{} # set
() # tuple

$G = (V, E) = (\{1, 2, 3, 4\}, \{(1, 2), (2, 3), (3, 4), (4, 5)\})$
$G = (\{0, 1,... n - 1\}, \{\{i,\ i + 1\} \mid for\ 0 \le i \le n - 2\} \cup \{\{n - 1, 0\}\} \cup$
$\{\{i, i + \frac{n}{2}\} | for\ 0 \le i \le \frac{n}{2} - 1\})$
R is reflexive if xRx (R is an operation)
R is symmetric if $xRy \Leftrightarrow yRx$
R is transitive if $xRy\ \&\ yRz \Leftrightarrow xRz$

$\delta: Q \times Z \rightarrow Q$ # transition function; $\delta(x, 1) = y$ # from state x, on input 1, to state y
$\delta: Q \times Z \cup \{\epsilon\} \rightarrow P(Q)$ # Nondeterministic
$\delta(q, a) = \{\emptyset,\ q = q_0\ and\ a \ne \epsilon\}$

M=$(Q\ (states;\ set),\ \sum\ (alphabet;\ set),\ \delta,\ q_0 \in Q,\ F \subseteq Q\ (accept\ states;\ set))$ # Finite automaton

$Q = \{q_1, q_2, q_3\};\ \sum = \{0, 1\};\ \delta(\{q_1: [q_1, q_2],\ q_2: [q_3, q_2], q_3: [q_2, q_2]\});\ q_0 = q_1;\ F = \{q_2\}$
L(M)=A # Language of machine M is the alphabet it accepts;
M recognizes language A if $A = \{w | M\ accepts\ w\}$
$A = \{w | w\ contains\ 1\ \&\ even\ number\ of\ 0s\ follow\ the\ last\ 1\}$. Is a regular language if some M accepts it.
M accepts ε (empty string) if $q_0 \in F$

Modulo counter: $B_i = (Q_i = \{q_0,..., q_{i-1}\}, \sum, \delta, q_0, \{q_0\})$

$\delta(q_j, 0) = q_j$
$\delta(q_j, 1) = q_k,\ where\ k = (j + 1)\%i$
$\delta(q_j, 2) = q_k,\ where\ k = (j + 2)\%i$
$\delta(q_j, < RESET >) = q_o$

$M\ accepts\ w\ if:\ r_0,... r_n\ states\ exist\ in\ Q\ with\ condition:\ r_0 = q_0$
$\delta(r_i, w_{i+1}) = r_{i+1},\ for\ i = 0,... n - 1$
$r_n \in F$
$A \cup B = \{x | x \in A\ ||\ x \in B\}$
$A \circ B = \{xy | x \in A\ \&\&\ y \in B\}$
$A * = \{x_1 ... x_k | k \ge 0\ \&\&\ x_i \in A\}$ # all possible (repeated) permutations of the alphabet, including ε

$P(Q) = \{R | R \subseteq Q\}\ \#\ all\ possible\ subsets,\ power\ set.\ |P| = 2^{|Q|}$

R is Regular expression if: $a\ (\in Z) \cup \epsilon \cup \emptyset \cup (R_1 \cup R_2) \cup (R_1 \circ R_2) \cup R_1^*$

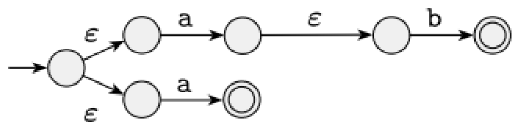
$0 * 1 \sum 0 *= \{w | w\ contains\ single\ or\ two\ 1\}$

a

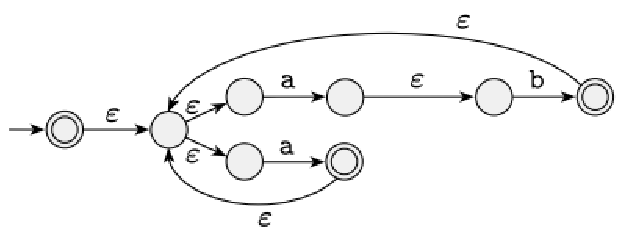
b

ab

ab ∪ a



(ab ∪ a)*



GNFA (no arrows to start or from end. all others are interconnected)

$s \in A,\ |s| \geq p,\ s = xyz \Rightarrow i \geq 0,\ xy^{i}z \in A,\ |y| > 0,\ |xy| \leq p$ # Pumping lemma

$(V\ (variables),\ \sum\ (terminals),\ R\ (rules),\ S\ (start\ var)),\ V \cap \sum = \emptyset$ # Context-free-grammar