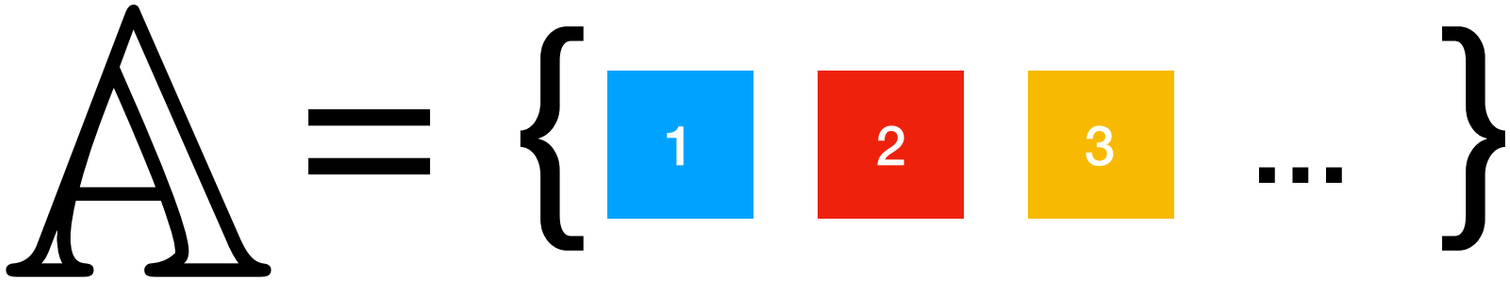
Single use register automata for data words

