Free Choice in Deontic Radical Inquisitive Semantics

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Standard Disjunctive Entailments

An example of standard disjunction

(1) A country established a research center or a laboratory.
(a) A country established a research center.
(b) A country established a laboratory.

Free Choice Puzzle

An example of free choice

(2) A country may establish a research center or a laboratory.
(a) A country may establish a research center.
(b) A country may establish a laboratory.

Pragmatic Mechanism

Zimmermann [2000]

Reinterpret deontic disjunction as a conjunction

(3) $\Diamond(\varphi \vee \psi) \equiv \Box\Diamond\varphi \wedge \Box\Diamond\psi$

Does not correctly predict the effect of negation

(4) A country may not establish a research center or a laboratory

(a) $\overline{\Box\Diamond\varphi \wedge \Box\Diamond\psi}$

(b) $\overline{\Box\Diamond\varphi \wedge \Box\Diamond\psi} \equiv \overline{\Box\Diamond\varphi} \vee \overline{\Box\Diamond\psi}$

Implicatures

Eckardt [2007]

Implicature-based account

1. Informed speaker uses disjunction: $\Diamond(\varphi \vee \psi)$.
2. Either disjunct would be more economical.
3. Infer that permissions are best described by disjunction because either disjunct would be false.
4. Free choice effect: There must be some worlds where $\Diamond\varphi \wedge \overline{\Diamond\psi}$ and others where $\overline{\Diamond\varphi} \wedge \Diamond\psi$

Problems with Implicature-based Accounts

What is being said and what is being implicated?

(5) X is meeting a woman this evening.
(2) A country may establish a research center or a laboratory.

Cancellation

(6) X is meeting a woman this evening but it's only his mother.
(7) A country may establish a research center or a laboratory, although in fact a country may not establish a laboratory.

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Cancellations Explored Further

Ignorance

(8) A country may establish a research center or a laboratory, but I do not know which.

Both

(9) A country may establish a research center or a laboratory, but not both.

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Reduction

Barker [2010]

(10) $\Diamond\varphi := \varphi \rightarrow \delta$

(11) $\Diamond(\varphi \vee \psi) \models (\varphi \vee \psi) \rightarrow \delta \models \varphi \rightarrow \delta \wedge \psi \rightarrow \delta$

Issues

1. Different violations and permissions
2. Negation

(12) $\overline{\Diamond\varphi} \vee \overline{\Diamond\psi}$

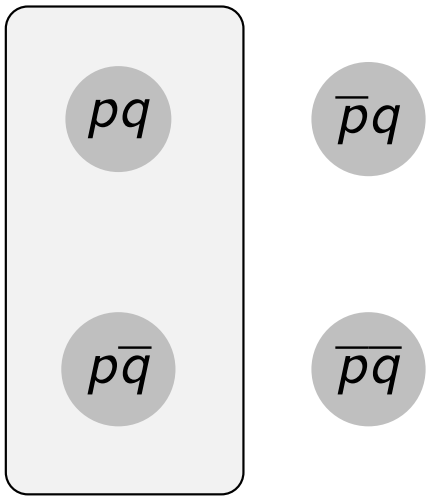
Propositions and Possibilities

Propositions

$\sigma \models^{+} p$ iff $\forall w \in \sigma : w(p) = 1$
$\sigma \models^{-} p$ iff $\forall w \in \sigma : w(p) = 0$

Possibilities and Counter-Possibilities

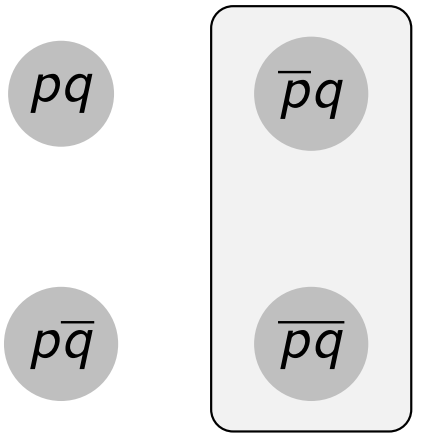
Possibilities are persistent and maximal sets of worlds.
$\lceil \varphi \rceil$ and $\lfloor \varphi \rfloor$ are sets of possibilities.



