

## Logic Tutorial 1 Solutions

- a.  $t$
- b.  $t \wedge r$
- c.  $r \wedge \neg h$
- d.  $\neg r \wedge \neg h$
- e.  $\neg(r \wedge h)$
- f.  $r \rightarrow h$  or  $h \leftarrow r$
- g.  $r \rightarrow h$  or  $h \leftarrow r$
- h.  $h \rightarrow r$  or  $\neg(h \wedge \neg r)$
- i.  $r \leftrightarrow h$  or  $(r \rightarrow h) \wedge (h \rightarrow r)$
- j.  $\neg r \rightarrow \neg h$

In general

“P unless Q” is often translated to

“P if not Q”, i.e.

$\neg Q \rightarrow P$  or

$P \leftarrow \neg Q$ .

- k.  $\neg r \rightarrow \neg h$

- l.  $b \vee w$   
 $\neg(b \wedge w)$   
 $b \wedge w \rightarrow$   
 $l \wedge d \wedge c \rightarrow f \vee p$   
 $l \wedge d \wedge \neg c \rightarrow fa \wedge cr$

Alternatively the last two sentences can be formalised as:

$$l \wedge d \rightarrow (c \rightarrow f \vee p) \wedge (\neg c \rightarrow fa \wedge cr)$$

- m.

$$\begin{aligned} &A \wedge \neg B \rightarrow C \\ &B \rightarrow C \\ &C \rightarrow \neg(B \rightarrow A) \\ &A \vee B \vee C \end{aligned}$$

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