Mikołaj Bojańczyk
Rafał Stefański

Deterministic register automata

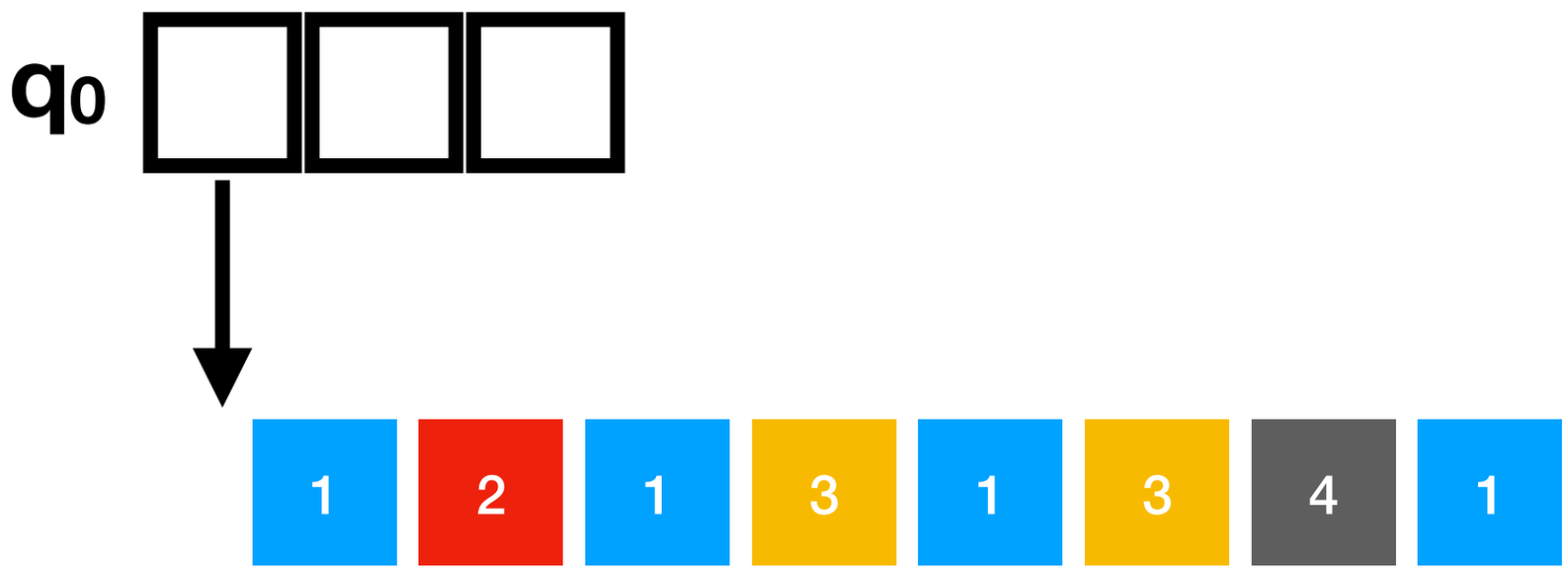


Deterministic register automata

There are at most 3 different letters in the input word

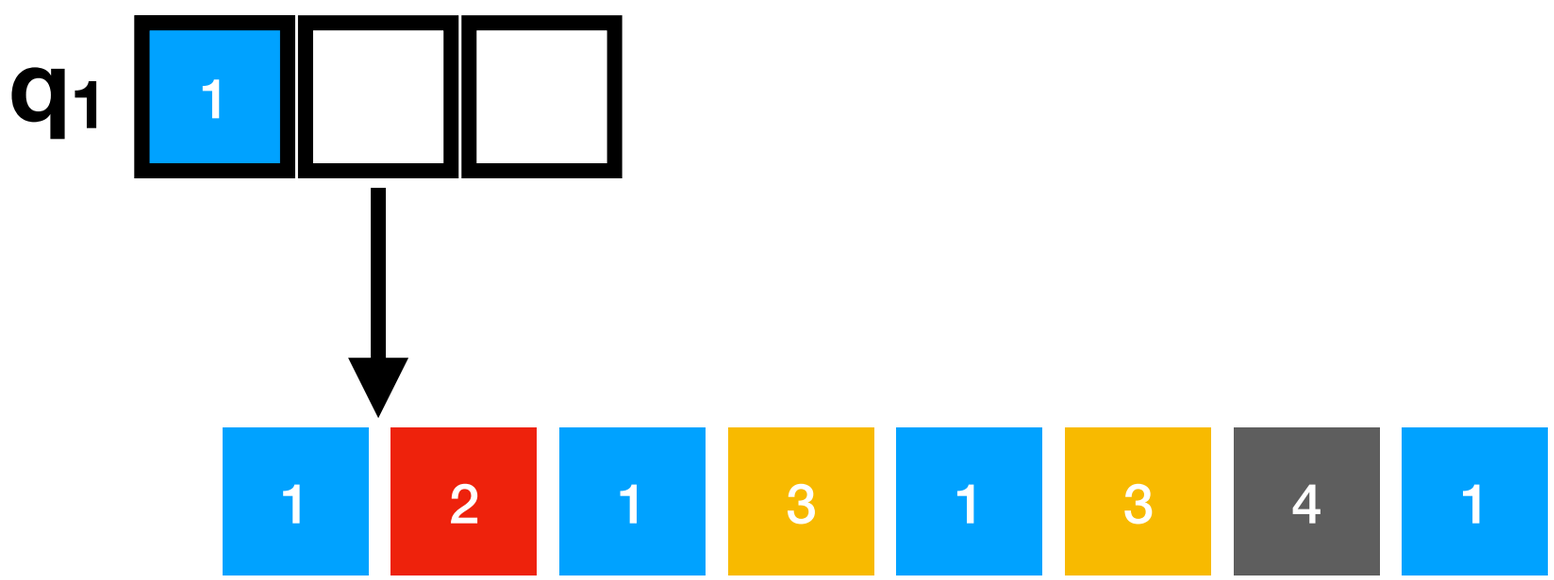
Deterministic register automata

There are at most 3 different letters in the input word



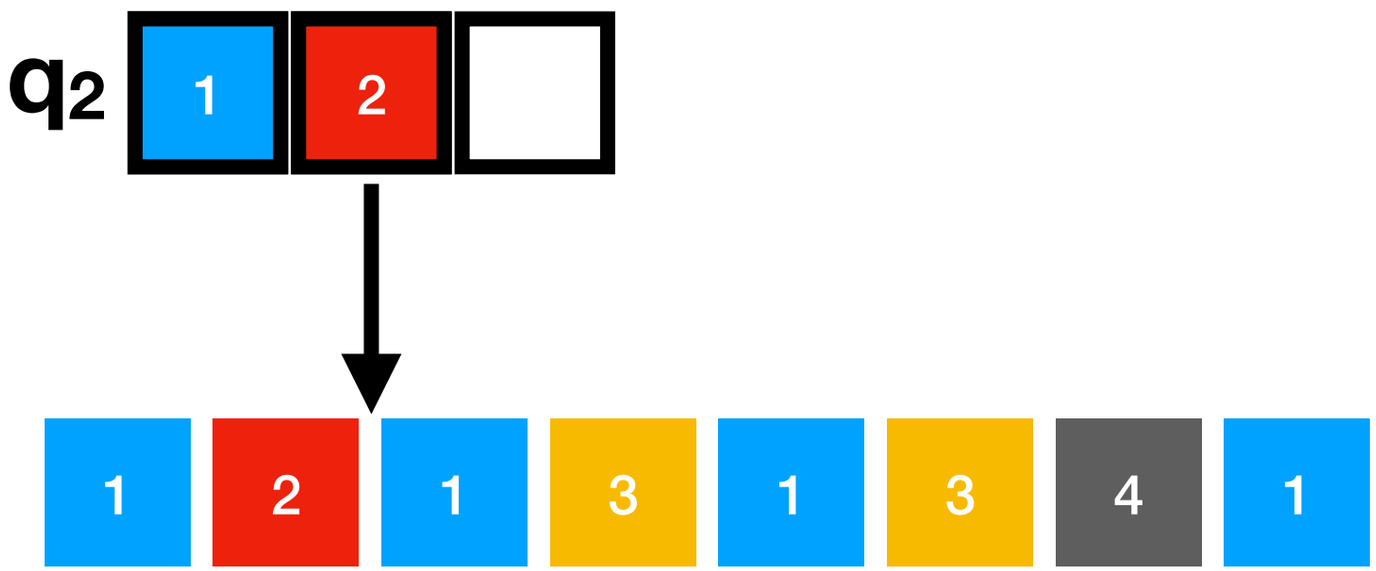
Deterministic register automata

There are at most 3 different letters in the input word



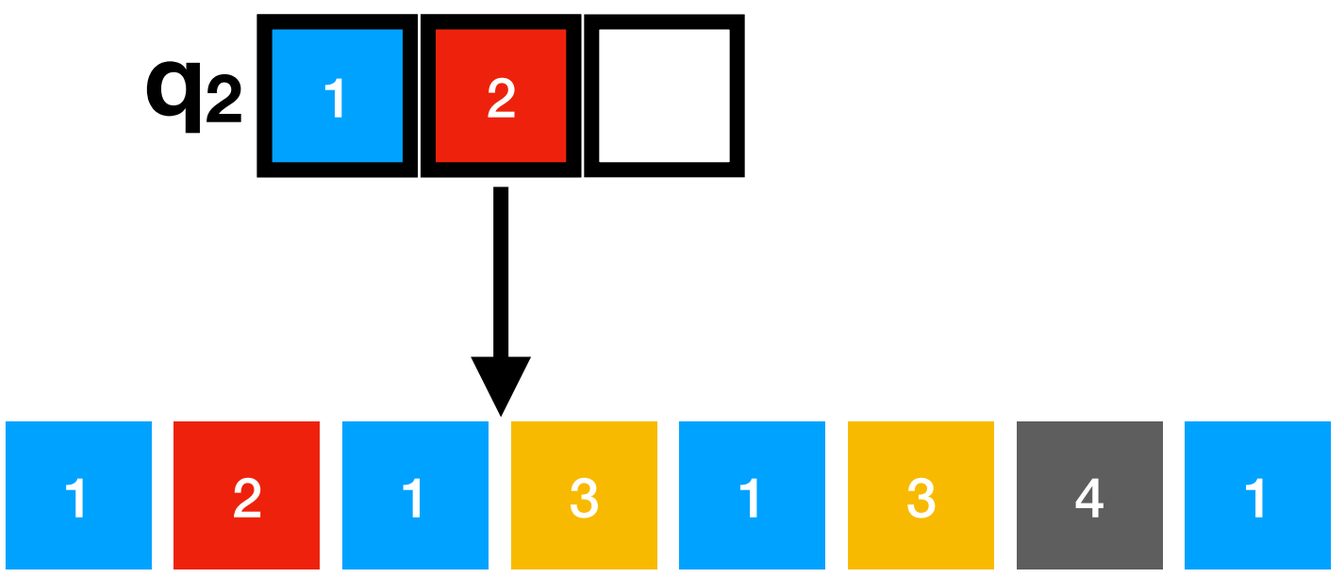
Deterministic register automata