(1) $\lceil p \rceil$

NEGATION

$\sigma \models^{+} \overline{\varphi}$ iff $\sigma \models^{-} \varphi$
$\sigma \models^{-} \overline{\varphi}$ iff $\sigma \models^{+} \varphi$
$\sigma \models^{+} \neg\varphi$ iff $\forall\tau \subseteq \sigma.\tau \not\models^{+} \varphi$
$\sigma \models^{-} \neg\varphi$ iff $\sigma \models^{+} \varphi$

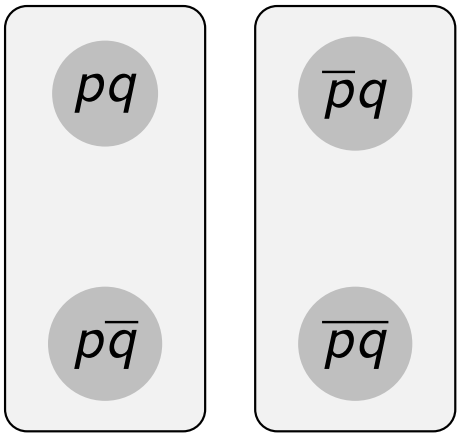


(2) $\lfloor p \rfloor$

Inquisitiveness

Inquisitiveness

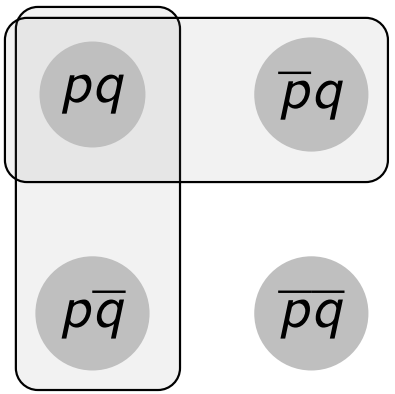
An utterance is inquisitive if it consists of two or more possibilities.



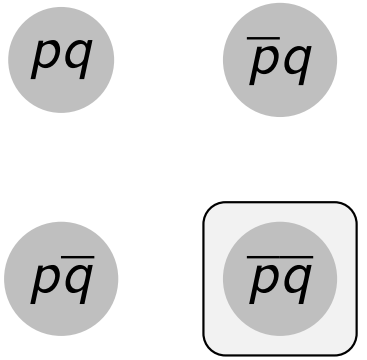
(3) $\lceil p \vee \overline{p} \rceil$

DISJUNCTION

$\sigma \models^+ \varphi \vee \psi$ iff $\sigma \models^+ \varphi$ or $\sigma \models^+ \psi$
$\sigma \models^- \varphi \vee \psi$ iff $\sigma \models^- \varphi$ and $\sigma \models^- \psi$



(4) $\lceil p \vee q \rceil$

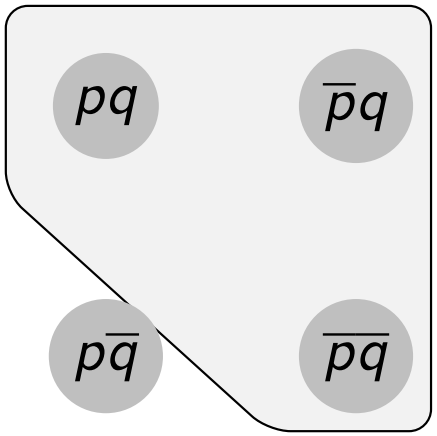


(5) $\lfloor p \vee q \rfloor$

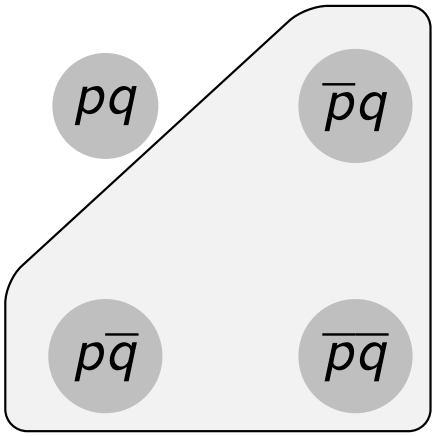
Conditionals

Conditionals

$\sigma \models^+ \varphi \to \psi$ iff $\forall \tau \subseteq \sigma.(\ \tau \models^+ \varphi$ implies $\tau \models^+ \psi)$
$\sigma \models^- \varphi \to \psi$ iff $\exists \tau.(\tau \models^+ \varphi$ and $\forall \tau' \supseteq \tau.(\tau' \models^+ \varphi$ implies $\sigma \cap \tau' \models^- \psi))$



