

## Main Connectives

## 1. Translating Complex Propositions

Select a convenient translation lexicon, and rewrite these propositions in PL. (Of course, you may use  $P$ ,  $Q$ , and so on.) Remember to identify the atomic propositions first and to mark the logical connectives. Use brackets to avoid ambiguities.

- (a) If it is not the case that either  $\overset{P}{\text{cats are smart}}$  or  $\overset{Q}{\text{dogs are dumb}}$ , then cats are not smart and dogs are not dumb.

$$\sim(P \vee Q) \supset \sim P \& \sim Q$$

- (b) If Locke is English but Hume is not then it is not true that both are English.

Locke - English :  $P$   
Hume - English :  $Q$

$$(P \& \sim Q) \supset \sim(P \& Q)$$

- (c) Either it is not the case that either Descartes likes wine or if he likes wine then he does not like ale, or it is not the case that he likes wine but not ale.

Descartes - wine :  $P$   
Descartes - ale :  $Q$

$$\sim(P \vee (P \supset \sim Q)) \vee \sim(P \& \sim Q)$$

- (d) It is neither the case that either virtue can be taught or the wise are happy, nor that the wise are unhappy if virtue cannot be taught or virtue cannot be taught if the wise are unhappy.

virtue - taught :  $P$   
wise - happy :  $Q$

$$\sim(P \vee Q) \& \sim((\sim P \supset \sim Q) \vee (\sim Q \supset \sim P))$$

$$\text{or: } \sim((P \vee Q) \vee ((\sim P \supset \sim Q) \vee (\sim Q \supset \sim P)))$$

- (e) Either the world is a dream or it is not. But if the world is a dream, then all my beliefs are false; and if the world is not a dream, then either my beliefs are false or not. And so all my beliefs are false.

world - dream :  $P$   
Beliefs - false :  $Q$

$$(P \vee \sim P) \& ((P \supset Q) \& (\sim P \supset (Q \vee \sim Q))) \& Q$$

Think about. Is the translation always unambiguous? How do you identify the main connective? Are there different ways to translate the propositions into PL? Are some of the connectives tacit?

## 2. Truth Tables

Truth tables are a very robust way to check under which conditions complex propositions are true. Remember, each line of a truth table represents a *possible situation* (or condition), and is thus an *evaluation* of that situation. So, the question is: under what conditions are these wff true, under which false? \*

(a)  $(P \vee Q) \vee ((\sim P \supset \sim Q) \& P)$  *neg connective: last*

P	Q	(1) $(P \vee Q)$	(4) $\vee$	(2) $(\sim P)$	(3) $(\sim Q)$	(3) $\&$	(3) $P$
T	T	T	T	F	F	T	T
T	F	T	T	F	T	T	T
F	T	F	T	T	F	F	F
* F	F	F	F	T	T	T	F

(b)  $(P \supset (Q \vee \sim P)) \& (\sim P \vee (\sim Q \supset \sim P))$  *neg connective*

P	Q	(2) $(P \supset (Q \vee \sim P))$	(1) $\&$	(5) $(\sim P \vee (\sim Q \supset \sim P))$	(4) $\vee$	(3) $(\sim Q \supset \sim P)$
T	T	T	T	T	T	F
* T	F	F	F	F	F	F
F	T	F	T	T	F	T
F	F	F	T	T	F	T

(c)  $((P \& Q) \supset (Q \vee \sim P)) \& (Q \vee \sim P) \& (P \& Q)$

P	Q	(1) $((P \& Q) \supset (Q \vee \sim P))$	(2) $\&$	(4) $(Q \vee \sim P)$	(3) $\&$	(6) $(P \& Q)$	(5) $\&$
T	T	T	T	T	T	T	T
* T	F	F	F	F	F	F	F
* F	T	F	T	T	T	F	F
* F	F	F	F	T	F	F	F

