

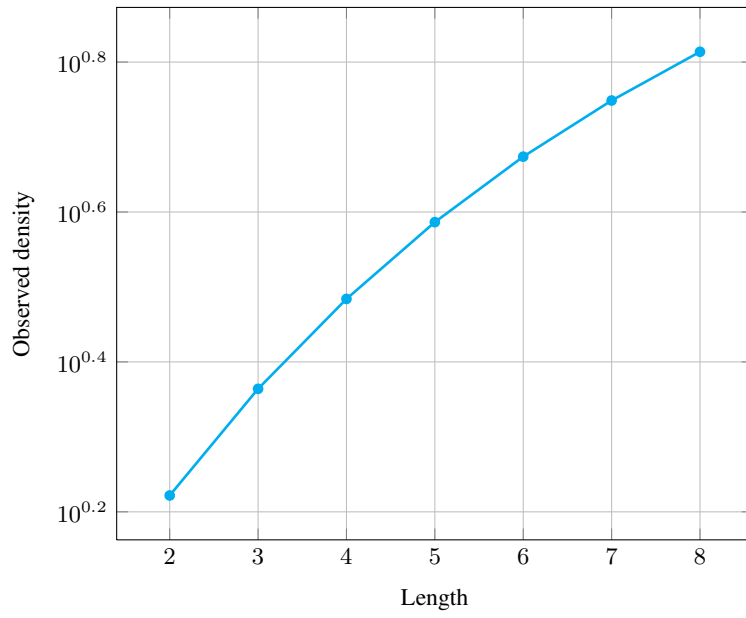
### 5.356 `soft_all_equal_max_var`

	DESCRIPTION	LINKS	GRAPH
<b>Origin</b>	[149]		
<b>Constraint</b>	<code>soft_all_equal_max_var(N, VARIABLES)</code>		
<b>Arguments</b>	N : <code>dvar</code> VARIABLES : <code>collection(var-dvar)</code>		
<b>Restrictions</b>	$N \geq 0$ $N \leq  \text{VARIABLES} $ <code>required(VARIABLES, var)</code>		
<b>Purpose</b>	<div style="border: 1px solid pink; padding: 5px;">           Let <math>M</math> be the number of occurrences of the most often assigned value to the variables of the VARIABLES collection. <math>N</math> is less than or equal to the total number of variables of the VARIABLES collection minus <math>M</math> (i.e., <math>N</math> is less than or equal to the minimum number of variables that need to be reassigned in order to obtain a solution where all variables are assigned a same value).         </div>		
<b>Example</b>	<div style="border: 1px solid blue; padding: 2px; display: inline-block;"> <math>(1, \langle 5, 1, 5, 5 \rangle)</math> </div> Within the collection $\langle 5, 1, 5, 5 \rangle$ , 3 is the number of occurrences of the most assigned value. Consequently, the <code>soft_all_equal_max_var</code> constraint holds since the argument $N = 1$ is less than or equal to the total number of variables 4 minus 3.		
<b>Typical</b>	$N > 0$ $N <  \text{VARIABLES} $ $N <  \text{VARIABLES} /10 + 2$ $ \text{VARIABLES}  > 1$		
<b>Symmetries</b>	<ul style="list-style-type: none"> <li>• <math>N</math> can be <code>decreased</code> to any value <math>\geq 0</math>.</li> <li>• Items of VARIABLES are <code>permutable</code>.</li> <li>• All occurrences of two distinct values of VARIABLES.var can be <code>swapped</code>; all occurrences of a value of VARIABLES.var can be <code>renamed</code> to any unused value.</li> </ul>		
<b>Algorithm</b>	[149].		
<b>Counting</b>			

