quick overview!

$P \Rightarrow Q$	$\neg P \Rightarrow \neg Q$	$Q \Rightarrow P$	$\neg Q \Rightarrow \neg P$
statement	inverse	converse	contrapositive

- $\mathbb{N}$ includes 0 in this class.
- just knowing $P \Rightarrow Q$ says nothing about inverse + converse.

Implications – a promise for Q if P. if P didn't happen, promise is still kept :)

P	Q	$P \Rightarrow Q$
T	T	T
T	F	F
F	T	T
F	F	T

≡ if P true, Q true ≡ if Q false, P false. ← contrapositive

$\Longleftrightarrow$ – need to prove both $P \Rightarrow Q$ and $Q \Rightarrow P$.

Quantifiers $\forall$ (for all) = "big and" ; $\exists$ (there exists) = "big or"

Negation

$\neg(\forall x\, P(x)) \equiv \exists x\ \neg(P(x))$ → "if its not true that all x are such, there must be some x that isn't such"

$\neg(\exists x\, P(x)) \equiv \forall x\ \neg(P(x))$

negate from outside to in (use flipped quantifiers + DeMorgans)

key takeaways and observations

- $x, y \in \mathbb{Z}$: $x \pm y \in \mathbb{Z}$, $x \cdot y \in \mathbb{Z}$, <u>not</u> closed under division
- when working with quantifiers / negating, converting implications to $\neg P \vee Q$ might be easier — try it!
- try approaches other than truth table when quantifiers ($\forall$, $\exists$) involved
- think of 2D space when propositions are of form $Q(x, y)$, etc.
- quantifier order matters if they are different

thanks for coming! please fill out the check-in **today** and feedback form when you want to.

- **check-in:** https://forms.gle/fKotx2ad4YZLmdb17
- **feedback:** https://tinyurl.com/aishani-sp21-fb