Truth Tables

Exercises

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1. A simple argument

If Alan goes to work early then his wife Beatrix doesn't prepare breakfast. Alan didn't go to work. Therefore Beatrix made breakfast.

Proposition ..... A = Alan goes to work early

Proposition ..... B = Beatrix made breakfast

Material implication = (if A then not B) and not A therefore B.

(if A then ~ B) and ~ A -> B

A	B	(if A	then	~B)	and	~A	then	B
T	T		F	F	F	F	T	
T	F		T	T	F	F	T	
F	T		T	F	T	T	T	
F	F		T	T	T	T	F	

2. Advertising

A radio commercial states "If you're thinking of orange juice but you're not thinking of Orange Blossom, then you're just not thinking of orange juice". Is this a valid claim?
Proposition ..... O = thinking of orange juice
Proposition ..... B = thinking of orange blossom

If O and not B then not O

O	B	(If O	and	~ B)	then	not O
T	T		F	F		F
T	F		T	T		F
F	T		F	F		T
F	F		F	T		T

3 A familiar argument

If Thomas is not a goldsmith then John is not a merchant. Therefore Thomas is in fact a goldsmith because John is certainly a merchant.

Proposition T = Thomas is a goldsmith
Proposition J = John is a merchant

if (If ~ T then ~ J) and J then T

T	J	if	(if ~T	then	~ J)	and	J	then	T
T	T		F	T	F	T	T	T	T
T	F		F	T	T	F	F	T	T
F	T		T	F	F	F	T	T	F
F	F		T	T	T	F	F	T	F

4. Creepy Crawlies

If archnids have eight legs then crabs spin webs and scorpions live under water. Crabs do not spin webs. Therefore arachnids do not have eight legs.

Proposition A = arachnids have 8 legs
Proposition C = crabs spin webs
Proposition S scorpions live under water

if ((if A then (C and S)) and ~ C) then ~A

A	C	S	if ((if A	then	(C	and	S))	and	~C	then	~A
T	T	T		T		T		F	F	T	F
T	T	F		F		F		F	F	T	F
T	F	T		F		F		F	T	T	F
T	F	F		F		F		F	T	T	F
F	T	T		T		T		F	F	T	T
F	T	F		T		F		F	F	T	T
F	F	T		T		F		T	T	T	T
F	F	F		T		F		T	T	T	T