(6) $\lceil p \to q \rceil$

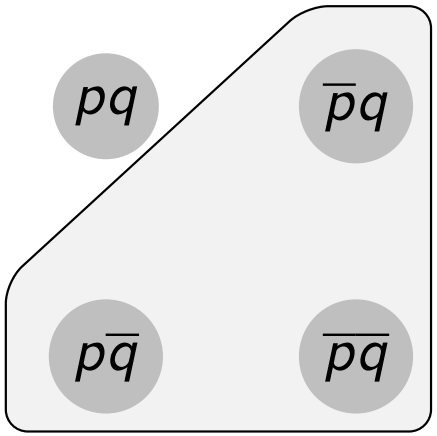


(7) $\lfloor p \to q \rfloor$

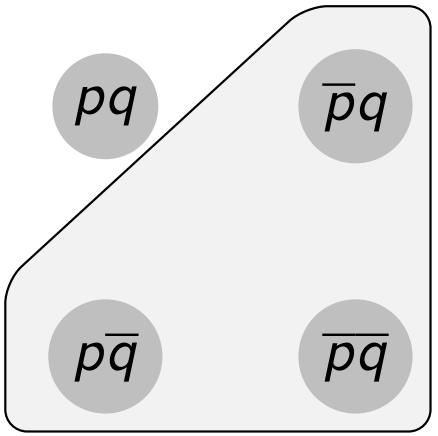
Conditionals Continued

False tautology rectified

$\lceil (p \rightarrow q) \vee (q \rightarrow p) \rceil$



(8) $\lfloor p \rightarrow q \rfloor$



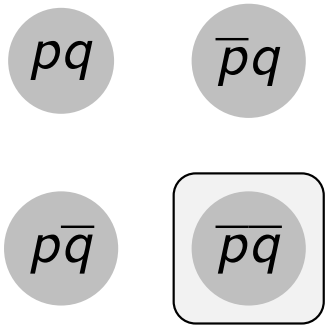
(9) $\lfloor q \rightarrow p \rfloor$

Conjunction

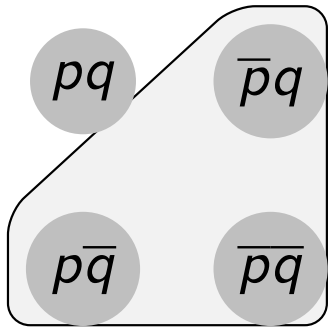
Standard inquisitive entailment

$\varphi \models \psi$ iff $\forall \alpha \in \lceil \varphi \rceil : \exists \beta \in \lceil \psi \rceil : \alpha \subseteq \beta$

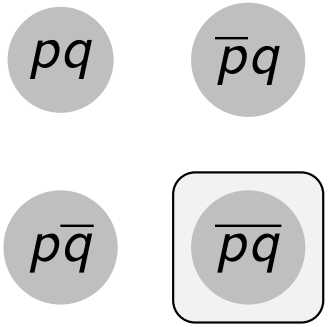
$\overline{p \vee q} \models \overline{p} \wedge \overline{q}$, $\overline{p \wedge q} \not\models \overline{p} \vee \overline{q}$



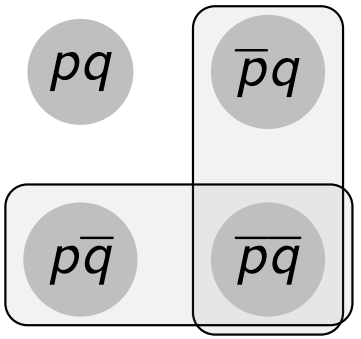
(10) $\overline{p \vee q}$



(11) $\overline{p \wedge q}$



(12) $\overline{p} \wedge \overline{q}$

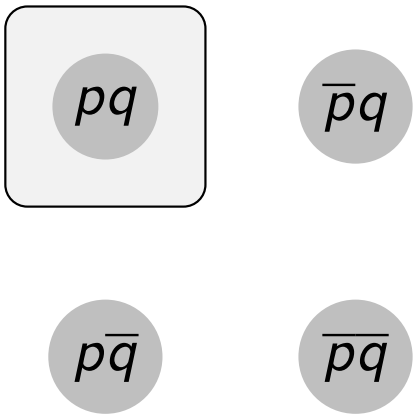


(13) $\overline{p} \vee \overline{q}$

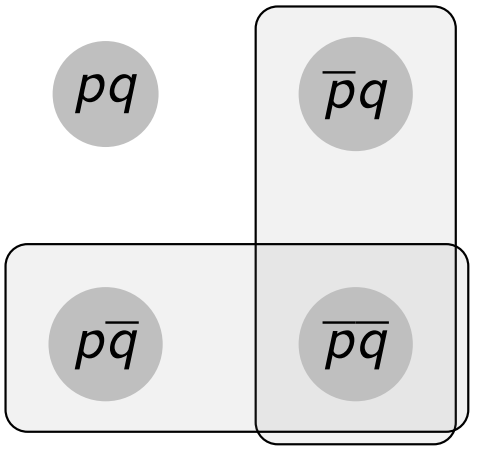
Conjunction Continued

Conjunction

$\sigma \models^{+} \varphi \wedge \psi$ iff $\sigma \models^{+} \varphi$ and $\sigma \models^{+} \psi$
$\sigma \models^{-} \varphi \wedge \psi$ iff $\sigma \models^{-} \varphi$ or $\sigma \models^{-} \psi$