There are at most 3 different letters in the input word



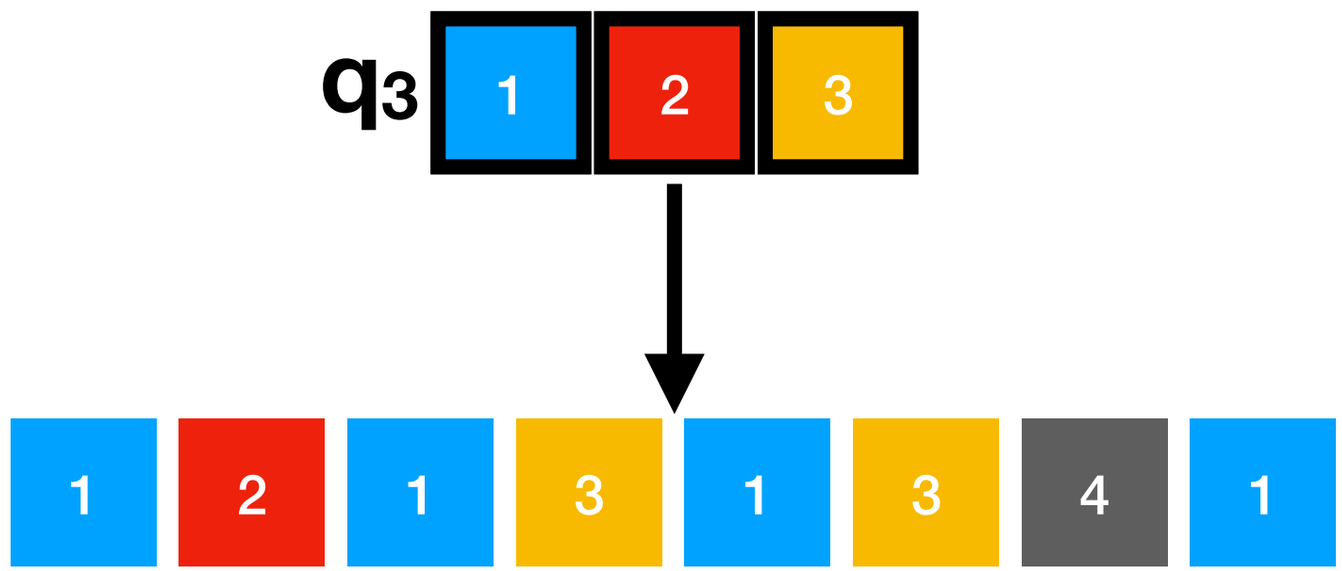
Deterministic register automata

There are at most 3 different letters in the input word



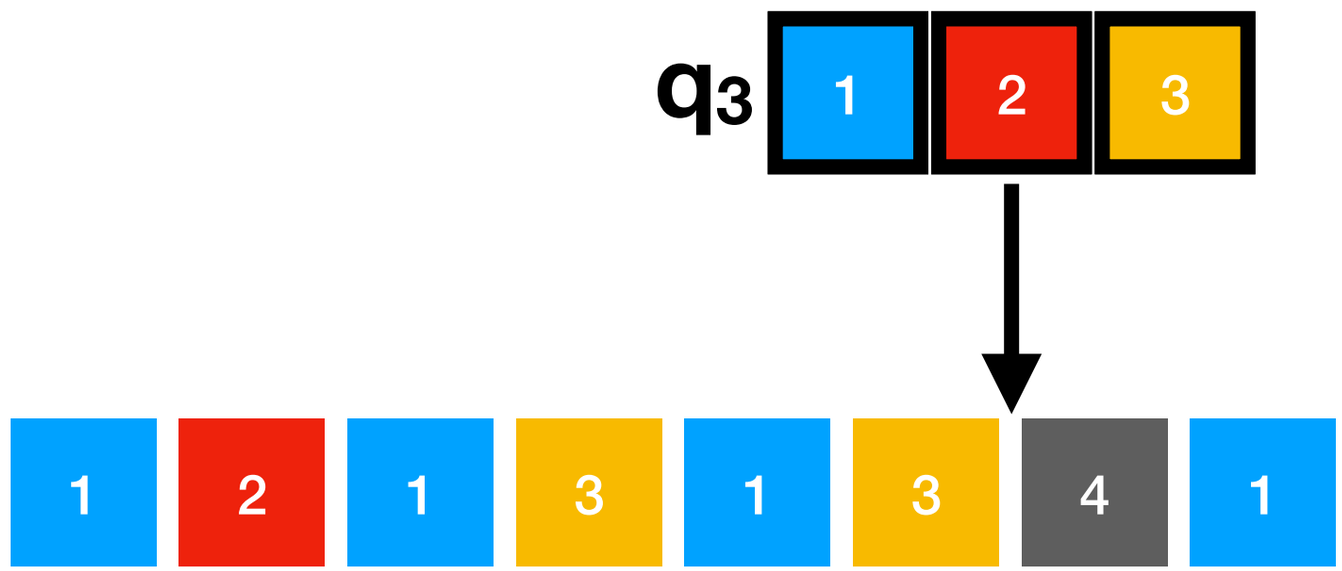
Deterministic register automata

There are at most 3 different letters in the input word



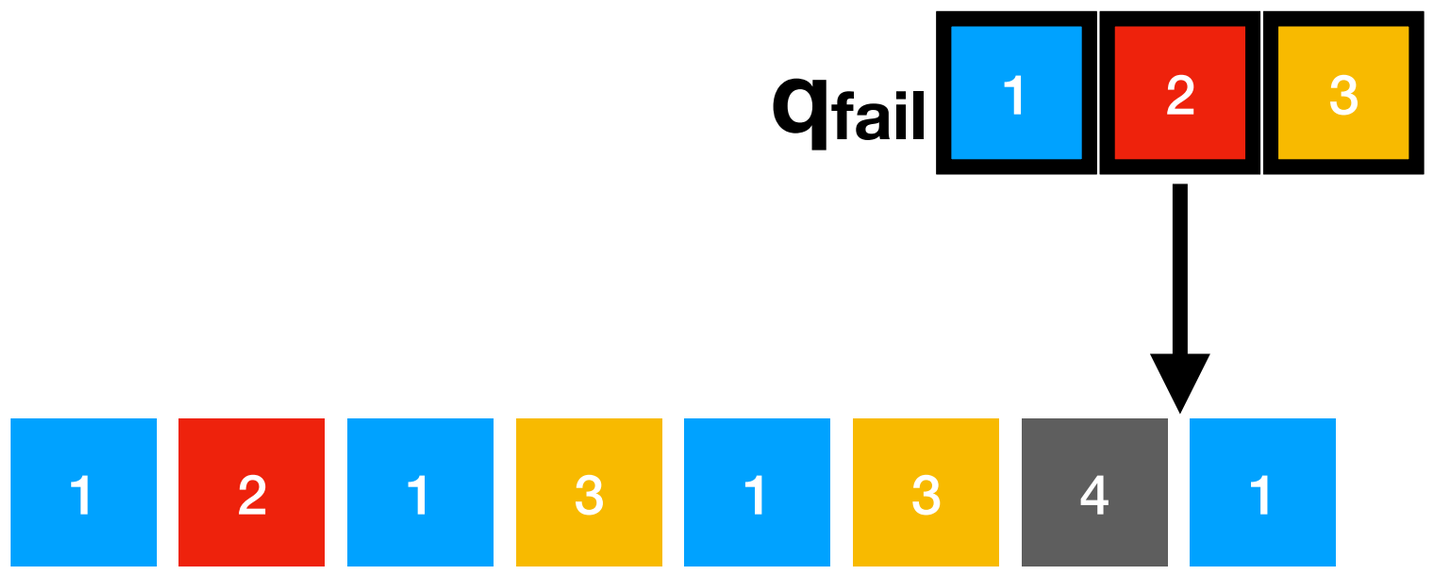
Deterministic register automata

There are at most 3 different letters in the input word



Deterministic register automata

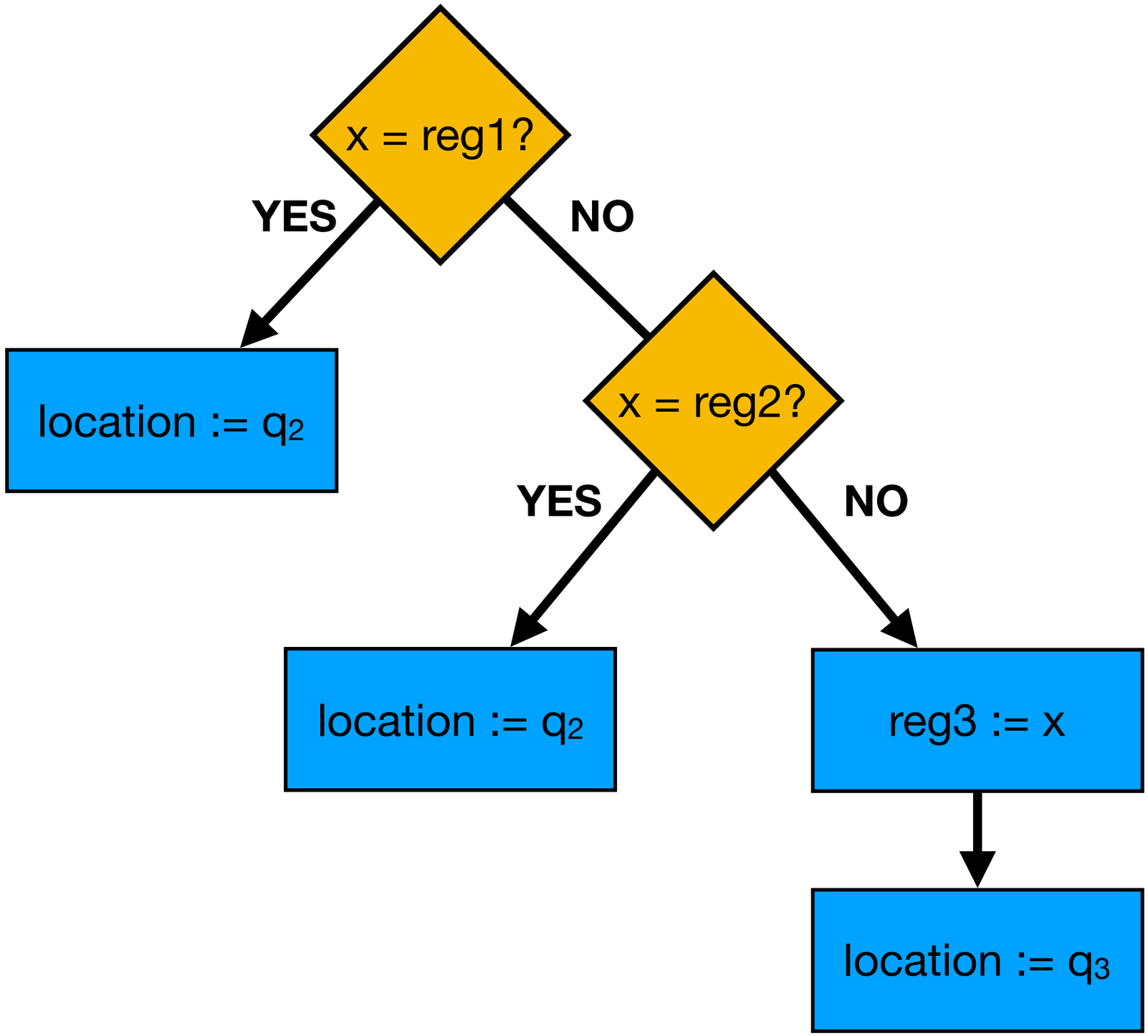
There are at most 3 different letters in the input word



