	$\emptyset$	P^d	P^dQ	P^dQR^d	P^dQR^dS	P^dQR^dST	P^dQR^dSTU	P^dQR^dSTUV	$\neg R$	$\neg RT$	$\neg RT\neg U$
(1) $P \vee \neg Q \vee R$		1	1	1	1	1	1	1			
(2) $P \vee \neg T \vee \neg U \vee V$		1	1	1	1	1	1	1			1
(3) $P \vee \neg Q \vee \neg T \vee U \vee \neg V$		1	1	1	1	1	1	1		1	1
(4) $\neg P \vee Q$		u	1	1	1	1	1	1			
(5) $R \vee T$				1	1	1	1	1	unit	1	1
(6) $R \vee \neg U$				1	1	1	1	1	unit	unit	1
(7) $\neg R \vee S \vee \neg U \vee \neg V$					1	1	1	1			1
(8) $\neg R \vee S$				unit	1	1	1	1	1	1	1
(9) $\neg R \vee T$				unit	unit	1	1	1	1	1	1
(10) $\neg S \vee T \vee U \vee \neg V$							1	1		1	1
(11) $\neg T \vee U$						unit.	1	1		unit	0
(12) $\neg S \vee \neg T \vee \neg U \vee V$							unit	1			
(13) $\neg U \vee \neg V$							unit	0			
	decide	u.prop.	decide	unit prop	unit prop.	unit prop	unit prop	backjump.	unit prop	unit prop	fail (unsat). (no decision literals left).

↓ * explanations on next page.

Analyze conflict (cf. slides mop-logic3.pdf, page 42)

Conflict clause: $\neg U \vee \neg V$ false in $M = P^dQR^dSTUV$.

- Not true that every literal is the complement of a decision literal
- $\neg U \vee \neg V$, V deduced literal because of clause (12): $\neg S \vee \neg T \vee \neg U \vee V$.

Resolution step: $\dfrac{\neg S \vee \neg T \vee \neg U \vee V \qquad \neg U \vee \neg V}{\neg S \vee \neg T \vee \neg U}$ ← also false in M.

Last deduced literal: U, because of clause (11) $\neg T \vee U$

Resolution step: $\dfrac{\neg T \vee U \qquad \neg S \vee \neg T \vee \neg U}{\neg S \vee \neg T}$ ← also false in M.

Last deduced literal complem. to lit. occuring in this clause: T, because of clause (9) $\neg R \vee T$

Resolution step: $\dfrac{\neg R \vee T \qquad \neg S \vee \neg T}{\neg R \vee \neg S.}$ ← also false in M.

Last deduced literal complementary to literal occurring in this clause: S, added because of (8) $\neg R \vee S$

$\dfrac{\neg R \vee S \qquad \neg R \vee \neg S}{\neg R}$ ← false in M; every literal is complem. of a decision literal.

backjump: Cause of conflict is R^d (P^d is not a cause for the conflict) ↦ use $\neg R$ for backjump.

Backjump

cf. slides mop-logic3.pdf, page 41:

(*) $M, L^d, M_1 \| F, C \Rightarrow M, L' \| F, C$ if
- $M, L^d, M_1 \models \neg C$
- There is some clause $C' \vee L'$ such that:
  - $\rightarrow$ $F, C \models C' \vee L'$, $M \models \neg C'$
  - $\rightarrow$ L' undefined in M, L' or $\neg L'$ occurs in F

In the exercise we have: **Conflict clause** $C = \neg U \vee \neg V$. (13)

- $\underline{P}^d Q R^d S T U V \models \neg(\neg U \vee \neg V)$
- There is a clause **$C' \vee L' = \neg R$** such that the conditions in (*) are satisfied. (the **backjump clause** we computed before)

- $\begin{cases} C' = \{\} \text{ (the empty clause)} \\ L' = \neg R \end{cases}$
- $M = \phi$, $L^d = P^d$, we thus have $\underbrace{}_{M}\underbrace{P^d}_{L^d} \underbrace{Q R^d S T U V}_{M_1} \| \underbrace{\overbrace{N}^{\text{clauses (1)–(13)}}}_{F, C}$

  F, C: clauses (1)–(12) $\rightarrow F$; clause (13) $\rightarrow C$
- $F, C \models \underset{C' \vee R'}{\neg R}$ (because we derived $\neg R$ using resolution from clauses (1)–(13))
- $M \models \neg C'$ (because C' is the empty clause, so $\neg C'$ is equiv. to verum.)

With rule (*) we obtain:

$\underbrace{}_{M}\underbrace{P^d}_{L^d} \underbrace{Q R^d S T U V}_{M_1} \| N \Rightarrow \neg R \| N$.