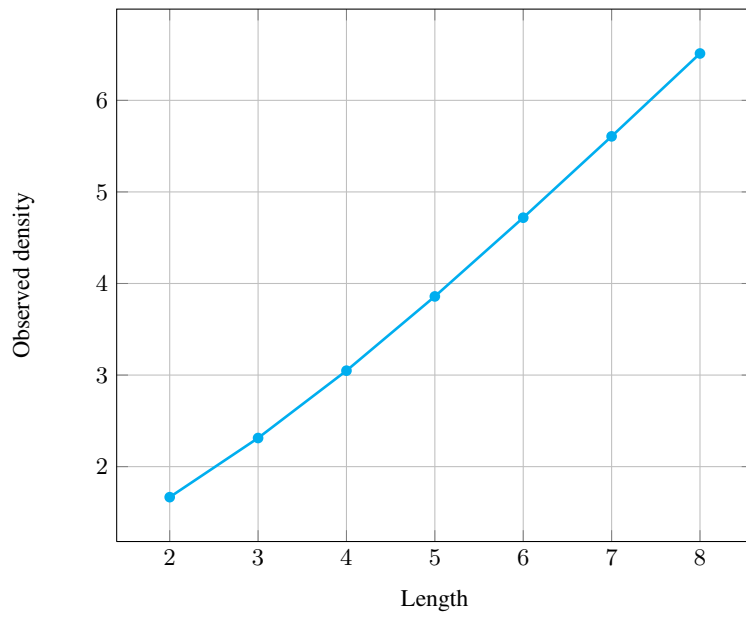
Length ( $n$ )	2	3	4	5	6	7	8
Solutions	15	148	1905	30006	555121	11758048	280310337

Number of solutions for `soft_all_equal_max_var`: domains  $0..n$

Solution density for soft\_all\_equal\_max\_var

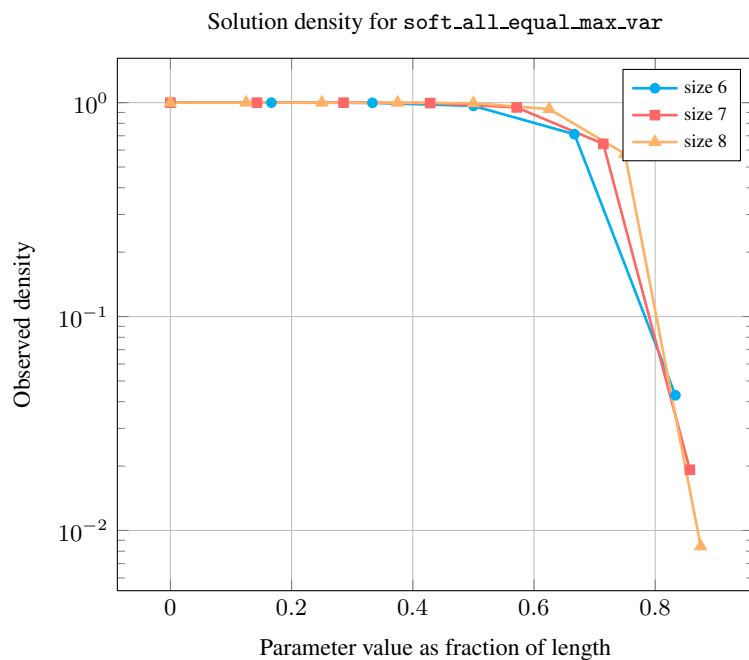


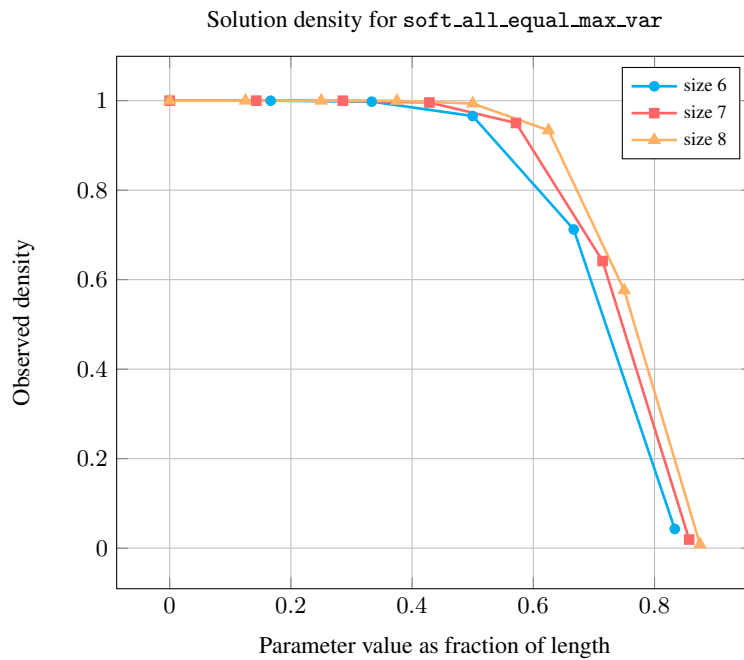
Solution density for soft\_all\_equal\_max\_var



