**Proposition**  
A **proposition** is a statement or assertion that is either **true** or **false**, but not both. They are declarative sentences that can be assigned a truth value (either true or false).

**Examples of Propositions:**

1. **True propositions**:
   * "The Earth orbits the Sun."
   * "2 + 2 = 4."
2. **False propositions**:
   * "The Moon is made of cheese."
   * "5 is greater than 10."

**Non-Propositions**

Some sentences are **not** propositions because they cannot be clearly classified as either true or false. These include:

* **Questions**: "What time is it?"
* **Commands**: "Close the door!"
* **Exclamations**: "Wow, that's amazing!"
* **Open-ended statements**: "This is a great day" (depends on interpretation or context).

**Propositional Logic**

In propositional logic, propositions are typically represented by variables like p, q, and r, and combined using logical connectives like:

* **AND** (∧)
* **OR** (∨)
* **NOT** (¬)
* **IMPLIES** (p  ⟹  q)
* **IF AND ONLY IF** OR **IFF** (p  ⟺  q)

**Argument**In logic and philosophy, an **argument** is a set of declarative statements or propositions, where some of the statements (called **premises**) are presented as evidence or reasons to support another statement (called the **conclusion**).

**Structure of an Argument:**

1. **Premises**: These are the statements that provide support or reasons. They are assumed to be true for the purpose of the argument.
2. **Conclusion**: This is the statement that is claimed to follow from the premises. The conclusion is what the argument is trying to prove or establish.

**Example of an Argument:**

**Premises**:

* Premise 1: All humans are mortal.
* Premise 2: Socrates is a human.

**Conclusion**:

* Therefore, Socrates is mortal.

Here, the premises lead logically to the conclusion. If the premises are true, the conclusion must also be true.

**Premise**

A **premise** is a statement or proposition that serves as the basis for an argument. Premises provide the reasons or evidence that lead to the **conclusion** of the argument. In other words, premises are the claims or assumptions that support the conclusion.

**Key Features of Premises:**

1. **Support**: Premises give support or justification for the conclusion.
2. **Truth-Value**: Like propositions, premises can be true or false.
3. **Role in Arguments**: An argument typically consists of one or more premises followed by a conclusion.

**Example of an Argument:**

**Premises**:

* Premise 1: All birds have wings.
* Premise 2: A robin is a bird.

**Conclusion**:

* Therefore, a robin has wings.

Here, the two premises provide the reasoning that leads to the conclusion that "a robin has wings."

**Types of Arguments**

Valid and Invalid Arguments refer to the **logical structure** of an argument, specifically whether the conclusion follows logically from the premises.

* In a **valid argument**, if both the premises and conclusion are true, the argument is valid.
* In an **invalid** **argument**, the premises are true but the conclusion is false, then the argument is invalid.

**Valid vs. Sound Arguments**

**1. A valid argument** can have false premises but still be logically consistent in truth table. The truth of the premises guarantees the truth of the conclusion, regardless of whether the premises themselves are factually correct.

**Example of a Valid Argument (with false premises):**

**Premise 1**: All fish can fly.  
**Premise 2**: Salmon is a fish.  
**Conclusion**: Therefore, salmon can fly.

This argument is **valid** because the conclusion logically follows from the premises, even though the premises are **factually incorrect**.

2. A **sound argument** is a **valid argument** where the premises are **actually true**, meaning the conclusion must also be true in the real world.

**Example of an Invalid Argument:**

**Premise 1**: All dogs are mammals.  
**Premise 2**: All cats are mammals.  
**Conclusion**: Therefore, all dogs are cats.

Here, both premises are true, but the conclusion **does not logically follow**. The argument is **invalid** because the premises do not support the conclusion.