"a **proposition** is a statement"
Conjuction ($\wedge$): And, but, plus, as well, too : TFFF

Disjunction ($\vee$): or : TTTF

Conditional implication ($\rightarrow$): if, in the case that, given that, provided that, so long as, when, where, whenever, should : TFTT

"if": "We will contact you if there is an issue with the payment" is I$\rightarrow$P

"only if": "We will contact you only if the case that there is an issue with the payment" is C$\rightarrow$I

Biconditional Implication ($\leftrightarrow$): if and only if : TFFT

"Sufficient": "Matching fingerprints are a sufficient condition to establish the presence of the suspect in the room." is F$\rightarrow$R

"Necessary": "Being plugged in is a necessary condition for the device to be on." O$\rightarrow$P

"Necessary and Sufficient": $\leftrightarrow$

A formula of propositional logic is a **contradiction** if and onlyif no truth assignment satisfies it.
A formula of propositional logic is **satisfiable** if and only ifthere is at least one truth assignment that satisfies it.
A formula of propositional logic is a **tautology** if and only if it is satisfied by every truth assignment. To prove that a formula is a tautology using tables, you must give every row of the table.
A formula of propositional logic that has at least one satisfying assignment and at least one non-satisfying assignment is called a **contingency**. To prove that a formula is a contingency, you must give two truth assignments: one satisfying, and one not satisfying. To prove that a formula is not a contingency using tables, you must give an entire table, showing either that every assignment satisfies the formula or no assignment does.

A set of formulas is **consistent** if and only if there exists at least one truth assignment that satisfies all of the formulas in the set. An argument is **valid** if and only if every truth assignment that satisfies all the premises also satisfies the conclusion.

Commutative Laws
p$\wedge$q $\equiv$ q$\wedge$p ($\wedge$-Commutative)
p$\vee$q $\equiv$ q$\vee$p ($\vee$-Commutative)

Association Laws
p$\wedge$(q$\wedge$r) $\equiv$ (p$\wedge$q)$\wedge$r
p$\vee$(q$\vee$r) $\equiv$ (p$\vee$q)$\vee$r

DeMorgan's Laws
$\neg$(p$\wedge$q) $\equiv$ $\neg$p$\vee\neg$q
$\neg$(p$\vee$q) $\equiv$ $\neg$p$\wedge\neg$q

Distributive Laws
p$\wedge$(q$\vee$r) $\equiv$ (p$\wedge$q)$\vee$(p$\wedge$r)
p$\vee$(q$\wedge$r) $\equiv$ (p$\vee$q)$\wedge$(p$\vee$r)

Idempotence Laws
p$\wedge$p $\equiv$ p
p$\vee$p $\equiv$ p

Absorption
p$\wedge$(q$\vee$p) $\equiv$ p

Implication or Material Implication
p$\rightarrow$q $\equiv$ $\neg$p$\vee$q

Bi-Implication
p$\leftrightarrow$q $\equiv$ (p$\wedge$q)$\vee$($\neg$p$\wedge\neg$q)

Exclusive Disjunction
p$\oplus$q $\equiv$ (p$\wedge\neg$q)$\vee$($\neg$p$\wedge$q)

Setlist Notation
A = {0,1,2,3}

Set builder notation
S = $\{n^2$ | n is an integer $\wedge$ n $\geq$ 20 $\wedge$ n $\leq$ 500}

Special Sets of Numbers
Natural Numbers: $\mathbb{N}$ = {0,1,2,3,...}
Integers: $\mathbb{Z}$ = {...,-2,-1,0,1,2,...}
Rational Numbers: $\mathbb{Q} = \{\frac{p}{q}$ | p $\in \mathbb{Z} \wedge$ q $\in \mathbb{Z} \wedge$ q $\neq 0\}$
= any # that can be written as a ratio/fraction/quotiant of integers

The universal set (or the universe) is the set of all the things we currently care about. We often use a cursive capital $\mathbb{U}$ for the universe.