(14) $\lceil p \wedge q \rceil$



(15) $\lfloor p \wedge q \rfloor$

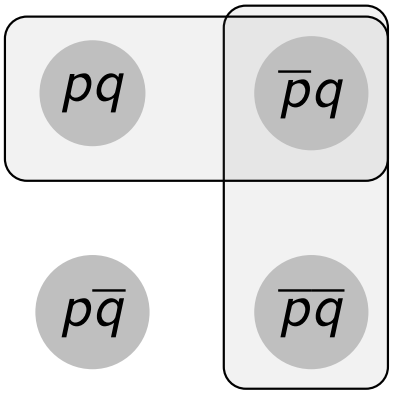
Entailment

Standard inquisitive entailment

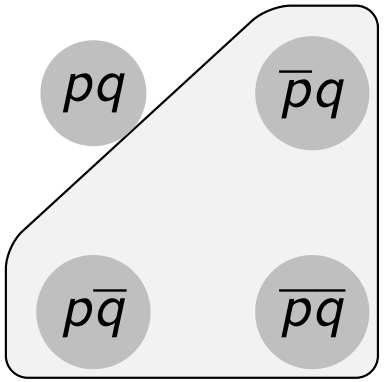
$\varphi \models \psi$ iff $\forall \alpha \in \lceil \varphi \rceil : \exists \beta \in \lceil \psi \rceil : \alpha \subseteq \beta$

Entailment test [Lewis and Langford 1932]

If φ entails ψ then it's impossible that $\varphi \wedge \overline{\psi}$.



(16) $\lceil \overline{p} \vee q \rceil$



(17) $\lfloor p \rightarrow q \rfloor$

Radical Entailment

Radical Entailment

$\varphi \models \psi$ iff $\forall \alpha \in \lceil \varphi \rceil : \exists \beta \in \lceil \psi \rceil : \alpha \subseteq \beta$ and $\lfloor \psi \rfloor \subseteq \lfloor \varphi \rfloor$

Deontics

Violations

Proposition v.

Definition of deontic "may"

$\sigma \models^{+} \Diamond\varphi$ iff $\forall\tau \subseteq \sigma.(\ \tau \models^{+} \varphi$ implies $\tau \models^{+} \overline{v})$
$\sigma \models^{-} \Diamond\varphi$ iff $\forall\tau \subseteq \sigma.(\ \tau \models^{+} \varphi$ implies $\tau \models^{-} \overline{v})$

(18) $\lceil\Diamond p\rceil$

(19) $\lfloor\Diamond p\rfloor$

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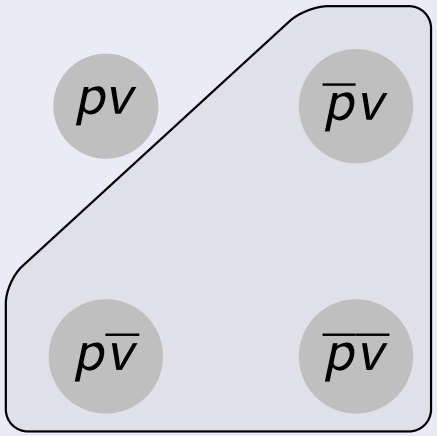
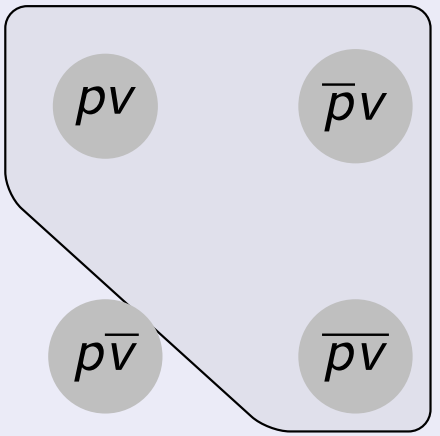


