

1. Complete the following truth tables

(a)

p	q	$\sim q$	$p \vee \sim q$
T	T	F	T
T	F	T	T
F	T	F	F
F	F	T	T

(b)

p	q	$p \vee q$	$\sim (p \vee q)$
T	T	T	F
T	F	T	F
F	T	T	F
F	F	F	T

(c)

p	q	$p \rightarrow q$	$\sim (p \rightarrow q)$
T	T	T	F
T	F	F	T
F	T	T	F
F	F	T	F

(d)

p	q	$\sim p$	$\sim p \rightarrow q$
T	T	F	T
T	F	F	T
F	T	T	T
F	F	T	F

(e)

p	q	r	$\sim p$	$q \wedge r$	$\sim p \rightarrow (q \wedge r)$
T	T	T	F	T	T
T	T	F	F	F	T
T	F	T	F	F	T
T	F	F	F	F	T
F	T	T	T	T	T
F	T	F	T	F	F
F	F	T	T	F	F
F	F	F	T	F	F

2. Construct a truth table for each of the following statements.

(a) $(p \vee q) \wedge p$

p	q	$p \vee q$	$(p \vee q) \wedge p$
T	T	T	T
T	F	T	T
F	T	T	F
F	F	F	F

(b) $(p \wedge q) \rightarrow p$

p	q	$p \wedge q$	$(p \wedge q) \rightarrow p$
T	T	T	T
T	F	F	T
F	T	F	T
F	F	F	T

(c) $[(p \vee q) \wedge p] \rightarrow \sim q$

p	q	$p \vee q$	$(p \vee q) \wedge p$	$\sim q$	$[(p \vee q) \wedge p] \rightarrow \sim q$
T	T	T	T	F	F
T	F	T	T	T	T
F	T	T	F	F	T
F	F	F	F	T	T

(d) $(p \wedge q) \longleftrightarrow (p \vee q)$

p	q	$p \wedge q$	$p \vee q$	$(p \wedge q) \longleftrightarrow (p \vee q)$
T	T	T	T	T
T	F	F	T	F
F	T	F	T	F
F	F	F	F	T

(e) $(p \vee q) \rightarrow r$

p	q	r	$p \vee q$	$(p \vee q) \rightarrow r$
T	T	T	T	T
T	T	F	T	F
T	F	T	T	T
T	F	F	T	F
F	T	T	T	T
F	T	F	T	F
F	F	T	F	T
F	F	F	F	T

3. Determine if the two statements are equivalent by using truth tables:

(a) $(p \vee q) \wedge p$ and $q \wedge p$

p	q	$p \vee q$	$(p \vee q) \wedge p$
T	T	T	T
T	F	T	T
F	T	T	F
F	F	F	F

p	q	$p \wedge q$
T	T	T
T	F	F
F	T	F
F	F	F

No, the two are not equivalent.

(b) $p \rightarrow q$ and $q \rightarrow p$

p	q	$p \rightarrow q$
T	T	T
T	F	F
F	T	T
F	F	T

p	q	$q \rightarrow p$
T	T	T
T	F	T
F	T	F
F	F	T

No, the two are not equivalent.

(c) $p \rightarrow q$ and $\sim p \vee q$

p	q	$p \rightarrow q$
T	T	T
T	F	F
F	T	T
F	F	T

p	q	$\sim p$	$\sim p \vee q$
T	T	F	T
T	F	F	F
F	T	T	T
F	F	T	T

Yes, the two are equivalent.

(d) $p \rightarrow q$ and $\sim q \rightarrow \sim p$

p	q	$p \rightarrow q$
T	T	T
T	F	F
F	T	T
F	F	T

p	q	$\sim q$	$\sim p$	$\sim q \rightarrow \sim p$
T	T	F	F	T
T	F	T	F	F
F	T	F	T	T
F	F	T	T	T

Yes, the two are equivalent.