

Example Given: $p \wedge q; q \rightarrow \sim(r \vee s)$
 Prove: $\sim r \wedge \sim s$

Proof:

Statements	Reasons
1. $p \wedge q$	1. Given
2. $q \wedge p$	2. Step 1 and Commutative Rule
3. q	3. Step 2 and Simplification
4. $q \rightarrow \sim(r \vee s)$	4. Given
5. $\sim(r \vee s)$	5. Steps 3 and 4 and Modus Ponens
6. $\sim r \wedge \sim s$	6. Step 5 and DeMorgan's Rule

Exercises

Supply the reasons to complete each proof.

1. Given: $a \rightarrow \sim b; b$
 Prove: $\sim a$

Statements

1. b
2. $\sim(\sim b)$
3. $a \rightarrow \sim b$
4. $\sim a$

2. Given: $a \vee (b \wedge c); \sim b$
 Prove: a

Statements

1. $a \vee (b \wedge c)$
2. $(a \vee b) \wedge (a \vee c)$
3. $a \vee b$
4. $b \vee a$
5. $\sim b$
6. a

Write two-column proofs for the following.

3. Given: $a \wedge (b \wedge c)$
 Prove: c

4. Given: $(p \wedge q) \rightarrow s; \sim s$
 Prove: $\sim p \vee \sim q$

5. Given: $p \vee \sim q; q$
 Prove: p

6. Given: $\sim q \rightarrow \sim p; q \rightarrow r; p$
 Prove: r

7. Given: $p \vee (q \wedge s)$
 Prove: $p \vee s$

8. Given: $t \vee (r \vee s); \sim r \wedge \sim s$
 Prove: t

Assume the given statements are true, symbolize the statements, and write a two-column proof.

9. If solid X is a cube, then it has twelve edges. If solid X is not a cube, then it does not have all square faces. Solid X has all square faces. Prove that solid X has twelve edges. (Use the letters c , t , and s .)
10. Pat loves me or Jean loves me. Pat sent me a valentine or Pat sent Kevin a valentine. If Pat sent me a valentine, I would have received it by now. If Pat sent Kevin a valentine, then Pat doesn't love me. I have received no valentines. Prove that Jean loves me. (Use the letters p , j , v , k , r .)