Arguments

An argument is a sequence of statements. All statements but the final one are called premises (or assumptions or hypotheses). The final statement is called the conclusion. The symbol $\therefore$ means “therefore”.

ex. If my check comes in time, I’ll buy a dress.
   I didn’t buy a dress.
   $\therefore$ My check didn’t come in time.

\[ p \rightarrow q \]
\[ \sim q \]
\[ \therefore \sim p \]

An argument form is valid if the fact that all premises are true forces the conclusion to be true. An argument is valid if its form is valid.

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Or… \((p \rightarrow q) \land \sim q \rightarrow \sim p\)

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ex.

\[p \rightarrow q\]

\[q\]

\[\therefore p\]

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Valid Argument forms:

1. Modus ponens (method of affirming)

   \[ p \rightarrow q \]
   
   \[ p \]
   
   \[ \therefore q \]

   ex.

2. Modus tolens (method of denying)

   \[ p \rightarrow q \]
   
   \[ \sim q \]
   
   \[ \therefore \sim p \]
3. Disjunctive Addition (generalizations)

\[ p \]

\[ \therefore p \lor q \]

ex.

4. Conjunctive Simplification

\[ p \land q \]

\[ \therefore p \]

\[ \therefore q \]
5. Disjunctive Syllogism

\[ p \lor q \]
\[ \sim q \]
\[ \therefore p \]

ex.

6. Hypothetical Syllogism

\[ p \rightarrow q \]
\[ q \rightarrow r \]
\[ \therefore p \rightarrow r \]
7. Dilemma (proof by division into cases)

\[ p \lor q \]
\[ p \rightarrow r \]
\[ q \rightarrow r \]
\[ \therefore r \]

8. Rule of contradiction

\[ \sim p \rightarrow c \]
\[ \therefore p \]
9. Conjunctive Addition

\[ p \]
\[ q \]
\[ \therefore p \land q \]

A fallacy is an error in reasoning which leads to an invalid argument.

1. Converse Error

\[ p \rightarrow q \]
\[ q \]
\[ \therefore p \]

2. Inverse Error

\[ p \rightarrow q \]
\[ \sim p \]
\[ \therefore \sim q \]
Do: Use a truth table to test the validity of the following arguments

1. 
   $p \lor \sim q$
   
   $p$
   
   $\therefore \sim q$

2. 
   $q \land r$
   
   $\sim r$
   
   $\therefore \sim q$

3. Put into symbols and decide if the following argument is valid or invalid.

   If this computer program is correct, then it produces the correct output when run with the test data my teacher gave me.
   This computer program produces the correct output when run with the test data my teacher gave me.
   $\therefore$ The computer program is correct.