Next connective:

Logical equivalence = Two statements are logically equivalent when the biconditionals connecting them is also a tautology.

You may forget that above statement because it is too confusing. Just remember these:

meant to translate one statement to another form

Log eq. connects two compound statements.

p & q both have same truth tables

Next connective:

Logical equivalence = Two statements are logically equivalent when the biconditionals connecting them is also a tautology.

You may forget that above statement because it is too confusing. Just remember these:

(i) Logical equivalence is meant to how how you can 'translate' one statement to another form of itself.
(ii) Log. eq. connects two compound statements.
(iii) If you draw the truth table of the LHS and RHS compound statements, the last columns will be matching.

So if you see two compound statements with matching truth tables, then they are logically equivalent (their logical values are equivalent). One does not imply the other, but they have similar truth tables.

Example:

If p*q is false, then that means that at least one of them is false.

In other words, if p*q is false, then that means that either p is false or q is false, but both can also be false.

Truth table?

~(p*q) ≡ (~p v ~q)

$$\sim(p * q) \equiv (\sim p \vee \sim q)$$

$$\sim(p \vee q) \equiv (\sim p * \sim q)$$

First statement Second Statement nt with the connective

p	q	p*q	~(p*q)	~p	~q	~pv~q
1	1	1	0	0	0	0
1	0	0	1	0	1	1
0	1	0	1	1	0	1
0	0	0	1	1	1	1

Bi-implication - material equivalence
implication - material implication - weak implication

Material implication is considered to be a weak implication because:

p	q	→
1	1	1
1	0	0
0	1	1
0	0	1

A false antecedent implies any consequent (rows 3 and 4), i.e. if the antecedent is false, we can't guess the truth value of consequent. A true consequent implies any antecedent (rows 1 and 3).

➔ Material equivalence is a stronger form of material implication.

➔ Material equivalence is a stronger form of material implication.

Truth table of material equivalence

p	q	↔
1	1	1
1	0	0
0	1	0
0	0	1

There are various ways to describe material equivalent.

- Antecedent and consequent both govern the truth value of each other.
- When antecedent is true (or false) the consequent is also true (or false). (p→q)* (~p→~q)
- Two statements p and q are materially equivalent when they have the same truth value.
- p and q are materially equivalent when p implies q and q implies p.
- Also called bi-implication/bi-conditional, because it has two conditionals/implications, (p→q) * (q→p)
- It means "either both or neither", (p*q) v (~p*~q)

denoted in nat. lang as if and only iff

Logical equivalent = Biconditional that is tautologous.

eg: ~(p*q) ≡ (~p v ~q)

~(p v q) ≡ (~p * ~q)

↳ Dont worry about this lol

Demorgan's Law from either direction!

Next: Arguments aren't just premises & conclusions!

What is an argument?

Arriving at a conclusion through premises.

What is a valid argument?

The one in which the conclusion is incontrovertibly supported by the premises. If premises are assumed to be true, then conclusion has to be true.

So which logical connective do you think exists between premises and conclusion in an argument?

Conditional.

premises→conclusion

Premises imply conclusion.

A valid argument has this condition:

- when premises are true the conclusion is also true

BUT... premises can be made up of multiple propositions. What logical connective should there be between these propositions? We need a connective that results in 'true' only when all of its propositions are 'true'.

Such a connective is conjunction. Therefore, the premise here shall be a conjunction of the individual propositions.

To put everything together: If an argument is valid, the conjunction of the true premises will imply the true conclusion.

p1 * p2 * ...*pn → c