(20) $\lceil\Diamond p\rceil$

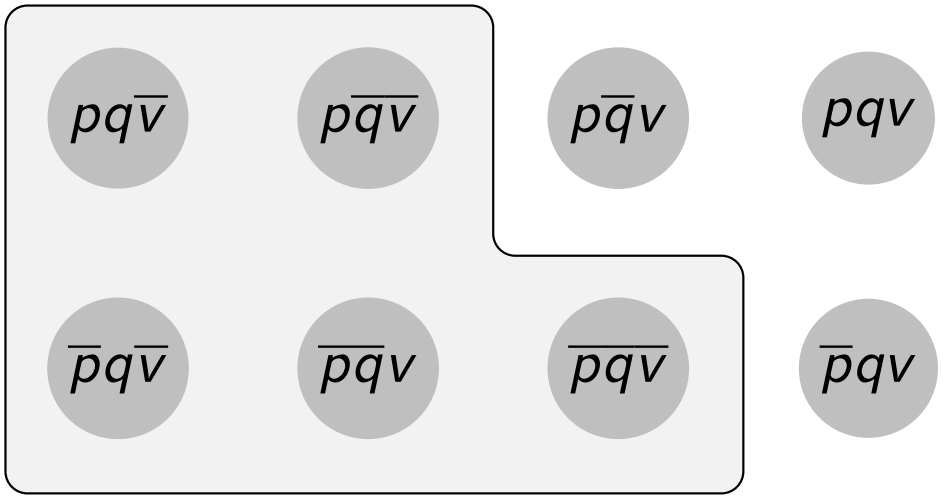


(21) $\lfloor\Diamond p\rfloor$

Free Choice

Free choice

(13) $\lceil \Diamond(p \vee q) \rceil$

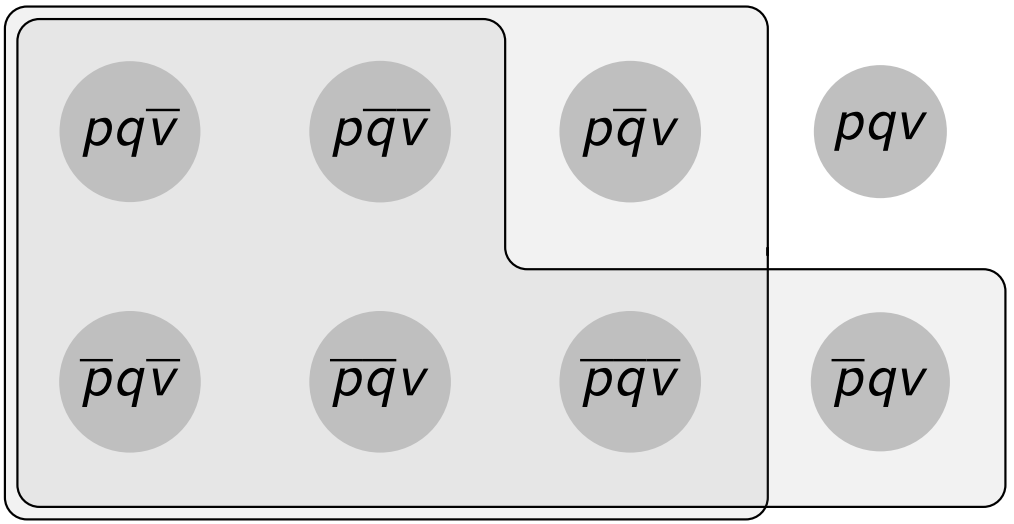


(22) "A country may establish a research center or a laboratory."

Ignorance Reading

Disjunction scoping over "may"

(14) $\lceil \Diamond p \vee \Diamond q \rceil$

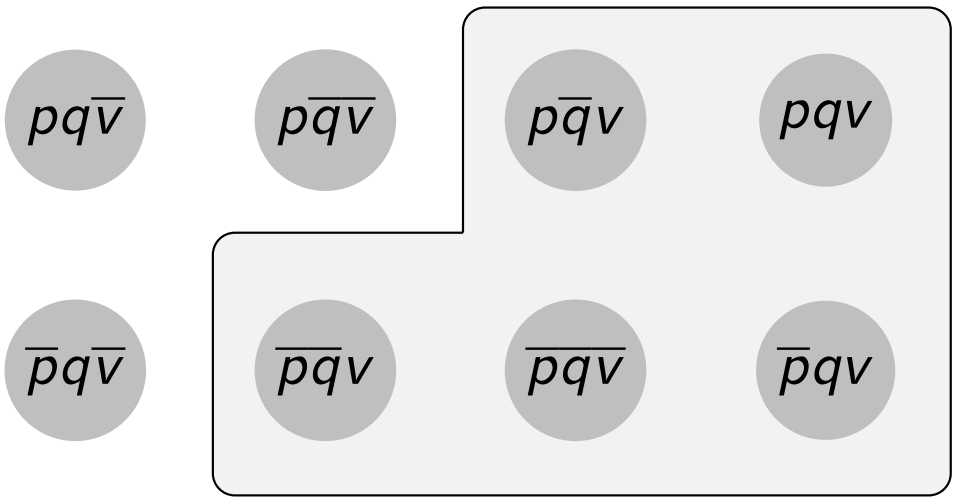


(23) "A country may establish a research center or a laboratory but I don't know which."

Negation

Negating permission

(15) $\lfloor \Diamond(p \vee q) \rfloor$

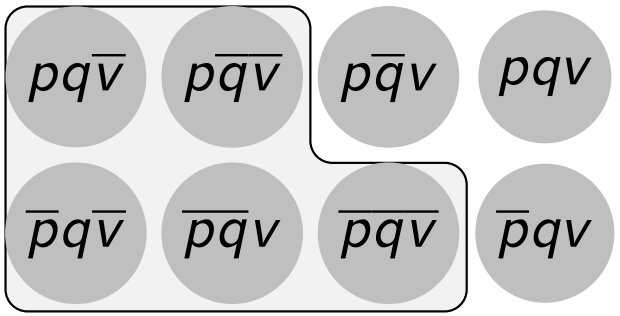


(24) "A country may not establish a research center or a laboratory."

