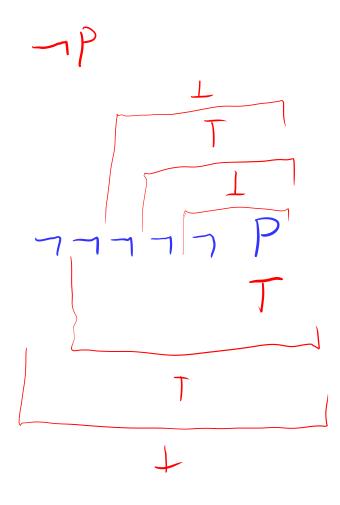
Q: it is cold

Sit down!

Are you sitting?

We can modify, combine, and relate propositions
with words such as "not," "and," "or," "implies," "if-then."

These are *connectives*—they can be used to form new sentences out of old ones.

$2+2 \neq 3$ not $2+2=3$ P: I am in Charlottesville

P

Truth Table

$\overline{P}$ $\neg P$

P	$\neg P$
T	$\bot$
$\bot$	T

$\bot$

T

$\bot$

$\neg \neg \neg \neg \neg P$

T

T

$\bot$

and

P and Q

⊤ in C'ville
⊤ dogs ≠ cats
⊥ 2+2=3
⊥ pigs fly

or

here or To go   exclusive

Salt or pepper   inclusive

P	Q	P $\wedge$ Q (P and Q)
⊤	⊤	⊤
⊤	⊥	⊥
⊥	⊤	⊥
⊥	⊥	⊥

P	Q	$\vee$ i	$\oplus$ e
⊤	⊤	⊤	⊥
⊤	⊥	⊤	⊤
⊥	⊤	⊤	⊤
⊥	⊥	⊥	⊥

An implication is true exactly when the if-part is false or the then-part is true.

A sentence can be symbolized as $A \rightarrow B$ if it can be paraphrased in English as 'If A, then B' or 'A only if B'.

For A, it is necessary that B.
It is a necessary condition on A that B.
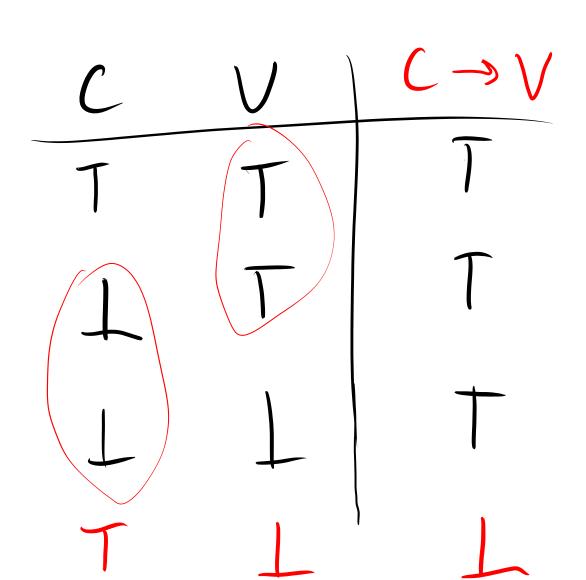For B, it is sufficient that A.
It is a sufficient condition on B that A.
A cannot be true without B also being true.
B cannot be false without A also being false.

If dragons exist, then I am king of Holland

Prop

If A, then B

Connection

Causality

not math!

$$C$$
$$V$$

if in C'ville, Then in VA

C	V	C → V
T	T	T
⊥	T	T
⊥	⊥	T
T	⊥	⊥

P	Q	$(\neg$	$(P \land Q))$	$\to$	$(P \land$	$\neg Q)$
0	0	1	0	0	0	1
0	1	1	0	0	0	0
1	0	1	0	1	1	1
1	1	0	1	1	0	0