Categorical Logic
Syllogisms

Definitions:

*Syllogism* - a deductive argument composed of exactly two premises and one conclusion.

*Categorical Syllogism* - a syllogism composed of *categorical propositions* with exactly three distinct terms.

I. The Parts of a Categorical Syllogism -

A. The **Major Term** - the *predicate* term of the conclusion
B. The **Minor Term** - the *subject* term of the conclusion

P1) - All mammals are **animals with hearts**.

P2 - All **dogs** are mammals.

C) - All **dogs** are **animals with hearts**.

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*minor term*  *major term*
I. The Parts of a Categorical Syllogism -

A. The **Major Term** - the *Predicate* of the conclusion

B. The **Minor Term** - the *Subject* of the conclusion

C. The **Middle Term** - the term *repeated* in the premises, but *not* in the conclusion.

P1) - All *mammals* are animals with hearts.

P2) - All dogs are *mammals*.

C) - All dogs are animals with hearts.
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I. The Parts of a Categorical Syllogism -

A. The **Major Term** - the *P*redicate of the conclusion

B. The **Minor Term** - the *S*ubject of the conclusion

C. The **Middle Term** - the term **repeated** in the premises, but **not** in the conclusion.

D. The **Major Premise** - the premise that contains the major term

E. The **Minor Premise** - the premise that contains the minor term

**Major Premise**  All *mammals* are *animals with hearts*.

**Minor Premise**  All *dogs* are *mammals*.
All *dogs* are *animals with hearts*.
II. **The Mood** of a Categorical Syllogism - the letters of the three propositions that compose the syllogism.

*All* mammals are animals with hearts.
*All* dogs are mammals.
*All* dogs are animals with hearts.  

*No* mammals are animals with hearts.
*All* dogs are mammals.
*No* dogs are animals with hearts.

*Some* mammals are animals with hearts.
*All* dogs are mammals.
*Some* dogs are animals with hearts.

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4\(^3\) = 64 possible moods
III. The **Figure** of the Categorical Syllogism - the *location of the middle term* in the major and minor premises

**Figure 1**  
\[
\begin{align*}
&M \text{ are } P. & \text{All *mammals* are animals with hearts.} \\
&S \text{ are } M. & \text{All dogs are *mammals*.} \\
&S \text{ are } P. & \text{All dogs are animals with hearts.}
\end{align*}
\]

**Figure 2**  
\[
\begin{align*}
&P \text{ are } M. & \text{All animals with hearts are *mammals*.} \\
&S \text{ are } M. & \text{All dogs are *mammals*.} \\
&S \text{ are } P. & \text{All dogs are animals with hearts.}
\end{align*}
\]
III. The Figure of the Categorical Syllogism - the location of the middle term in the major and minor premises

**Figure 3**

- $M$ are $P$.  
  All *mammals* are animals with hearts.
- $M$ are $S$.  
  All *mammals* are dogs.
- $S$ are $P$.  
  All dogs are animals with hearts.

**Figure 4**

- $P$ are $M$.  
  All animals with hearts are *mammals*.
- $M$ are $S$.  
  All *mammals* are dogs.
- $S$ are $P$.  
  All dogs are animals with hearts.
### III. The Figure of the Categorical Syllogism - the location of the middle term in the major and minor premises

<table>
<thead>
<tr>
<th>Figure 1</th>
<th>Figure 2</th>
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</table>
| $M$ are P.  
S are $M$.  
S are P.  | P are $M$.  
S are $M$.  
S are P.  |

<table>
<thead>
<tr>
<th>Figure 3</th>
<th>Figure 4</th>
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</thead>
</table>
| $M$ are P.  
$M$ are S.  
S are P.  | P are $M$.  
$M$ are S.  
S are P.  |
III. The **Figure** of the Categorical Syllogism - the *location of the middle term* in the major and minor premises

