Exercises

Supply the reasons to complete each proof.

1. Given: $p \wedge q$; $p \rightarrow s$
Prove: s

Statements	
1. $p \wedge q$	
2. p	
3. $p \rightarrow s$	
4. s	

2. Given: $r \rightarrow s$; r; $s \rightarrow t$
Prove: t

Statements	
1. $r \rightarrow s$	
2. r	
3. s	
4. $s \rightarrow t$	
5. t	

Write two-column proofs for the following.

3. Given: $p \vee q$; $\sim p$; $q \rightarrow s$
Prove: s

4. Given: $a \rightarrow b$; $a \vee c$; $\sim b$
Prove: c

5. Given: $a \wedge b$; $a \rightarrow \sim c$; $c \vee d$
Prove: d

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

Symbolize the statements using the letters indicated, accept the statements as true, and write two-column proofs.

7. If Jorge wins the marathon, then he will receive a gold medal.
If Jorge receives a gold medal, then his country will be proud.
Jorge wins the marathon and Yolanda wins the javelin contest.
Prove that Jorge's country will be proud.

(Use the letter w for "Jorge wins the marathon," g for "Jorge receives a gold medal," p for "Jorge's country will be proud," and y for "Yolanda wins the javelin contest.")

8. The sides of $ABCD$ are not all the same length, and $ABCD$ is a plane figure. $ABCD$ is a square or a rectangle. If the sides of $ABCD$ are not all the same length, then it is not a square.

Prove that $ABCD$ is a rectangle. (Use the letters l, p, s, and r.)

Valid Arguments and Mistaken Premises

A statement whose truth table contains only Ts in the last column is called a *tautology*. An example is the disjunction $p \vee \sim p$ ("p or not p"). This is always true, no matter whether p is true (and $\sim p$ is false) or p is false (in which case $\sim p$ is true).

Tautology

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

Valid argument

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