

Quiz 1 Solutions

CE16 W15

Larrabee

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1. How many rows appear in the truth table for $(p \wedge \neg q) \rightarrow q$?

There are two variables p and q , and each variable can either be 1 or 0. Therefore there are 2×2 different combinations. So, the answer is 4.

2. Complete the truth table for $(p \wedge \neg q) \rightarrow q$.

p	q	$\neg q$	$p \wedge \neg q$	$(p \wedge \neg q) \rightarrow q$
0	0	1	0	1
0	1	0	0	1
1	0	1	1	0
1	1	0	0	1

3. Verify the first De Morgan Law by showing that $\neg(p \wedge q) \equiv \neg p \vee \neg q$.

p	q	$p \wedge q$	$\neg(p \wedge q)$	$\neg p$	$\neg q$	$\neg p \vee \neg q$
0	0	0	1	1	1	1
0	1	0	1	1	0	1
1	0	0	1	0	1	1
1	1	1	0	0	0	0

The truth tables are the same. Therefore they are logically equivalent.

4. Show that $(p \rightarrow q) \rightarrow r$ and $p \rightarrow (q \rightarrow r)$ are not logically equivalent.

p	q	r	$p \rightarrow q$	$(p \rightarrow q) \rightarrow r$	$q \rightarrow r$	$p \rightarrow (q \rightarrow r)$
0	0	0	1	0	1	1
0	0	1	1	1	1	1
0	1	0	1	0	0	1
0	1	1	1	1	1	1
1	0	0	0	1	1	1
1	0	1	0	1	1	1
1	1	0	1	0	0	0
1	1	1	1	1	1	1

The truth tables are not the same. Therefore the two expressions are not logically equivalent.