2. Non-truth-functional compound = Its truth value does not depend on the truth value of its components.

E.g. P = John believes Q.

What is the truth value of P?

Q = Two plus two is five. Q = Moon is earth's satellite.

P will be true depending only on if John really believes Q.

It does not depend at all on whether Q is true or not.

Truth value of P does not depend on the truth value of its component Q. Changing the truth value of Q does not change the truth value of P.

Q is not truth functional component, P is not a truth functional compound

Truth functional connectives

words or symb - connect truth fnl components inside a truth functional compound

Truth-functional connectives have truth tables

First	Second	Statement with connective
John is Boy	John is a Bitsian	John is a boy & a bitsian
P	Q	P*Q
1	1	1
1	0	0
0	1	0
0	0	0

And = Truth table for the operator/connective and.

Aka conjunction. The component statements are called the conjuncts.

Truth value of conjunction depends on the truth value of conjuncts.

Also denoted with English words like moreover, also, although, etc.

Both of the statements has to be true for conjunction to be true.

Denotation: A*B

Truth Table.

Or = Also called disjunction or alteration.

The components are called the disjuncts or alternatives.

There are two types of OR.

(i) Inclusive OR. Also called the weak OR.
It is true when at least one of the disjuncts are true. Both disjuncts can be true too.
E.g.: "(Call me or email me) for a response".
"Scholarship awardees are (10-graders or Olympiad winners)".

(ii) Exclusive OR. Also called the strong OR.
It is true when only one of the disjuncts are true. Both disjuncts cannot be true.
E.g.: "In BITS cafeteria, for 10 rupees you can (get a cup of coffee OR a cup of tea)"
The symbol 'v' is used for inclusive OR.
A v B
The symbol '∧' is used for exclusive OR
$A \wedge B$

XOR Ed

Negation of OR

$\sim(A \vee B) \quad (\sim A) * (\sim B)$

Neit

Negation of OR
Negation of something means that something is false.

When is OR false? When both the disjuncts are false. (0-0-0)

To rephrase the above statement in symbols:
OR is false = When the first disjunct is false and the second one is false too. (0-0-0)
$\boxed{\sim(A \text{ v } B) = (\sim A) * (\sim B)}$
It is [not (Trump or Biden)] that won the election
= It is [(not Trump) and (not Biden)] that won the election
= Neither Trump nor Biden won the election *(in natural-spoken language)*
We can draw the truth table of (A v B), then negate the output, then look at the part where we have true in the negated output.
In computer science, it is called Logical NOR.

Regardless & irregardless
Bruh
Same in American Eng

Implication connective or Conditional connective

An implication/conditional connective connects two statements such that:

If one of the statement is true, the other one is also true.

Denoted in natural language in the form: “If P, then Q”.

Also in the form: P implies Q.

Denoted in symbolic logic in the form: P → Q

Also in the form: $\underbrace{P \supset Q}_{\text{actually wrong lol}}$

Sunday holiday

$R = P \to Q$		
T	T	T
F	T	F (eg: gulf has Friday & saturday)
T	F	T
T	F	F

if ANTECEDENT then CONSEQUENT
if HYPOTHESIS then CONCLUSION

“if HYPOTHESIS, then CONCLUSION”

“if PROTASIS, then ADOPSIS”

“if IMPLICANS, then IMPLICATE”

Whenever the antecedent is true the consequent is also true

Otherwise the implication is false

if antecedent is false implication is true

$P \to Q$

Implication connective or Conditional connective

An implication/conditional connective connects two statements such that:
If one of the statement is true, the other one is also true.
Denoted in natural language in the form: "If P, then Q".
Also in the form: P implies Q.
Denoted in symbolic logic in the form: $P \to Q$
Also in the form: $P \supset Q$ (This is not the mathematical notation of super/subset)

Implication of logic is not the same thing as subset relationship.
(i) Subset relationship is among sets. Implication is among propositions.
(ii) Subset is about memberships, implication is about the truth values.
(iii) Subset can be a proper subset of a set (A entirely contained in B) but also equal (A equals to B). No such difference exists between the propositions in implication.

if → then can be stronger than logical if then

Causal → jump water → wet
definitional → x is a circle → it has a radius
Logical → intelligent (BITSIANS)
Student (Aditya, BITSIANS)
→ Intelligent (Aditya)

Earth is flat → I am millionaire not causal
may be co-occuring

implication doesnt assert truth value of the singular statements, but their relationships

Implication in logic ⇒ weak implication
aka
material implication

if P then Q
if P, Q
Q if P
that P (is true) implies Q is true
P is the sufficient condition
for ~~q~~ Q
Q is the necessary condition for P

P q r s → argument form

actual statements

S * T → S
S * T
therefore T

S * T
therefore T

argument forms are different

'p' → first statement in argument form
'q' → second " "
:
'z'
: → Then try to simplified

Specific argument form = "Specific argument form is an array of symbols that contains statement variables – each statement variable stands for a distinct **simple** statement – such that when statements are substituted for statement variables, the result is an argument. "

In general argument form, statement variables can stand for compound as well simple statements. In specific argument form, statement variables can stand for only simple statements.

How does it help with validity?

If a substitution-instance (capital letter, like the actual values of an equation) of a specific argument form is invalid, then that specific argument form will also be invalid.

Then all the substitution-instance for that argument form shall be invalid.

Formally speaking:

Invalid argument = If the specific form for an argument has a substitution instance with true premises and false conclusion, then that given argument is invalid. All specific forms for that argument shall be invalid.

To break it down:

Is a given argument valid?

Look at its specific form (turn it into letters and symbols).

Look at all the substitution instances of this specific form!

Are they all valid? Yes. Then the specific form, and hence the given argument are valid.

Is even one substitution instance invalid? Then the specific form and hence the given argument are invalid.

- **Material equivalence** (XNOR)
-
- Two statements are materially equivalent when they have the same truth value.
-
- Textbook symbol is ≡
- Symbol I use is ↔

Material equivalence means that one statement implies another, and the other one implies the first one.