Deterministic register automata

There are at most 3 different letters in the input word

When reading input letter x in location q_2 the automaton does this:



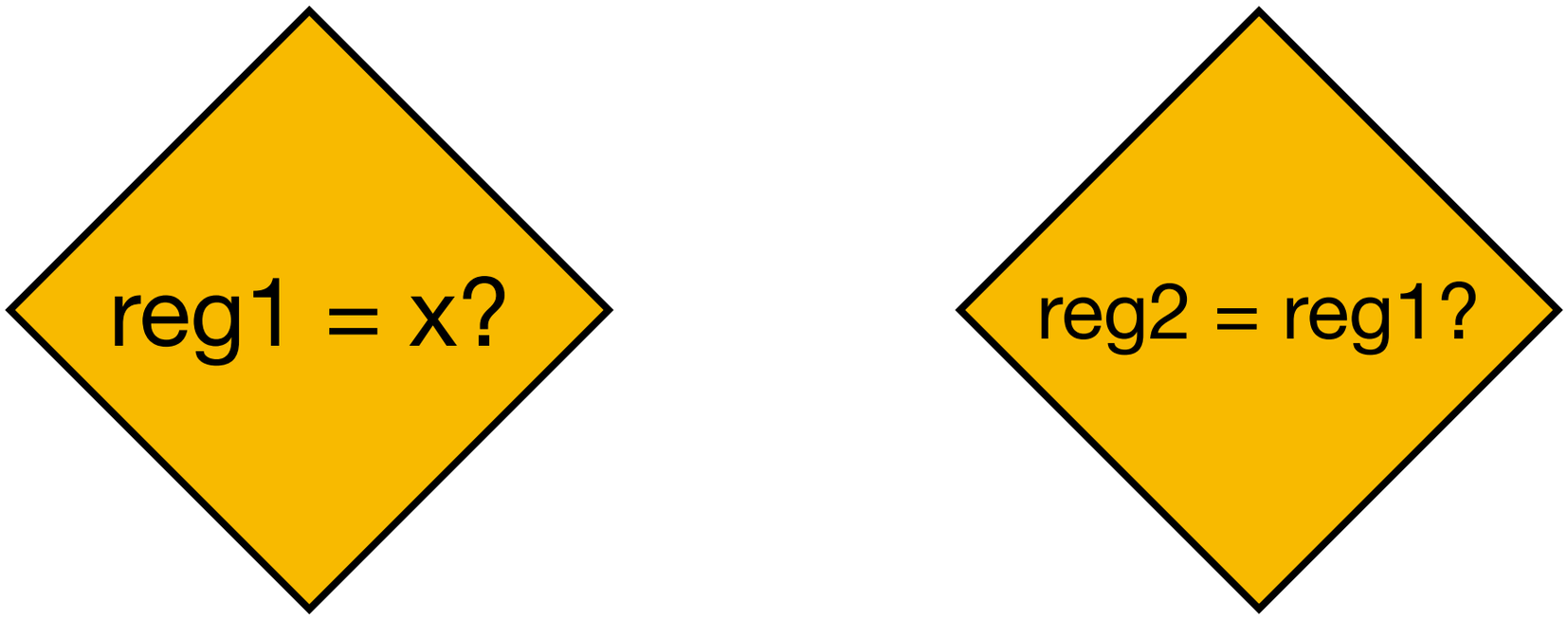
Not robust:

The following recognise different languages:

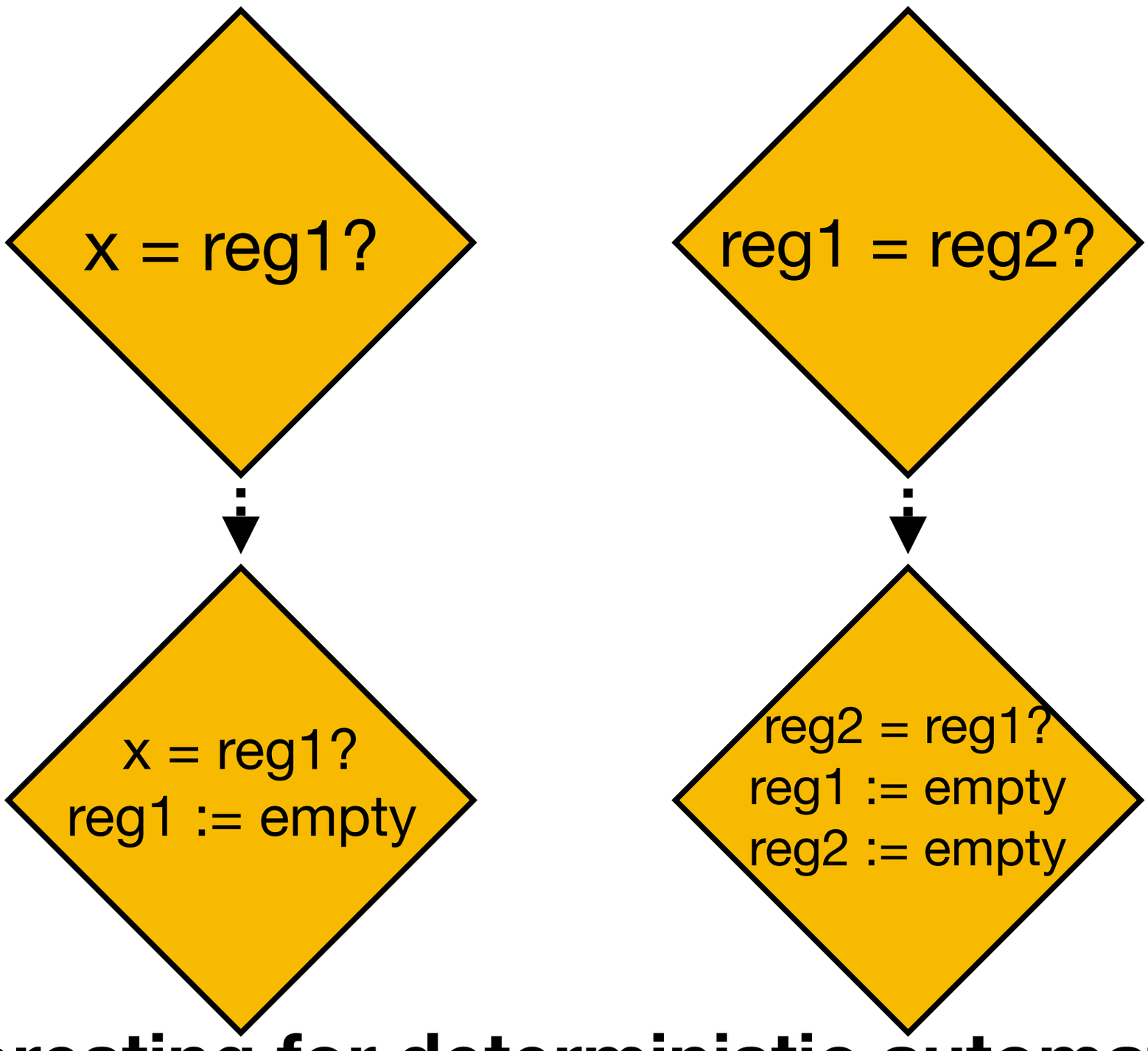
- Deterministic register automata
- 2-way deterministic register automata
- Nondeterministic register automata
- 2-way nondeterministic register automata

...

