Propositions

What is propostion?

- Propositions are entities (facts or non-facts) that can be true or false
- It is a declarative sentence
- We cannot say a proposition is True or False just by looking at itself
- Its truth value (true or false) will be determined by given context or semantics

Examples:

- “The sky is blue” - the sky is blue (here and now).
- “Socrates is bald” (assumes ‘Socrates’, ‘bald’ are well defined)
- “The car is red” (requires ‘the car’ to be identified)

Propositional Letter

What is propostion Letter?

- Let Letters stand for “basic” propositions
- A shortcut way that let you do not need to write a long sentence

Examples:

- We can let B represents “The sky is blue” this proposition
- We can let Q represents “Socrates is bald” this proposition
- We can let G represents “Grass is green” this proposition
- We can let S represents “The car is red” this proposition
- We can let P represents “The plants will grow up” this proposition

Propositional Logic

What is propostion Logic?

- Propositional Letters stand for “basic” propositions
- Combine into more complex sentences using operators not, and, or, implies, iff

Propositional connectives:

¬	represents	**negation**
∧	represents	**conjunction**
∨	represents	**disjunction**
→	represents	**implication**
↔	represents	**bi-implication**

¬P means “not P”

P ∧ Q means “P and Q”

P ∨ Q means “P or Q”

P → Q means “If P then Q”

P ↔ Q means “P if and only if Q”

From English to Propositional Logic

Recall from previous example:

- We can let B represents “The sky is blue”
- We can let Q represents “Socrates is bald”
- We can let G represents “Grass is green”
- We can let S represents “The car is red”
- We can let P represents “The plants will grow up”

Then:

- “It is not the case that the sky is blue”: ¬B (alternatively “the sky is not blue”)
- “The sky is blue and the grass is green”: B ∧ G
- “Either the sky is blue or the grass is green”: B ∨ G
- “If the sky is blue, then the grass is not green”: B → ¬G
- “The sky is blue if and only if the grass is green”: B ↔ G
- “If the sky is blue, then if the grass is not green, the plants will not grow”: B → (¬G → ¬P)

Quiz Time!