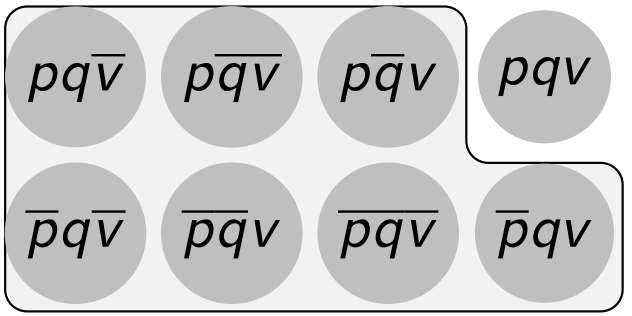
Not Both

Not both readings

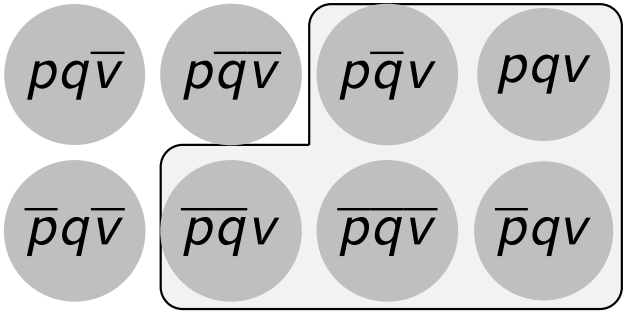
$\lceil \Diamond(p \vee q) \rceil \not\models \lceil \Diamond(p \wedge q) \rceil$



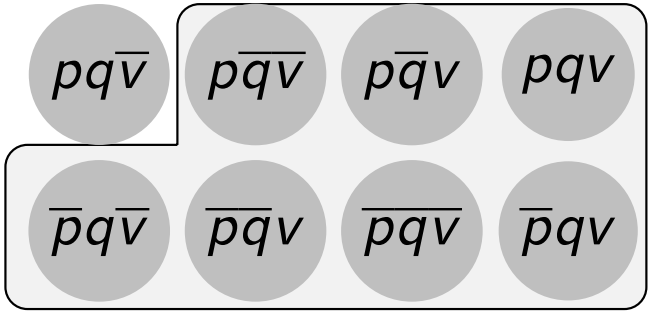
(25) $\lceil \Diamond(p \vee q) \rceil$



(27) $\lceil \Diamond(p \wedge q) \rceil$



(26) $\lfloor \Diamond(p \vee q) \rfloor$

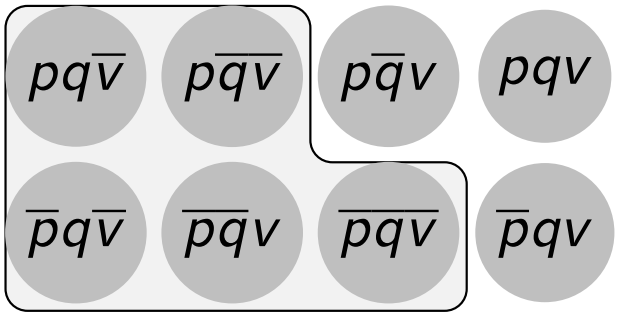


(28) $\lfloor \Diamond(p \wedge q) \rfloor$

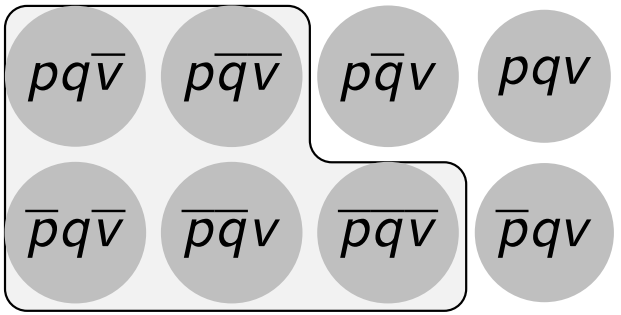
Not Both Continued

Not both readings

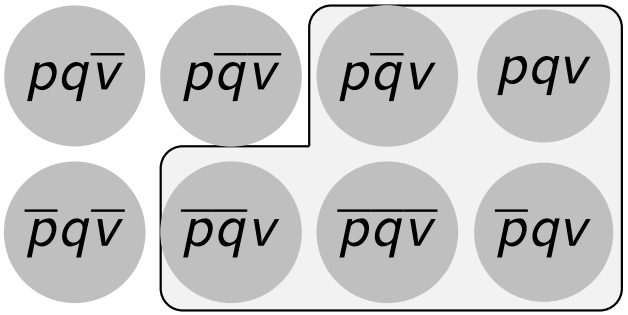
$\lceil \Diamond(p \vee q) \rceil \not\models \lceil \Diamond p \wedge \Diamond q \rceil$



