

Answers to Sample Questions

No calculator was used.

1. Let W mean *the wind is blowing*, P mean *Lara passes her exam* and H mean *Dad is happy*. Express the following statements symbolically, using the notation of propositional logic.

- (a) The wind is not blowing.

$$\sim W$$

- (b) Lara passes her exam or Dad is sad.

$$P \vee \sim H$$

- (c) Lara fails her exam and the wind is blowing.

$$\sim P \wedge W$$

- (d) If Lara passes her exam then Dad is happy.

$$P \rightarrow H$$

- (e) The wind is blowing if and only if Dad is sad.

$$W \leftrightarrow \sim H$$

2. Consider the compound proposition $(P \rightarrow Q) \leftrightarrow (P \wedge \sim Q)$.

- (a) Construct the truth table for the compound proposition.

P	Q	$\sim Q$	$P \rightarrow Q$	$P \wedge \sim Q$	$(P \rightarrow Q) \leftrightarrow (P \wedge \sim Q)$
T	F	T	T	F	F
T	T	F	F	T	F
F	T	T	T	F	F
F	F	F	T	F	F

- (b) Is this a tautology, a contradiction or a contingency? Give reasons for your answer.

The compound proposition is a contradiction, since only F appears in the last column.

3. Consider the compound proposition $P \vee Q \vee \sim R \rightarrow Q \wedge R$.

- (a) Construct the truth table for the compound proposition.

P	Q	R	$\sim R$	$\overbrace{P \vee Q \vee \sim R}^A$	$\overbrace{Q \wedge R}^B$	$A \rightarrow B$
T	T	T	F	T	T	T
T	T	F	T	T	F	F
T	F	T	F	T	F	F
T	F	F	T	T	F	F
F	T	T	F	T	T	T
F	T	F	T	T	F	F
F	F	T	F	F	F	T
F	F	F	T	T	F	F

(b) Is this a tautology, a contradiction or a contingency? Give reasons for your answer.

The compound proposition is a contingency, since both T and F appear in the last column.

4. Consider the compound proposition $P \wedge \sim Q \wedge R \rightarrow P \wedge (Q \vee R)$.

(a) Construct the truth table for the compound proposition.

P	Q	R	$\sim Q$	$Q \vee R$	$\overbrace{P \wedge \sim Q \wedge R}^A$	$\overbrace{P \wedge (Q \vee R)}^B$	$A \rightarrow B$
T	T	T	F	T	F	T	T
T	T	F	F	T	F	T	T
T	F	T	T	T	T	T	T
T	F	F	T	F	F	F	T
F	T	T	F	T	F	F	T
F	T	F	F	T	F	F	T
F	F	T	T	T	F	F	T
F	F	F	T	F	F	F	T

(b) Is this a tautology, a contradiction or a contingency? Give reasons for your answer.

The compound proposition is a tautology, since only T appears in the last column.