

5.33 atleast1

	DESCRIPTION	LINKS
Origin	[331]	
Constraint	atleast1(SETS)	
Synonym	pair_atleast1.	
Argument	SETS : collection(s—svar, c—int)	
Restrictions	required(SETS, [s, c]) SETS.c ≥ 1	
Purpose	Given a collection of set variables s_1, s_2, \dots, s_n and their respective cardinality c_1, c_2, \dots, c_n , the atleast1 constraint enforces the following two conditions: <ul style="list-style-type: none"> • $\forall i \in [1, n] : s_i = c_i$, • $\forall i, j \in [1, n] (i < j) : s_i \cap s_j \leq 1$. 	
Example	$\left(\left\langle \begin{array}{ll} s - \{5, 8\} & c - 2, \\ s - \{5\} & c - 1, \\ s - \{5, 6, 7\} & c - 3, \\ s - \{1, 4\} & c - 2 \end{array} \right\rangle \right)$ <p>The atleast1 constraint holds since:</p> <ul style="list-style-type: none"> • $\{5, 8\} = 2, \{5\} = 1, \{5, 6, 7\} = 3, \{1, 4\} = 2$. • $\{5, 8\} \cap \{5\} \leq 1, \{5, 8\} \cap \{5, 6, 7\} \leq 1, \{5, 8\} \cap \{1, 4\} \leq 1,$ $\{5\} \cap \{5, 6, 7\} \leq 1, \{5\} \cap \{1, 4\} \leq 1,$ $\{5, 6, 7\} \cap \{1, 4\} \leq 1$. 	
Typical	SETS > 1	
Symmetries	<ul style="list-style-type: none"> • Items of SETS are permutable. • All occurrences of two distinct values of SETS.s can be swapped; all occurrences of a value of SETS.s can be renamed to any unused value. 	
Remark	When we have only two set variables the atleast1 constraint was called pair_atleast1 in [389].	
Algorithm	C. Bessière <i>et al.</i> have shown in [62] that it is NP-hard to enforce bound consistency for the atleast1 constraint. Consequently, following the first filtering algorithm from A. Sadler and C. Gervet [331], W.-J. van Hoes and A. Sabharwal have proposed an algorithm that enforces bound-consistency when the atleast1 constraint involves only two sets variables [389].	

Keywords

constraint arguments: constraint involving set variables.

constraint type: predefined constraint.

filtering: bound-consistency.