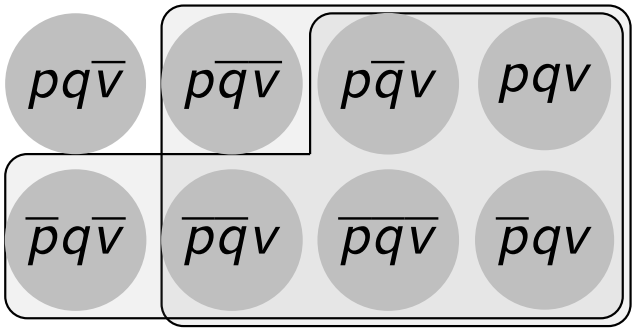
(29) $\lceil \Diamond(p \vee q) \rceil$



(31) $\lceil \Diamond p \wedge \Diamond q \rceil$



(30) $\lfloor \Diamond(p \vee q) \rfloor$

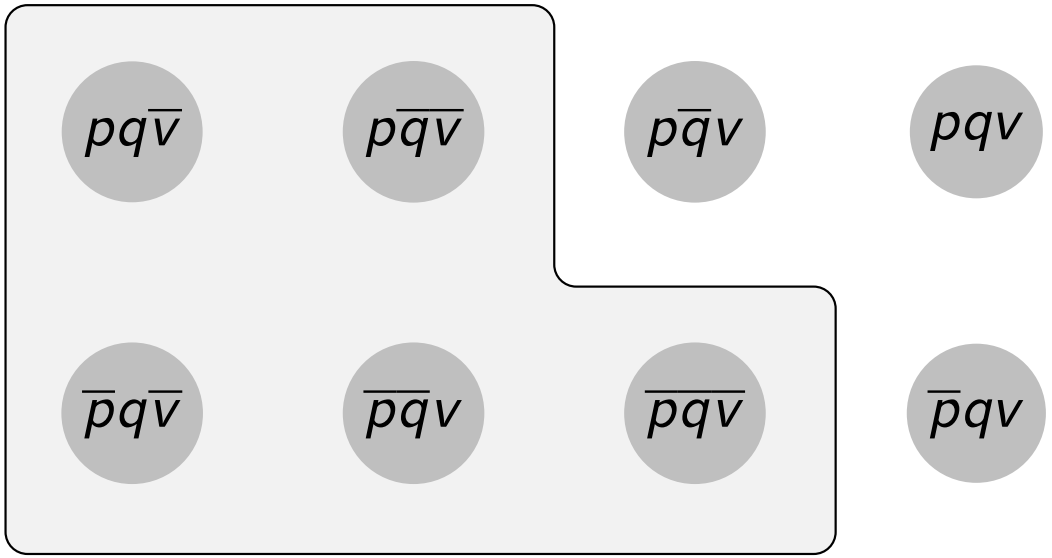


(32) $\lfloor \Diamond p \wedge \Diamond q \rfloor$

Free Choice

Wide Scope Free choice

(13) $\lceil \Diamond(p \vee q) \rceil$

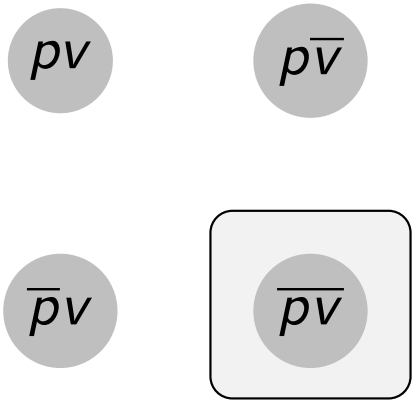


(33) "A country may establish a research center or a country may establish a laboratory."

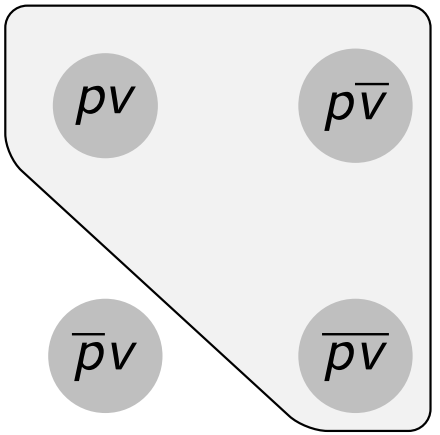
Counterargument Countered

Anderson [1967]

1. $\Box p := \overline{p} \rightarrow v$
2. p
3. $\overline{\overline{p}}$
4. $\overline{p} \vee v$
5. $\overline{p} \rightarrow v$
6. $p \rightarrow \Box p$



(34) $\lfloor \overline{\overline{p}} \vee v \rfloor$



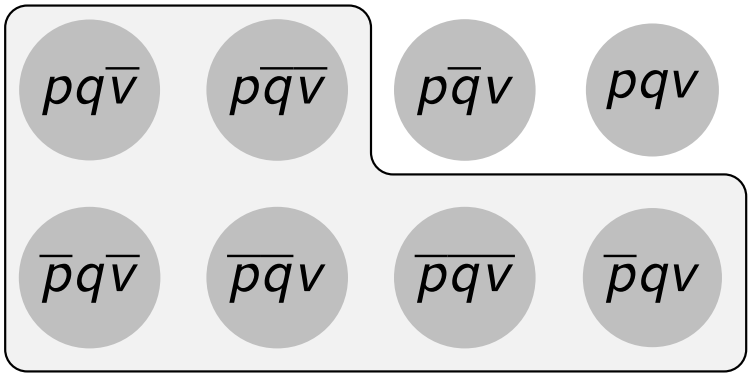
(35) $\lfloor \overline{p} \rightarrow v \rfloor$

