

**Prove a & d** from the following premises  
 $a \mid b$   
 $c \mid d$   
 $\sim b \ \& \ \sim c$

**Goal: a & d**

**Intuition:** If you look carefully at the structure of this question, it is *very similar* to Fitch-Example1 where you had to prove  $q$  from the premises  $p \mid q$  and  $\sim p$ .

High-level Approach:  
 1. **AND Elimination** of  $\sim b \ \& \ \sim c$  results in  $b$  and  $c$ .  
 Note that this step makes the problem *look exactly* like two separate instance of Example-Fitch1  
 2. Use **OR Elimination** to prove  $a$  and  $d$  (similar to Example-Fitch1)  
   - Prove  $a \Rightarrow a$ ,  $b \Rightarrow a$  and then use OR Elimination with  $a \mid b$  to prove  $a$   
   - Prove  $d \Rightarrow d$ ,  $c \Rightarrow d$  and then use OR Elimination with  $c \mid d$  to prove  $d$   
 3. Use **AND Introduction** with  $a$  and  $d$  to prove the goal  $a \ \& \ d$ .

**Note** that again we have used Shortcuts in Steps 6 and 7 for display purposes. You **CANNOT USE SHORTCUTS** in problems - instead you have to plug in the proofs of  $a$  and  $d$ .

# Logica

*Tools  
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Show Instructions

## Fitch

<input type="checkbox"/> 1.	$a \mid b$	Premise
<input type="checkbox"/> 2.	$c \mid d$	Premise
<input type="checkbox"/> 3.	$\sim b \ \& \ \sim c$	Premise
<input type="checkbox"/> 4.	$\sim b$	And Elimination: 3
<input type="checkbox"/> 5.	$\sim c$	And Elimination: 3
<input type="checkbox"/> 6.	$a$	Fitch-Example1 $p=b$ , $q=a$
<input type="checkbox"/> 7.	$d$	Fitch-Example1 $p=c$ , $q=d$
<input type="checkbox"/> 8.	$a \ \& \ d$	And Introduction: 6, 7

Premise	Negation Introduction	Implication Introduction	Universal Introduction
Assumption	Negation Elimination	Implication Elimination	Universal Elimination
Reiteration	And Introduction	Biconditional Introduction	Existential Introduction
Shortcut	And Elimination	Biconditional Elimination	Existential Elimination
Delete	Or Introduction	Equality Introduction	
	Or Elimination	Equality Elimination	