CMPSC

Tips 360

p necessary q
$p \to q$

p is sufficient q
$p \to q$

p whenever q
$q \to p$

p nevertheless q
$p \wedge q$

p if and only if q
$p \leftrightarrow q$

Demorgans on sentences and turns to either or turns to neither

$p \to q = \neg p \vee q$

negation
of $\forall P(x) = \exists \neg P(x)$
$\exists P(x) = \forall \neg P(x)$

No one can fly to the moon
negation: Someone can fly to the moon
$\exists P(x)$

therefore means $\frac{p \quad p \to q}{q}$ the line
when also means $\to$

$p \to q$
contrapositive: $\neg q \to \neg p$ ↖ logically equiv.
converse: $q \to p$
inverse: $\neg p \to \neg q$ ↗ logically equiv.

Direct Proof: $p \to q$
Assume p is true
[arg]
therefore q

contrapositive: $p \to q$
assume $\neg q$
[arg]
therefore $\neg p$

contradiction: p
assume $\neg p$
[derive contradiction]
conclude p is true

contradiction: $p \to q$
assume p and $\neg q$ are true
[derive a contradiction]
conclude $p \to q$ is true

Induction:
base case: show $P(1) = T$
induction step: $P(k) \to P(k+1)$
conclude: $\forall n \in \mathbb{N}\ P(n)$

Strong Induction
base case may be $P(k-1)$ or $P(k+14)$ etc.