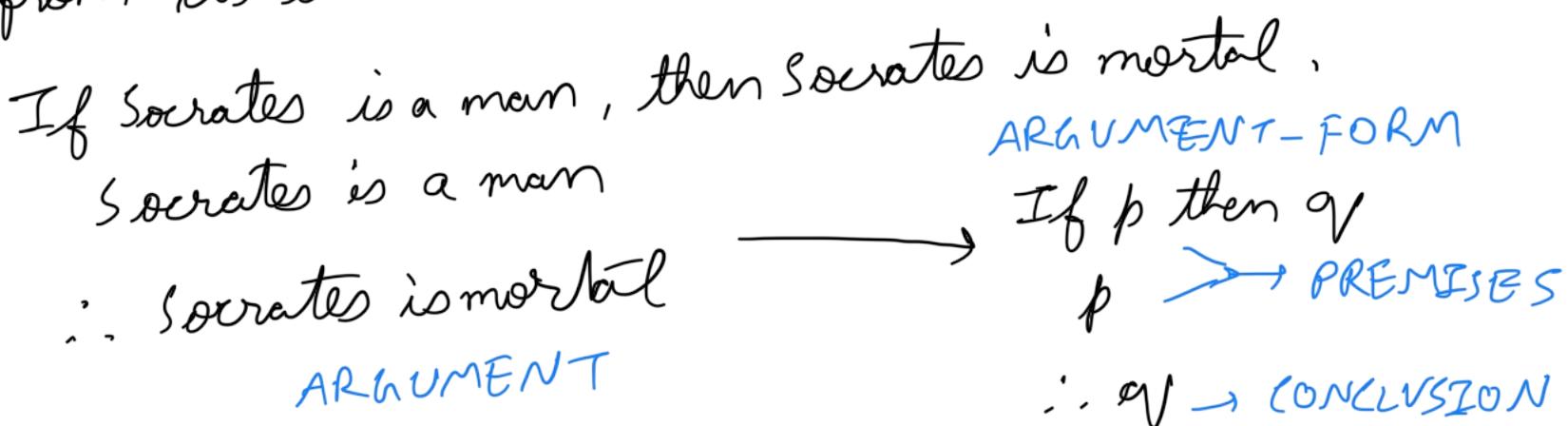


Valid and Invalid Arguments

The logical form of an argument can be abstracted from its content. For example,



Testing and Argument form of validity:

- Identify the premises and conclusion of the argument form.
- Construct a truth table showing truth values of all premises and the conclusion.
- A row of the truth table in which all premises are true is called a critical row. If the conclusion is true in every critical row, then the argument is valid; else invalid.



Caution! If at least one premise of an argument is false, then we have no information about the conclusion: It might be true or it might be false.

$$p \rightarrow q \vee \neg r$$

$$q \rightarrow p \wedge r$$

$$\therefore p \rightarrow r$$

Solution The truth table shows that even though there are several situations in which the premises and the conclusion are all true (rows 1, 7, and 8), there is one situation (row 4) where the premises are true and the conclusion is false.

			premises			conclusion		
p	q	r	$\neg r$	$q \vee \neg r$	$p \wedge r$	$p \rightarrow q \vee \neg r$	$q \rightarrow p \wedge r$	$p \rightarrow r$
T	T	T	F	T	T	T	T	T
T	T	F	T	T	F	T	F	
T	F	T	F	F	T	F	T	
T	F	F	T	T	F	T	T	F
F	T	T	F	T	F	T	F	
F	T	F	T	T	F	T	F	
F	F	T	F	F	F	T	T	T
F	F	F	T	T	F	T	T	T

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This row shows that an argument of this form can have true premises and a false conclusion. Hence this form of argument is invalid.

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TABLE 2.3.1 Valid Argument Forms

Modus Ponens	$p \rightarrow q$ p $\therefore q$	Elimination	a. $p \vee q$ $\sim q$ $\therefore p$	b. $p \vee q$ $\sim p$ $\therefore q$
Modus Tollens	$p \rightarrow q$ $\sim q$ $\therefore \sim p$	Transitivity	$p \rightarrow q$ $q \rightarrow r$ $\therefore p \rightarrow r$	
Generalization	a. p $\therefore p \vee q$	b. q $\therefore p \vee q$	Proof by Division into Cases	$p \vee q$ $p \rightarrow r$ $q \rightarrow r$ $\therefore r$
Specialization	a. $p \wedge q$ $\therefore p$	b. $p \wedge q$ $\therefore q$		
Conjunction	p q $\therefore p \wedge q$	Contradiction Rule		$\sim p \rightarrow c$ $\therefore p$

Fallacies :

- Ambiguous premises : Using ambiguous premises .
- Circular Reasoning : Assuming what is to be proved without having derived it from premises .
- Jumping to a conclusion : Jumping to a conclusion without adequate grounds .
- Converse Error : This fallacy is known as affirming the consequent .

$$\begin{array}{c} p \rightarrow q \\ q \\ \therefore p \text{ (incorrect inference)} \end{array}$$

- Inverse Error : This fallacy is known as denying the antecedent .

$$\begin{array}{c} p \rightarrow q \\ \neg p \\ \therefore \neg q \text{ (incorrect inference)} \end{array}$$