

## 5.319 period

	DESCRIPTION	LINKS
<b>Origin</b>	N. Beldiceanu	
<b>Constraint</b>	period(PERIOD, VARIABLES, CTR)	
<b>Arguments</b>	PERIOD : <a href="#">dvar</a> VARIABLES : <a href="#">collection(var-dvar)</a> CTR : <a href="#">atom</a>	
<b>Restrictions</b>	PERIOD $\geq 1$ PERIOD $\leq  \text{VARIABLES} $ <a href="#">required</a> (VARIABLES, var) CTR $\in [=, \neq, <, \geq, >, \leq]$	
<b>Purpose</b>	Let us note $V_0, V_1, \dots, V_{m-1}$ the variables of the VARIABLES collection. PERIOD is the <i>period</i> of the sequence $V_0 V_1 \dots V_{m-1}$ according to constraint CTR. This means that PERIOD is the smallest natural number such that $V_i \text{ CTR } V_{i+\text{PERIOD}}$ holds for all $i \in \{0, 1, \dots, m - \text{PERIOD} - 1\}$ .	
<b>Example</b>	$(3, \langle 1, 1, 4, 1, 1, 4, 1, 1 \rangle, =)$	
	The period constraint holds since, as depicted by Figure 5.649, its first argument PERIOD = 3 is equal (i.e., since CTR is set to =) to the period of the sequence 1 1 4 1 1 4 1 1.	
		
	Figure 5.649: A sequence of period 3	
<b>Typical</b>	PERIOD $> 1$ PERIOD $<  \text{VARIABLES} $ $ \text{VARIABLES}  > 2$ <a href="#">range</a> (VARIABLES.var) $> 1$ CTR $\in [=]$	
<b>Symmetries</b>	<ul style="list-style-type: none"> <li>Items of VARIABLES can be <a href="#">reversed</a>.</li> <li>Items of VARIABLES can be <a href="#">shifted</a>.</li> <li>All occurrences of two distinct values of VARIABLES.var can be <a href="#">swapped</a>; all occurrences of a value of VARIABLES.var can be <a href="#">renamed</a> to any unused value.</li> </ul>	

**Arg. properties**

- **Functional dependency**: PERIOD determined by VARIABLES and CTR.
- **Contractible** wrt. VARIABLES when  $CTR \in [=]$  and PERIOD = 1.
- **Prefix-contractible** wrt. VARIABLES.
- **Suffix-contractible** wrt. VARIABLES.

**Algorithm**

When CTR corresponds to the equality constraint, a potentially incomplete filtering algorithm based on 13 deductions rules is described in [54]. The generalisation of these rules to the case where CTR is not the equality constraint is discussed.

**See also**

**generalisation**: `period_vectors` (variable replaced by *vector*).  
**implies**: `period_except_0`.  
**soft variant**: `period_except_0` (value 0 can match any other value).

**Keywords**

**combinatorial object**: periodic, sequence.  
**constraint arguments**: pure functional dependency.  
**constraint type**: predefined constraint, timetabling constraint, scheduling constraint.  
**filtering**: border.  
**modelling**: functional dependency.