- Before looking at more examples (more algorithms, as turing machines) we will learn some concepts related to computation in general.

- A YES or NO problem (like the one we saw in the example) can be thought of as a 'language'.
- A 'language' of strings.
- For $0^n 1^n (n \geq 1)$, 01 is in the language.

i.e., $01 \in L$, $0010 \notin L$. L is a set of strings, that gives YES answer.

Examples:

1. Qn: Is the string of even length?

   Language: $\{00, \varepsilon, 0000, \ldots\}$

2. $A = \{0^{2^n} \mid n \geq 0\}$, i.e, 2^n zeroes.

   Qn: Is the string length a power of 2?

3. Is the given number prime?

   Set of prime numbers.

- A machine 'decides' a language means
  it says YES if input $w \in L$
  says NO if $w \notin L$
- Machine 'recognizes' a language:
  It says YES if input $\in L$

and does not say YES if input is not in L

• Language of stringth of even length:
can be checked using states alone,
reading the input symbols only once.
i.e., it can be done using a
'finite automata'.

• A turing machine can do much more!

- What explains 'where is the turing machine' (or computation) right now:
  - State
  - current contents on the tape
  - which is the 'current cell'.
- Called the 'configuration' or instantaneous description of a TM.

C_1: $q_0 1101$:

1	1	0	1

state: q_0

C_i: $10 q_1 x 01$:

1	0	x	0	1

q_1

If there is a move

$$\delta(q_1, x) = (q_2, 0, L)$$

The 'next' config is

1	0	0	0	1

q_2