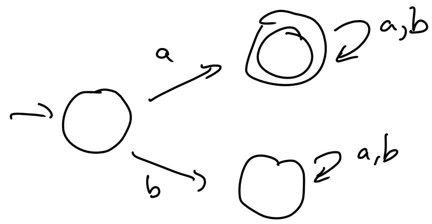
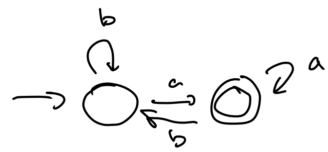
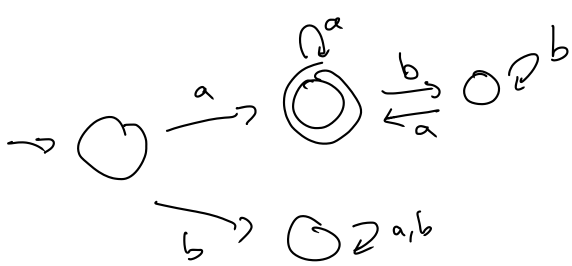
A DFA to accept any string starting with a



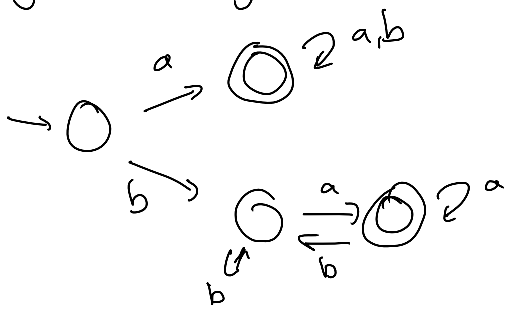
"ending with a"



Accepting any string starting & ending with a.

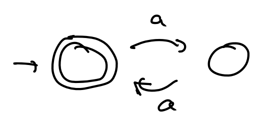


Starting or ending with a

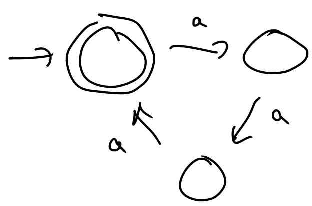


What types of languages can be accepted by a DFA?

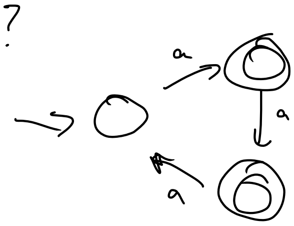
on $\Sigma = \{a\}$, we can do all even length strings



how about lengths div. by 3?



how about <u>not</u> div. by 3?



divisibility is generally easy to handle.

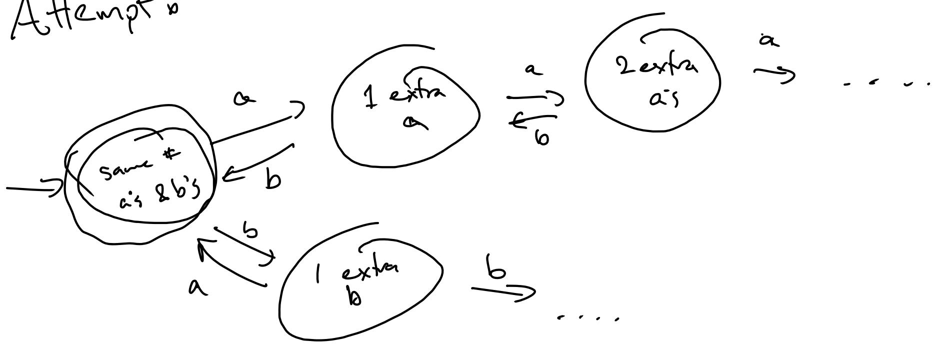
A DFA which accepts when length is prime.

(Not possible with a DFA)

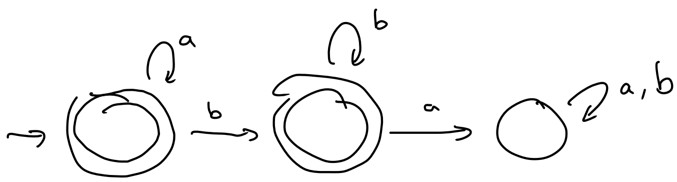
on $\Sigma = \{a, b\}$, accept any string where
# of a's = # of b's

impossible by a DFA.

Attempt:



This requires ∞-ly many states, so it's not a DFA.



what is the language of this DFA?

a ✓
b ✓
ab ✓
ba ✗

abbb ✓
abba ✗
baba ✗

a bunch of a's followed by a bunch of b's

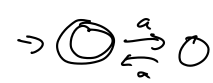
$\{a^n b^m \mid n, m \in \mathbb{N}\}$

"The language of the DFA"

If the DFA is called M,

$$L(M) = \{ x \in \Sigma^* \mid x \text{ is accepted by } M \}$$

<u>Def</u> A language L is called <u>regular</u> if $\exists$ a DFA M such that $L = L(M)$

So $\{ x \in \{a\}^* \mid |x| \text{ is even} \}$ <u>is</u> a regular language since it's the lang. of 

$\{ axa \mid x \in \{a,b\}^* \}$ is a regular lang. (we make a DFA for it)

$\{ x \in \{a,b\}^* \mid \#\text{ of } a\text{'s} = \#\text{ of } b\text{'s} \}$ is not a regular language since no possible DFA has this language. (<u>Hard</u> to prove)

An interesting math DFA on $\Sigma = \{0, 1\}$

about binary #s:

decimal	binary
0	0
1	1
2	10
3	11
4	100
5	101
6	110
7	111
8	1000
9	1001
10	1010
11	1011

A DFA which reads a string on $\{0,1\}$, accepts when the # is divisible by 3.

1010111001101

A DFA can do this with 3 states!