

## Directed Graphs

$$G = (V, E)$$

$V$  is a set of vertices (an underlying set of elements)

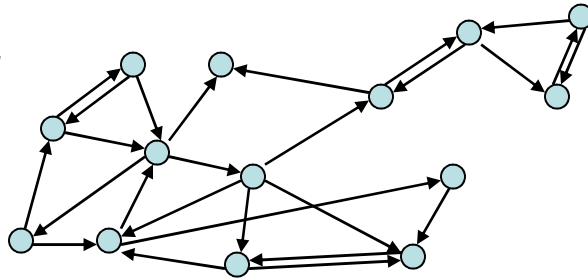
$E$  is a set of edges (ordered pairs of vertices; i.e. connections from one to the next).

**Path**  $v_0, v_1, \dots, v_k$  such that  $(v_i, v_{i+1}) \in E$

**Simple Path**: path with all  $v_i$  distinct

**Cycle**: path with  $v_0 = v_k$  (and  $k > 0$ )

**Simple Cycle**: simple path plus edge  $(v_k, v_0)$  with  $k > 0$



## Relations and Graphs

Describe how each property will show up in the graph of a relation.

Reflexive

Symmetric

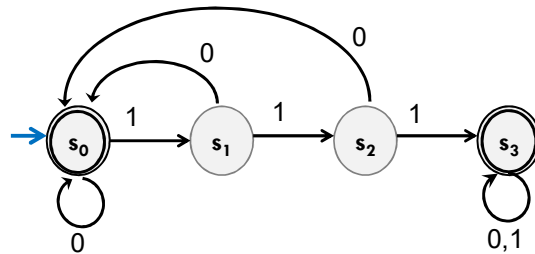
Antisymmetric

Transitive

## Deterministic Finite Automata

What is the language of this DFA?  
I.e. the set of all strings it accepts?

Old State	0	1
$s_0$	$s_0$	$s_1$
$s_1$	$s_0$	$s_2$
$s_2$	$s_0$	$s_3$
$s_3$	$s_3$	$s_3$



## Design some DFAs

Let  $\Sigma = \{0,1,2\}$

$M_1$  should recognize "strings with an even number of 2's.

What do you need to remember?

$M_2$  should recognize "strings where the sum of the digits is congruent to 0 (mod 3)"