Length ( $n$ )		2	3	4	5	6	7	8
Total		15	148	1905	30006	555121	11758048	280310337
Parameter value	0	9	64	625	7776	117649	2097152	43046721
	1	6	60	620	7770	117642	2097144	43046712
	2	-	24	540	7620	117390	2096752	43046136
	3	-	-	120	6120	113610	2088520	43030008
	4	-	-	-	720	83790	1992480	42771960
	5	-	-	-	-	5040	1345680	40194000
	6	-	-	-	-	-	40320	24811920
	7	-	-	-	-	-	-	362880

Solution count for soft\_all\_equal\_max\_var: domains 0.. $n$



**See also**

**common keyword:** `soft_all_equal_min_ctr`, `soft_all_equal_min_var`, `soft_alldifferent_ctr`, `soft_alldifferent_var` (*soft constraint*).

**hard version:** `all_equal`.

**implied by:** `xor`.

**related:** `atmost_nvalue`.

**Keywords**

**constraint type:** `soft constraint`, `value constraint`, `relaxation`, `variable-based violation measure`.

**filtering:** `arc-consistency`, `bound-consistency`.

<b>Arc input(s)</b>	VARIABLES
<b>Arc generator</b>	<i>CLIQUE</i> $\mapsto$ <code>collection(variables1, variables2)</code>
<b>Arc arity</b>	2
<b>Arc constraint(s)</b>	<code>variables1.var = variables2.var</code>
<b>Graph property(ies)</b>	<u>MAX_NSCC</u> $\leq$  VARIABLES  - N

**Graph model**

We generate an initial graph with binary *equalities* constraints between each vertex and its successors. The graph property states that N is less than or equal to the difference between the total number of vertices of the initial graph and the number of vertices of the largest strongly connected component of the final graph.

Parts (A) and (B) of Figure 5.697 respectively show the initial and final graph associated with the **Example** slot. Since we use the MAX\_NSCC graph property we show one of the largest strongly connected components of the final graph.

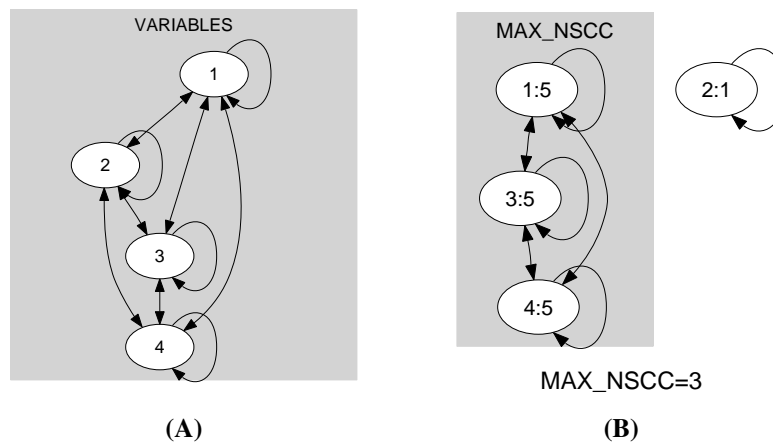


Figure 5.697: Initial and final graph of the `soft_all_equal_max_var` constraint

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