<table>
<thead>
<tr>
<th>Figure</th>
<th>Major Premise</th>
<th>Minor Premise</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>M</strong> are <strong>P</strong>.</td>
<td><strong>S</strong> are <strong>M</strong>.</td>
<td><strong>S</strong> are <strong>P</strong>.</td>
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<tr>
<td>2</td>
<td><strong>P</strong> are <strong>M</strong>.</td>
<td><strong>S</strong> are <strong>M</strong>.</td>
<td><strong>S</strong> are <strong>P</strong>.</td>
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<td>3</td>
<td><strong>M</strong> are <strong>P</strong>.</td>
<td><strong>M</strong> are <strong>S</strong>.</td>
<td><strong>P</strong> are <strong>M</strong>.</td>
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<td>4</td>
<td><strong>M</strong> are <strong>P</strong>.</td>
<td><strong>M</strong> are <strong>S</strong>.</td>
<td><strong>M</strong> are <strong>S</strong>.</td>
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</tbody>
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4 figures

4 figures \( \times \) 64 moods = 256 categorical syllogisms
AAA-1

All M are P.
All S are M.
All S are P.
AAA-1

All M are P. ✓
All S are M.
All S are P.
AAA-1

All M are P. ✓
All S are M. ✓
All S are P.

Valid
**EIO-2**

No P are M.
Some S are M.
Some S are not P.

**NOTE:** always start with universal premises.
EIO-2

No P are M. ✓
Some S are M.
Some S are not P.
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EIO-2

No P are M. ✓
Some S are M. ✓
Some S are not P.

Valid
IV. The Fallacies of Categorical Syllogisms - the five ways a categorical syllogism can fail

A. Undistributed Middle Term - the middle term of a categorical syllogism must be distributed at least once.

All dogs are mammals.

AAA-2

All cats are mammals.

Therefore, all cats are dogs
All dogs are *mammals*. 
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AAA-2

Invalid

All cats are mammals.

All dogs are mammals.

All cats are dogs?
IV. The Fallacies of Categorical Syllogisms - the five ways a categorical syllogism can fail

A. Undistributed Middle Term - the middle term of a categorical syllogism must be distributed \textit{at least once.}

B. Illicit Major/Minor Term - if a term is distributed in the conclusion, it \textit{must} be distributed in its premise.

All dogs are \textit{mammals.}
Some cats are not dogs.
Therefore, some cats are \textit{not mammals.}

AOO-1
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AOO-1

Invalid

Some cats are not dogs.

All dogs are mammals.

Some cats are not mammals?
IV. The Fallacies of Categorical Syllogisms - the five ways a categorical syllogism can fail:

A. Undistributed Middle Term - the middle term of a categorical syllogism must be distributed *at least once*.

B. Illicit Major/Minor Term - if a term is distributed in the conclusion, it *must* be distributed in the premise.

C. Exclusive Premises - A categorical syllogism *cannot* have two negative premises.

*No* fish are birds.
Some parrots are *not* fish.
Therefore, some parrots are not birds.
No fish are birds.
Some parrots are *not* fish.

No fish are birds.

EOO-1

Invalid

Some parrots are *not* birds?
The Fallacies of Categorical Syllogisms - the five ways a categorical syllogism can fail:

A. **Undistributed Middle Term** - the middle term of a categorical syllogism must be distributed *at least once*.

B. **Illicit Major/Minor Term** - if a term is distributed in the conclusion, it *must* be distributed in the premise.

C. **Exclusive Premises** - A categorical syllogism cannot have two negative premises.

D. **Losing the Negative** - A negative premise requires a negative conclusion (and a negative conclusion requires a

\[ \text{No fish are birds.} \]

EII-1

Some parrots are fish.

Therefore, some parrots are birds.
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EII-1
No fish are birds.
Categorical Logic
Syllogisms

EII-1

Invalid

Some parrots are fish.

No fish are birds.

Some parrots are birds?
IV. The Fallacies of Categorical Syllogisms - the five ways a categorical syllogism can fail:

A. Undistributed Middle Term - the middle term of a categorical syllogism must be distributed at least once.

B. Illicit Major/Minor Term - if a term is distributed in the conclusion, it must be distributed in the premise.

C. Exclusive Premises - A categorical syllogism cannot have two negative premises.

D. Losing the Negative - A negative premise requires a negative conclusion (and a negative conclusion requires a negative premise).

E. Existential Fallacy* - A particular conclusion cannot be derived from two universal premises.
### Categorical Logic

#### Syllogisms

V. The **Valid** Categorical Syllogisms - 24 Valid syllogisms:

**Unconditionally Valid: 15**

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<th>Figure 1</th>
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<tbody>
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**Conditionally Valid: 9**

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