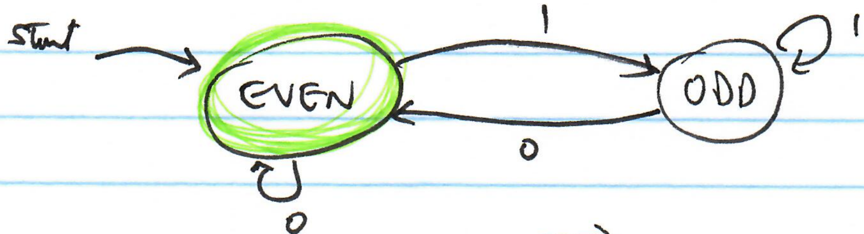
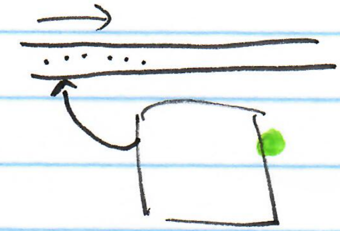
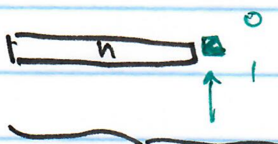
FSM Even integers in binary (L to R)





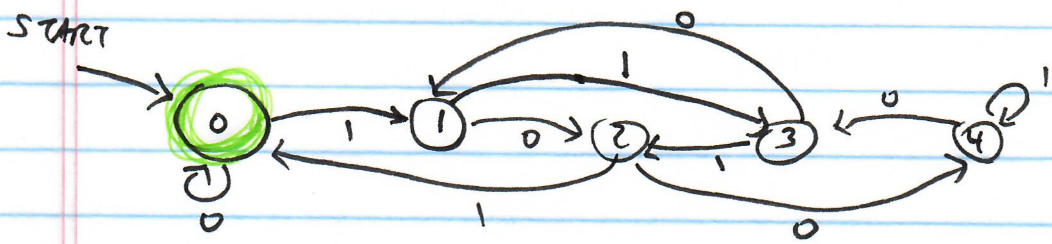
Multiples of 5 in binary

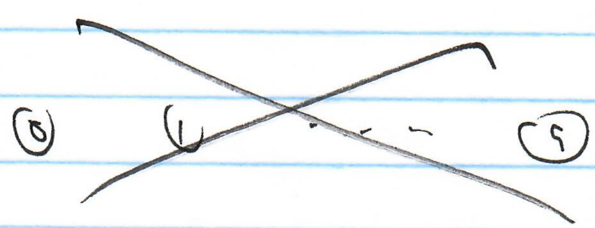


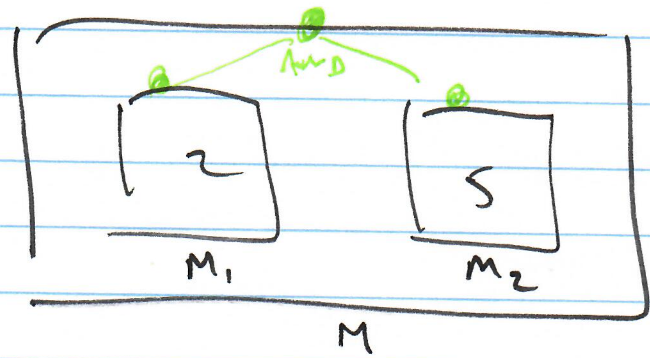
n mod 5 = remainder when n is divided by 5

2n +0 — remainder doubles

+1 — doubles, +1







F.S.M. $(\Sigma, S, s_0, F, \delta)$

$M_1 = (\{0,1\}, S, s_0, F_1, \delta_1)$

$M_2 = (\{0,1\}, T, t_0, F_2, \delta_2)$

$L(M)$ = set of strings "ACCEPTED" by FSM M

$M = (\{0,1\},$

states $S \times T$ set of pairs (a,b) $a \in S$, $b \in T$

start (s_0, t_0)

final $F_1 \times F_2$ (a,b) $a \in F_1$, $b \in F_2$

~~transition~~ $\delta : \underline{S \times T \times \Sigma} \longrightarrow \underline{S \times T}$

$)$

$$\delta(\underset{\in S}{a}, \underset{\in T}{b}, \underset{\in \Sigma}{x}) = (\delta_1(a,x), \delta_2(b,x))$$

$L(M) = L(M_1) \cap L(M_2)$ CLOSURE

$\cup$ $F_1 \times S \cup T \times F_2$

OOPS!

A language recognized by a FSM is called REGULAR

Thm Even integers in binary are regular

Thm Multiples of 5 in binary are regular

Cor Multiples of 10 in binary are regular

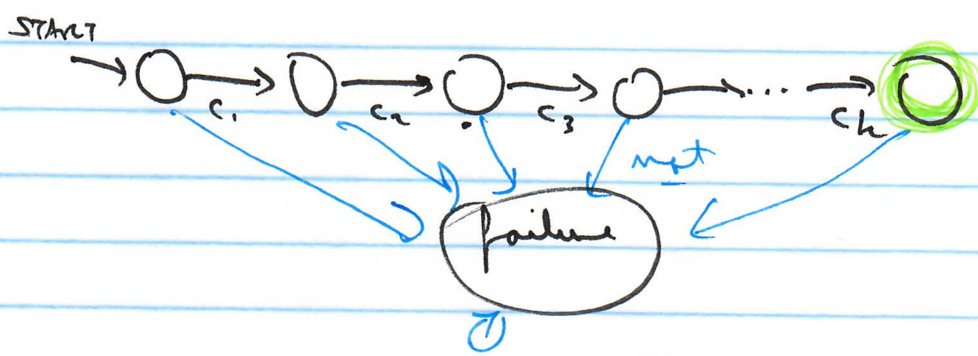
Thm If L_1 and L_2 are regular, then
$L_1 \cap L_2$ is regular
$L_1 \cup L_2$ is regular

CLOSURE

Thm Any finite set is regular

Thm If L contains of one string, L is regular

$c_1 c_2 c_3 \cdots c_k$



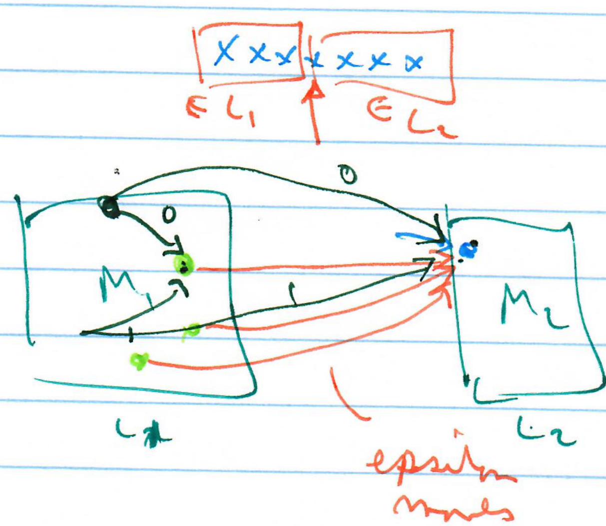
"Empty string"

ϵ

L_1, L_2

L_1 & L_2 are regular

$\underbrace{L_1 L_2}_{\{xy \mid x \in L_1,\ y \in L_2\}}$ is regular



$P \stackrel{?}{=} NP$