Strengthening the Antecedent

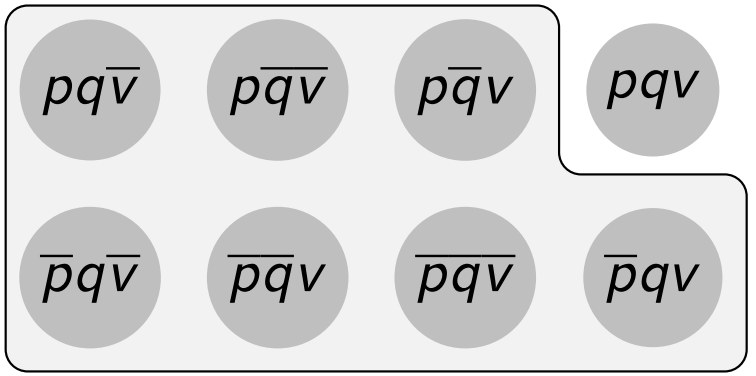
Example

(16) A man walked his dog and killed the president.

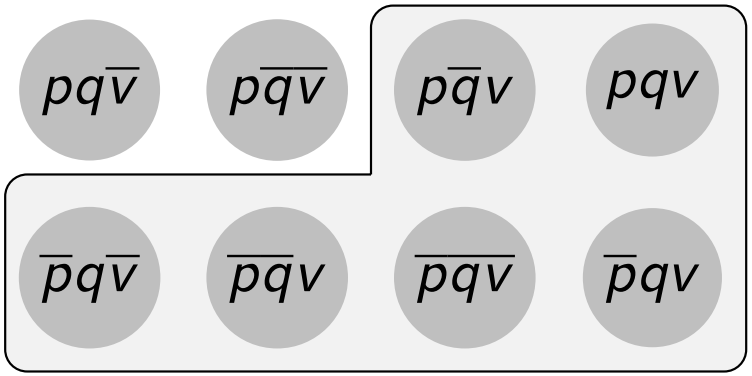
Strengthening the Antecedent



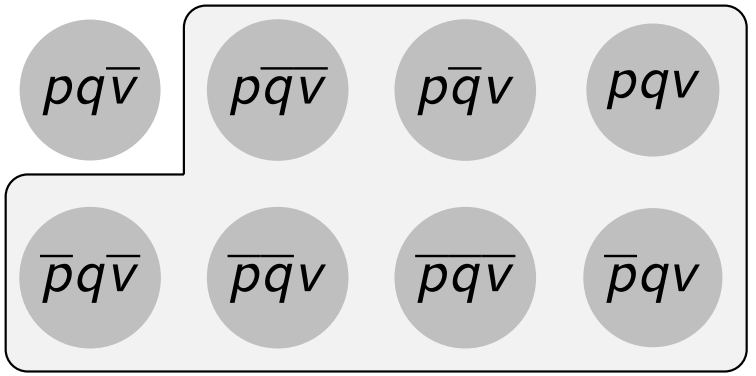
(36) $\lceil \Diamond p \rceil$



(38) $\lceil \Diamond(p \wedge q) \rceil$



(37) $\lfloor \Diamond p \rfloor$



(39) $\lfloor \Diamond(p \wedge q) \rfloor$

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Proposition v.

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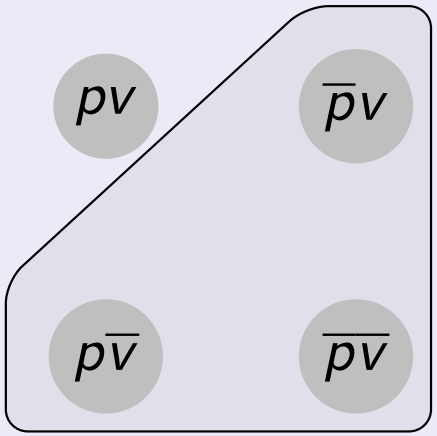
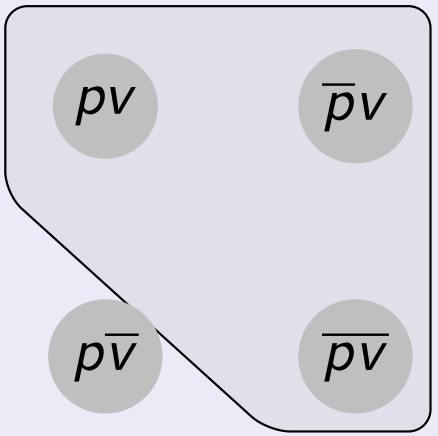


(40) $\lceil\Diamond p\rceil$



(41) $\lfloor\Diamond p\rfloor$