

1. Scope

In $P \wedge (Q \vee R)$:

- The scope of \wedge is $P \wedge (Q \vee R)$.
- The scope of \vee is $Q \vee R$.
- \wedge has wide scope, \vee has narrow scope.

In $(P \wedge Q) \vee R$:

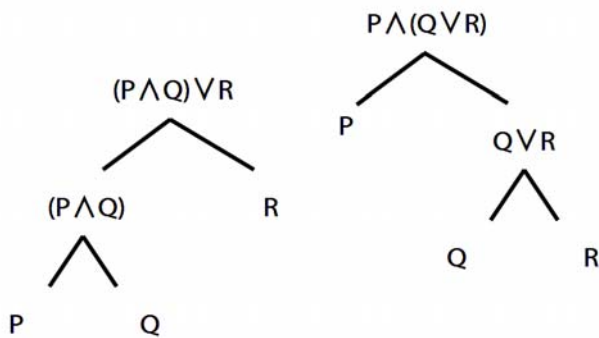
- The scope of \wedge is $(P \wedge Q)$.
- The scope of \vee is $(P \wedge Q) \vee R$.
- \vee has wide scope, \wedge has narrow scope.

Scope is defined in terms of the structure of sentences (where the structure is given by the rules for constructing sentences). You don't need to know how to define scope only that it can be defined.

We can describe how to generate complex truth tables from simple truth tables using scope.

Rules:

1. If * and # are sentences, then $(* \wedge \#)$ is a sentence
2. If * and # are sentences, then $(* \vee \#)$ is a sentence



P	Q	R	$(P \wedge Q) \vee R$	$P \wedge (Q \vee R)$
T	T	T	T	T
T	T	F	T	T
T	F	T	T	T
T	F	F	F	F
F	T	T	T	F
F	T	F	F	F
F	F	T	T	F
F	F	F	F	F

2. Definitions

Read §§4.1–3, then look up & ponder definitions in the glossary for:

- logical possibility
- logical truth
- logical equivalence
- tautology

3. Proof

Example #1

	1. $P \wedge Q$	
	2. $Q \wedge R$	
	3. P	\wedge Elim: 1
	4. R	\wedge Elim: 2
	5. $P \wedge R$	\wedge Intro: 3,4

Example #2

	1. $P \wedge Q$	
	2. P	\wedge Elim: 1
	3. $P \vee Q$	\vee Intro: 2

Example #3

	1. $P \vee Q$			
		2. P		
		3. $Q \vee P$	\vee Intro: 1	
			4. Q	
			5. $Q \vee P$	\vee Intro: 1
	6. $Q \vee P$	\vee Elim: 1, 2-3, 4-5		

Rules for \wedge

\wedge Elim:

$$\left| \begin{array}{l} P1 \wedge P2 \wedge P3 \wedge \dots \\ \dots \\ P_i \end{array} \right.$$

\wedge Intro:

$$\left| \begin{array}{l} P1 \\ \dots \\ P2 \\ \dots \\ P1 \wedge P2 \end{array} \right.$$

Rules for \vee

\vee Intro:

$$\left| \begin{array}{l} P_i \\ \dots \\ P1 \vee P2 \vee \dots \vee P_i \vee \dots \end{array} \right.$$

\vee Elim

$$\left| \begin{array}{l} P1 \vee P2 \vee \dots \vee P_n \\ \hline \left| \begin{array}{l} P1 \\ \dots \\ S \end{array} \right. \\ \dots \\ \left| \begin{array}{l} P_n \\ \dots \\ S \end{array} \right. \\ \hline 8. S \end{array} \right.$$