DEDUCTIVE ARGUMENTS

Argument: consists of given statements called premises and a conclusion.

Valid Argument: conclusion must follow from the given set of premises.

Invalid Argument (or fallacy): conclusion doesn't necessarily follow from given premises.

To determine if an argument is valid, write it in symbols and analyze the symbol pattern.

ex. If I am sleeping, then I am breathing.  
   p → q  
   I am asleep.  p  
   ∴ I am breathing.  q

The argument is valid if the conjunction of the premises implies the conclusion for all cases. (TAUTOLOGY)
Valid Argument: conclusion **must** follow from the given set of premises.

**DEDUCTIVE**

Invalid Argument (or fallacy): conclusion doesn't necessarily follow from given premises.

<table>
<thead>
<tr>
<th>FORM (STRUCTURE)</th>
<th>CONTENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Valid</td>
<td>TRUTH VALUES of Premise(s) and Conclusion</td>
</tr>
<tr>
<td>2. Invalid</td>
<td></td>
</tr>
</tbody>
</table>
Construct a truth table for \[(p \rightarrow q) \land p \rightarrow q\].

<table>
<thead>
<tr>
<th>p</th>
<th>q</th>
<th>p \rightarrow q</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>T</td>
<td>T</td>
</tr>
<tr>
<td>T</td>
<td>F</td>
<td>F</td>
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<td>F</td>
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<td>T</td>
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<tr>
<td>F</td>
<td>F</td>
<td>T</td>
</tr>
</tbody>
</table>

This is a valid argument!

Please see the next page for the entire Truth Table.

The truth of the conclusion does not determine validity. The form of the argument determines validity. In a valid argument, if the premises are true, the conclusion must also be true. A valid argument with true premises is called a sound argument.

ex. If you live in Miami, then you wear a heavy coat every day. 
   You live in Miami. 
   \[\therefore\] You wear a heavy coat every day.

This is a valid argument. However, the conclusion is not true since the premises are not both true.
Construct a truth table for \([(p \rightarrow q) \land p] \rightarrow q\).

<table>
<thead>
<tr>
<th>p</th>
<th>q</th>
<th>p\rightarrow q</th>
<th>(p \rightarrow q) \land p</th>
<th>[(p \rightarrow q) \land p] \rightarrow q</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>T</td>
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<td>T</td>
</tr>
</tbody>
</table>

The argument is a tautology in form.

\[\therefore\] Arg. is VALID
### Invalid

- **Fallacy of the Converse**
  - $p \rightarrow q$
  - $q$
  - $\therefore \neg p$

- **Fallacy of the Inverse**
  - $p \rightarrow q$
  - $\neg p$
  - $\therefore \neg q$

- **Misuse of Disjunctive Reasoning**
  - $p \lor q$
  - $p$
  - $q$
  - $\therefore \neg q$
  - $\therefore \neg p$

- **Misuse of Transitive Reasoning**
  - $p \rightarrow q$
  - $q \rightarrow r$
  - $\therefore \neg p \rightarrow \neg r$

---

**Valid**

1. If I eat, I get fat.
2. If I get fat, I die.
3. If I eat, then I die.

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**Inverse**

1. If it rains, Jones gets wet.
2. Jones gets wet.
3. It rains.

**Invalid**

- **Valid form**
  - $p \rightarrow q$
  - $q \rightarrow r$
  - $\therefore p \rightarrow r$

---

**Conclusion**

- **Inverse**
  - If the shoe fits, then I will wear it.

- **Valid**
  - The shoe doesn’t fit.

- **Invalid**
  - I don’t wear it.
If an English argument translates into one of these forms, you can immediately determine validity without using truth tables.

\[
\begin{align*}
\text{Direct Reasoning} & \quad p \rightarrow q \\
\text{Contrapositive Reasoning} & \quad p \rightarrow q \\
\text{Disjunctive Reasoning} & \quad p \lor q \\
\text{Transitive Reasoning} & \quad p \rightarrow q \\
\end{align*}
\]

**VALID**

\[
\begin{align*}
& \quad \therefore q \\
& \quad \therefore \neg p \\
& \quad \therefore p \\
& \quad \therefore \neg r \rightarrow \neg r \\
\end{align*}
\]

- 1) Two alternatives
- 2) Rule out one

**INVALID**

\[
\begin{align*}
\text{Fallacy of the Converse} & \quad p \rightarrow q \\
\text{Fallacy of the Inverse} & \quad q \rightarrow \neg p \\
\text{Misuse of Disjunctive Reasoning} & \quad p \lor q \\
\text{Misuse of Transitive Reasoning} & \quad q \rightarrow r \\
\end{align*}
\]

- 2) Only one thing left to do
Valid Form

ex. If I'm sleeping, then I'm breathing.
   I'm sleeping.
   ∴ I'm breathing.

ex. If I'm sleeping, then I'm breathing.
   I'm not breathing.
   ∴ I'm not sleeping.

ex. If I am sick, then I stay in bed.
   If I stay in bed, then I watch TV.
   ∴ If I am sick, then I watch TV.

ex. I will go to Publix Monday or Tuesday.
   I did not go to Publix Monday.
   ∴ I went to Publix Tuesday.
Invalid

ex. If I'm sleeping, then I'm breathing.
    I'm not sleeping.
    ∴ I'm not breathing.

ex. If I'm sleeping, then I'm breathing.
    I'm breathing.
    ∴ I'm sleeping.

ex. I will go to Publix Monday or Tuesday.
    I went to Publix Monday.
    ∴ I did not go to Publix Tuesday.

ex. If I am sick, then I stay in bed.
    If I stay in bed, then I watch TV.
    ∴ If I watch TV, then I am sick.
Drawing Logical or Valid Conclusions

Draw a valid conclusion from the given premises by translating into symbolic form and using valid patterns.

If Frank buys a car, then he can drive home. \( p \rightarrow q \)
Frank cannot drive home. \( \sim q \)

Therefore, FRANK DIDN'T BUY A CAR.

If you study, then you will pass this class. \( p \rightarrow q \)
If you pass this class, then you can graduate. \( q \rightarrow r \)

Therefore, IF YOU STUDY THEN YOU'LL GRADUATE.
If all stores are closed, then no one can shop. \[ p \rightarrow q \]
Some one can shop. \[ \sim q \]
Therefore, THE STORES ARE NOT CLOSED.

(Corrected 11/10/09 dj) -- Some stores are not closed.

**IMPORTANT EXAMPLE**

If you work, then you can pay your bills. \[ p \rightarrow q \]
If you can pay your bills, then your credit is good. \[ q \rightarrow r \]
Your credit is not good. \[ \sim r \]
Therefore, \[ \sim p \]

See text examples 1 - 6. Use Handout on Alternative Truth Table Method for Symbolic Arguments.