

A non-regular language.

$\{0^i 1^j \mid i \geq 0\}$

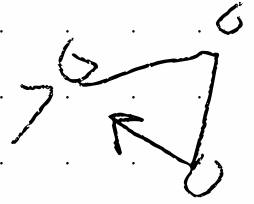
$b^0 a b^0 a b^0 a b^0$

Count 3

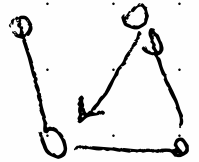
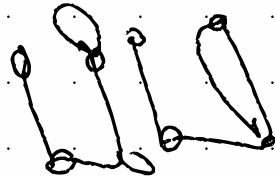
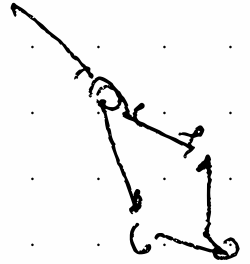
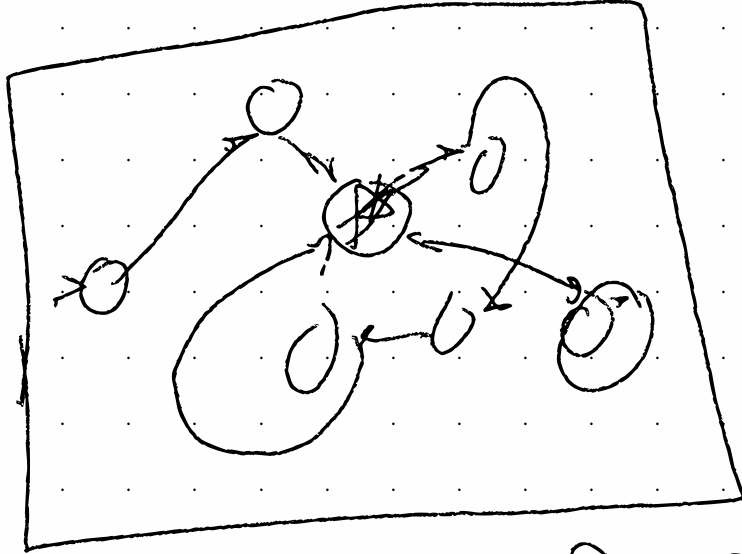
$b^0 (b^0 a b^0 a b^0 a)^2 b^0$

Count 3

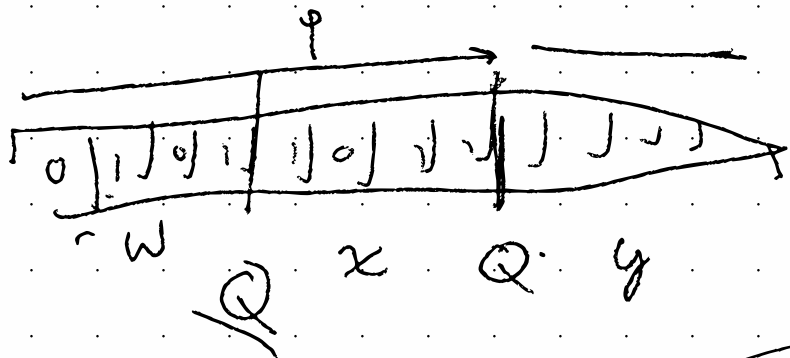
$0^2 / 0 \Rightarrow 0$



How  
states  
must  
repeat

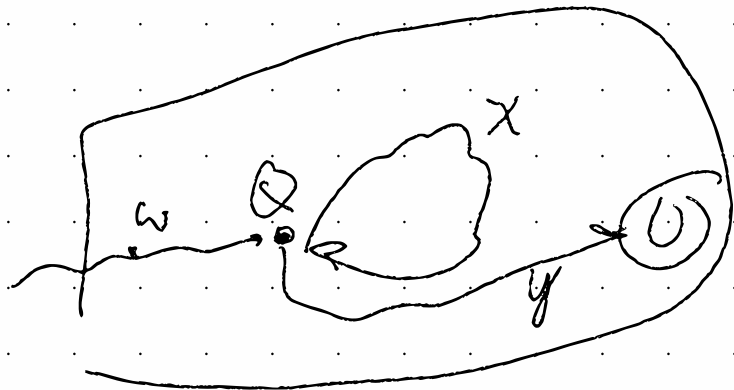


"X" repeats



$s \in L$   $|s|$  "long"

$$s = wxy$$



$\Rightarrow wx^i y \in L$

$\Rightarrow wx^m y \in L$

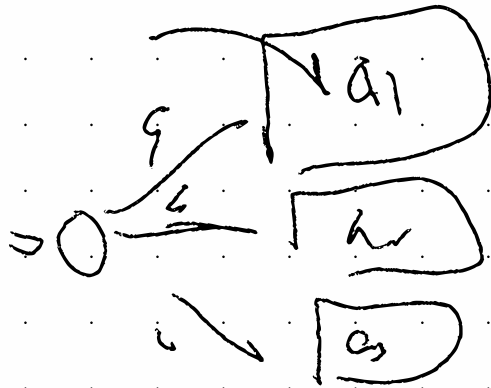
$\forall i \geq 0 \quad wx^i y \in L$   
= pumping =

If  $L$  is regular, all sufficiently  
long strings that are in the  
language, can be pumped

$\exists p \forall s \forall r \in A, |s| \geq p \exists x, y, z$   
s.t.  $s = xyz$  s.t.  $|y| \geq 1, \forall i, x^i y^i z^i \in A$

What about  $|L| < \infty$ .

Given  $L$ , it's regular iff  $\exists$   
an NFA, accepting exactly  $x \in L$ ,



$L = \{a_i\}$

00 00 - - - 0111 - - - )

(000)

0

(0011)

0

(111)

0

$$\forall xy^2z = 5,$$

$$y = \begin{cases} 0 \dots 0 \\ 0 \dots 11 \\ 1 \dots 11 \end{cases}$$

$$xy^2z \notin L$$