Single use restriction



Single use restriction



Interesting for deterministic automata

An example

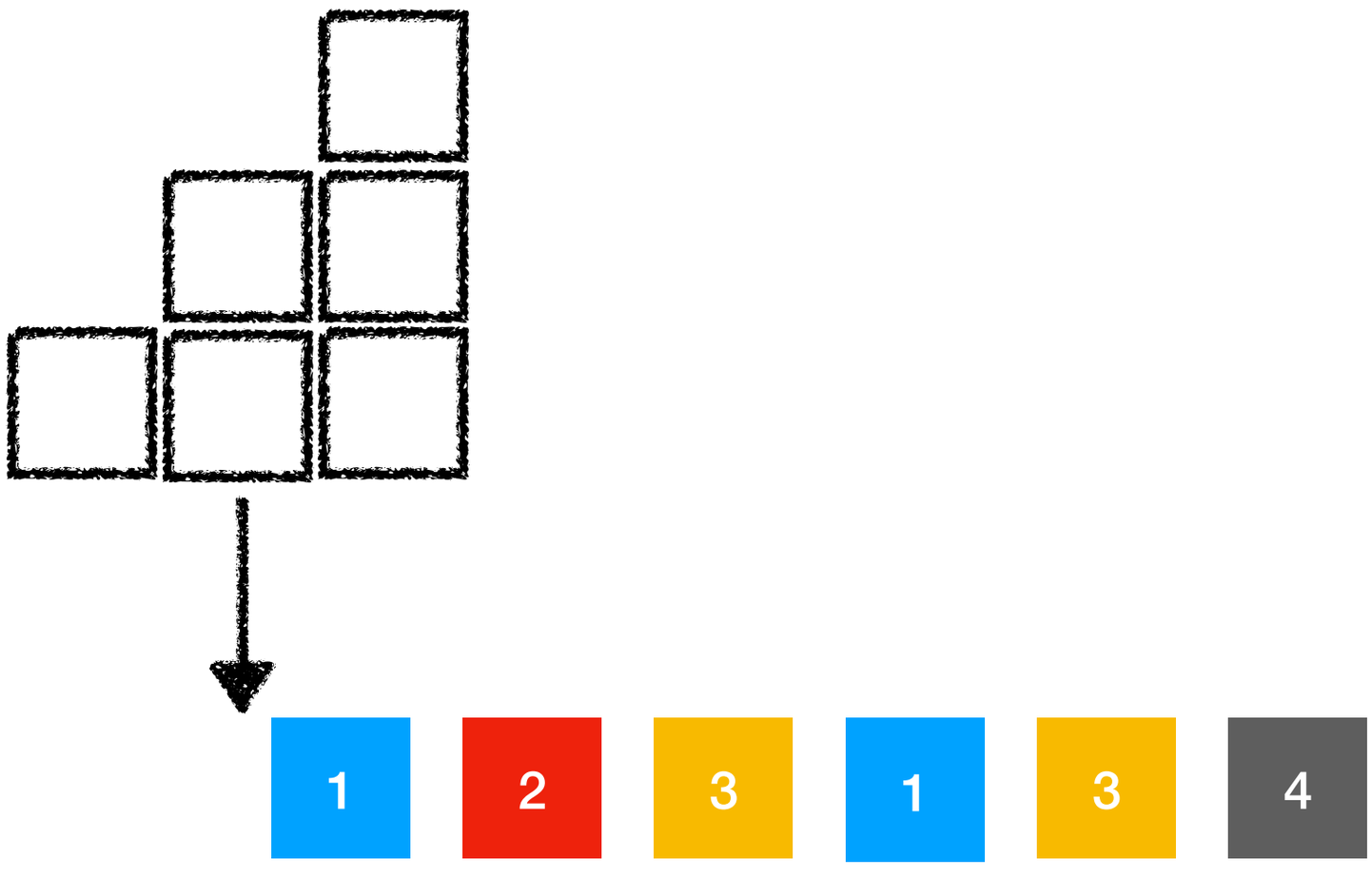
There are at most 3 different letters in the input word

Natural construction doesn’t work with the single use restriction,
but there is another one that does:

An example

There are at most 3 different letters in the input word

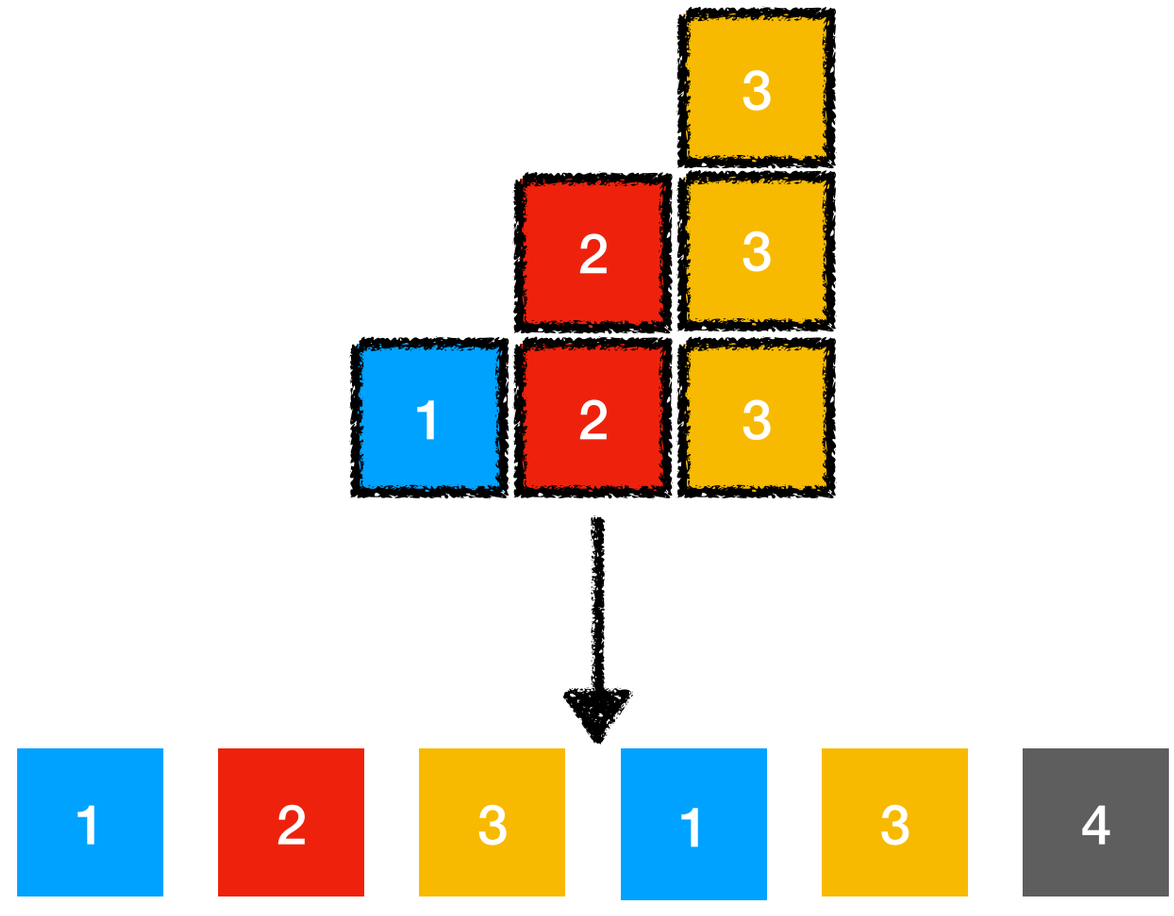
Natural construction doesn’t work with the single use restriction,
but there is another one that does:



An example

There are at most 3 different letters in the input word

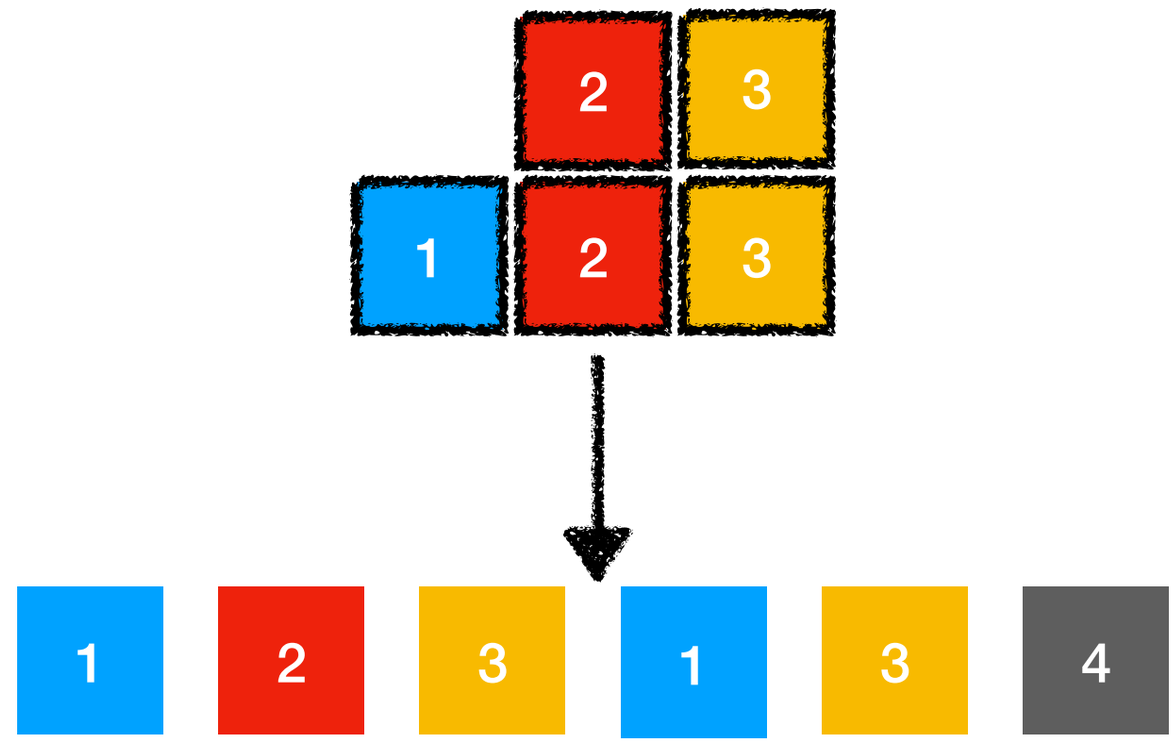
Natural construction doesn’t work with the single use restriction,
but there is another one that does:



An example

There are at most 3 different letters in the input word

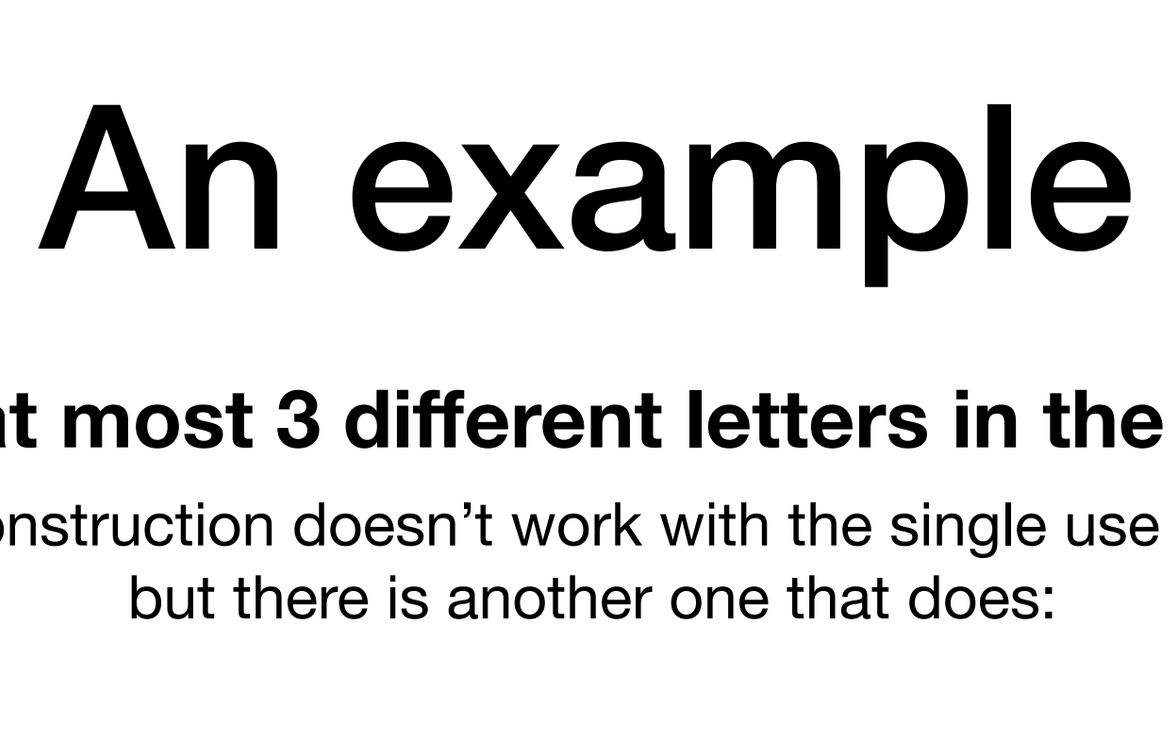
Natural construction doesn’t work with the single use restriction,
but there is another one that does:



An example

There are at most 3 different letters in the input word

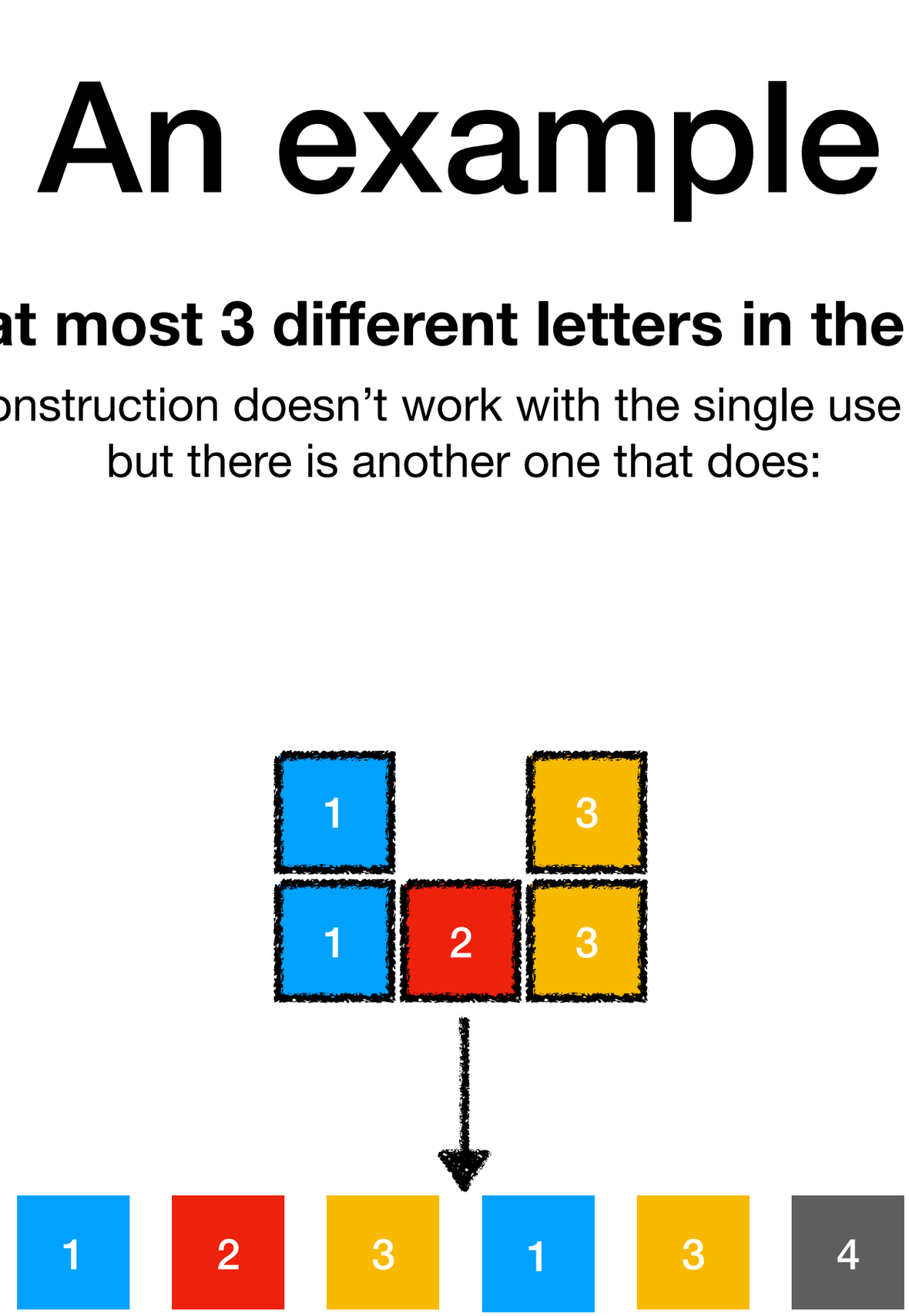
Natural construction doesn’t work with the single use restriction,
but there is another one that does:



An example

There are at most 3 different letters in the input word

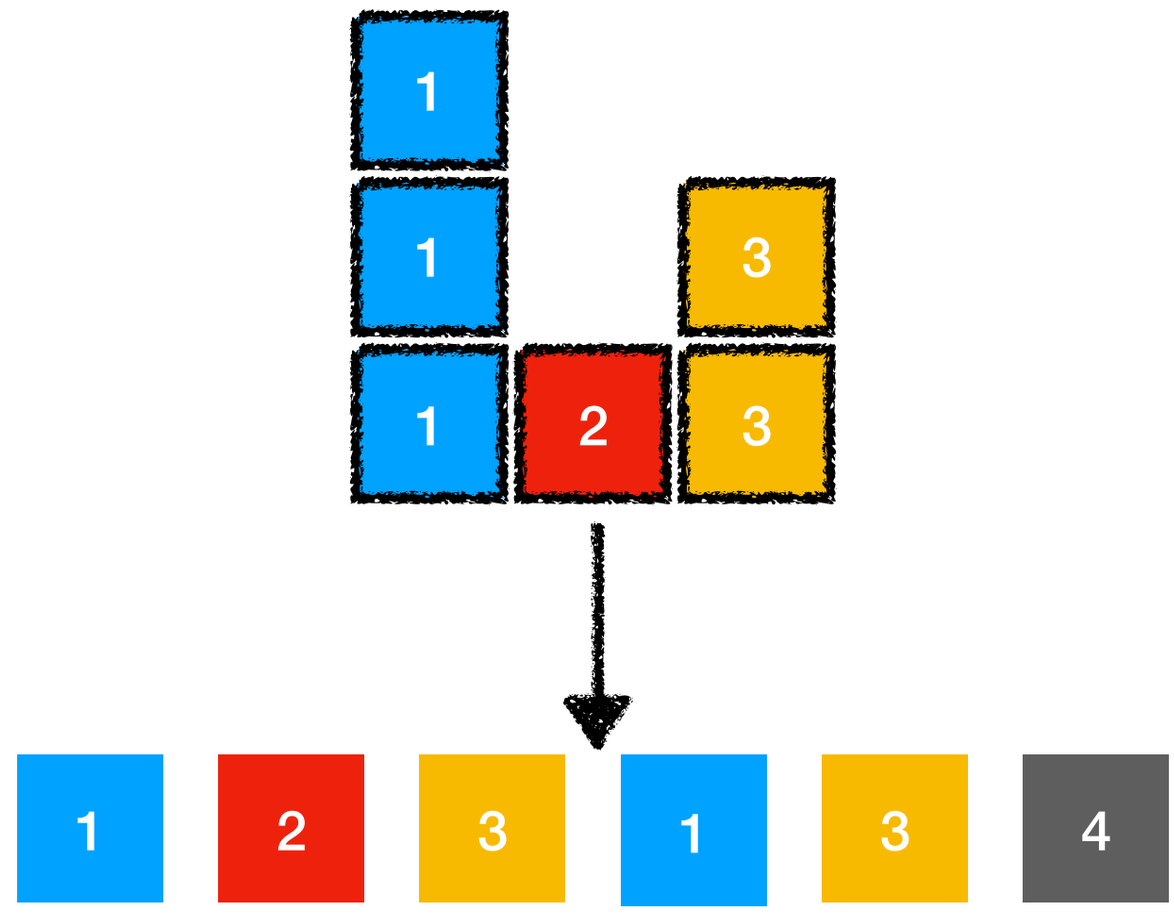
Natural construction doesn’t work with the single use restriction,
but there is another one that does:



An example

There are at most 3 different letters in the input word

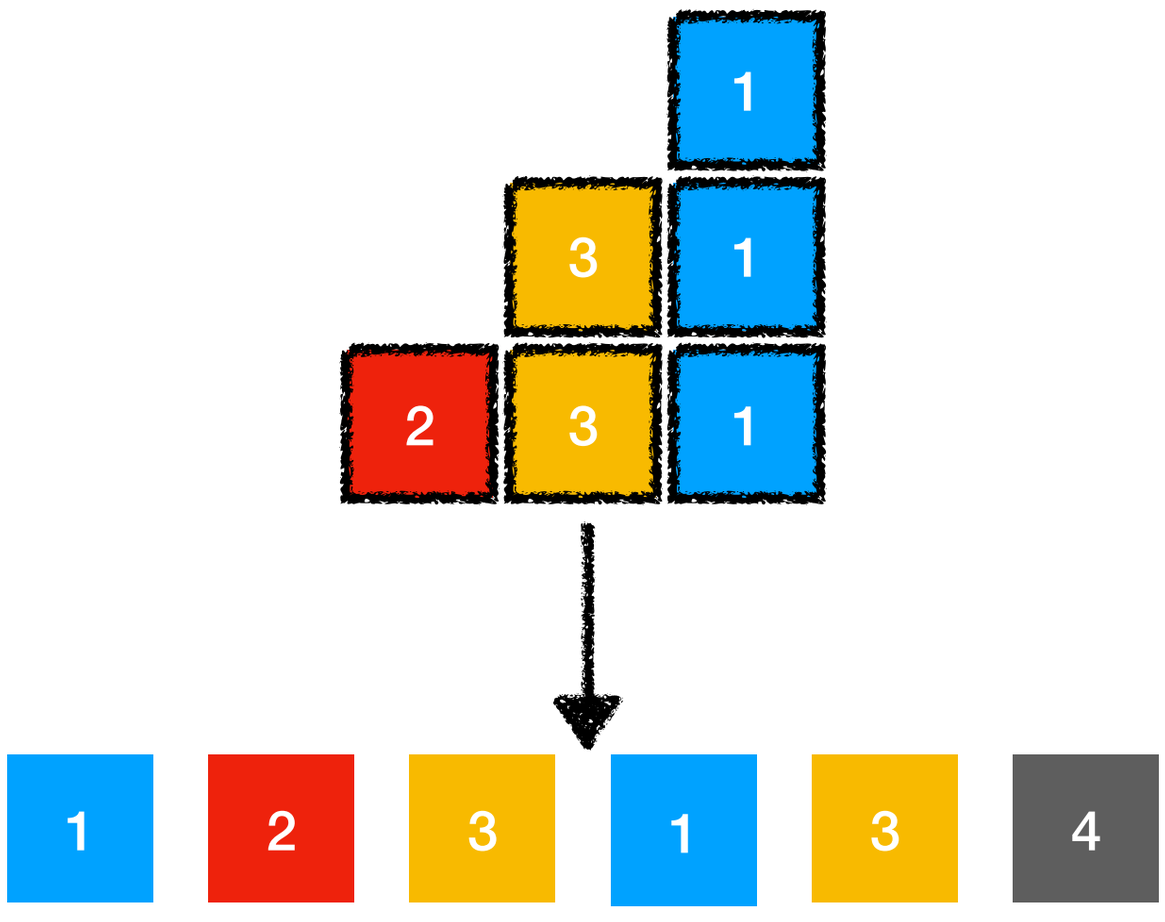
Natural construction doesn’t work with the single use restriction,
but there is another one that does:



An example

There are at most 3 different letters in the input word

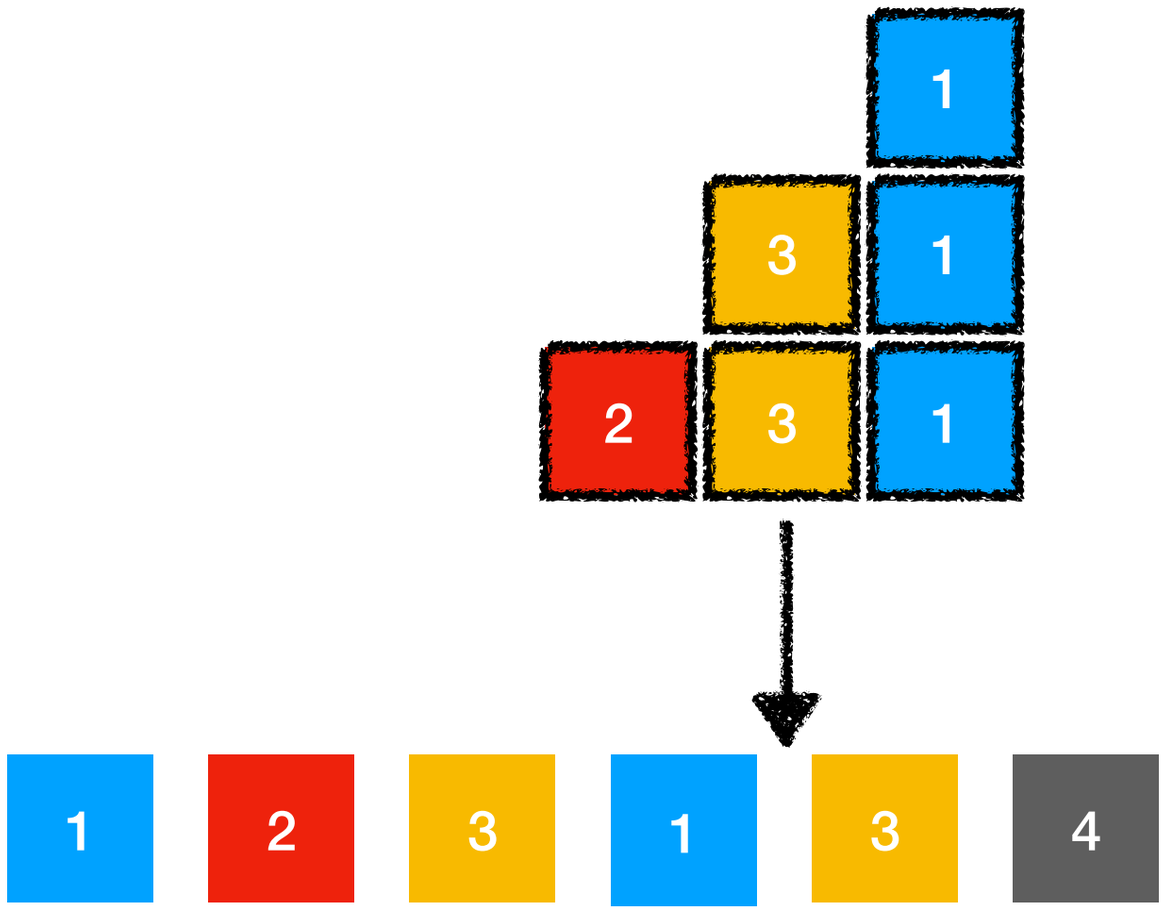
Natural construction doesn’t work with the single use restriction,
but there is another one that does:



An example

There are at most 3 different letters in the input word

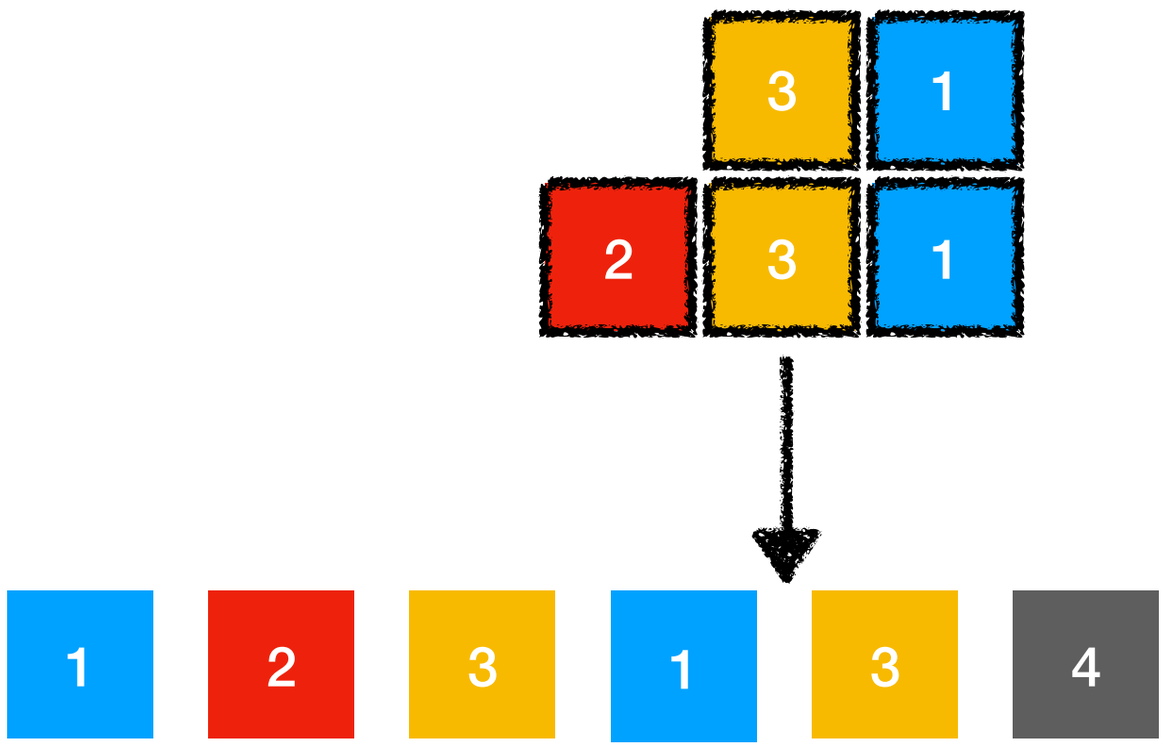
Natural construction doesn’t work with the single use restriction,
but there is another one that does:



An example

There are at most 3 different letters in the input word

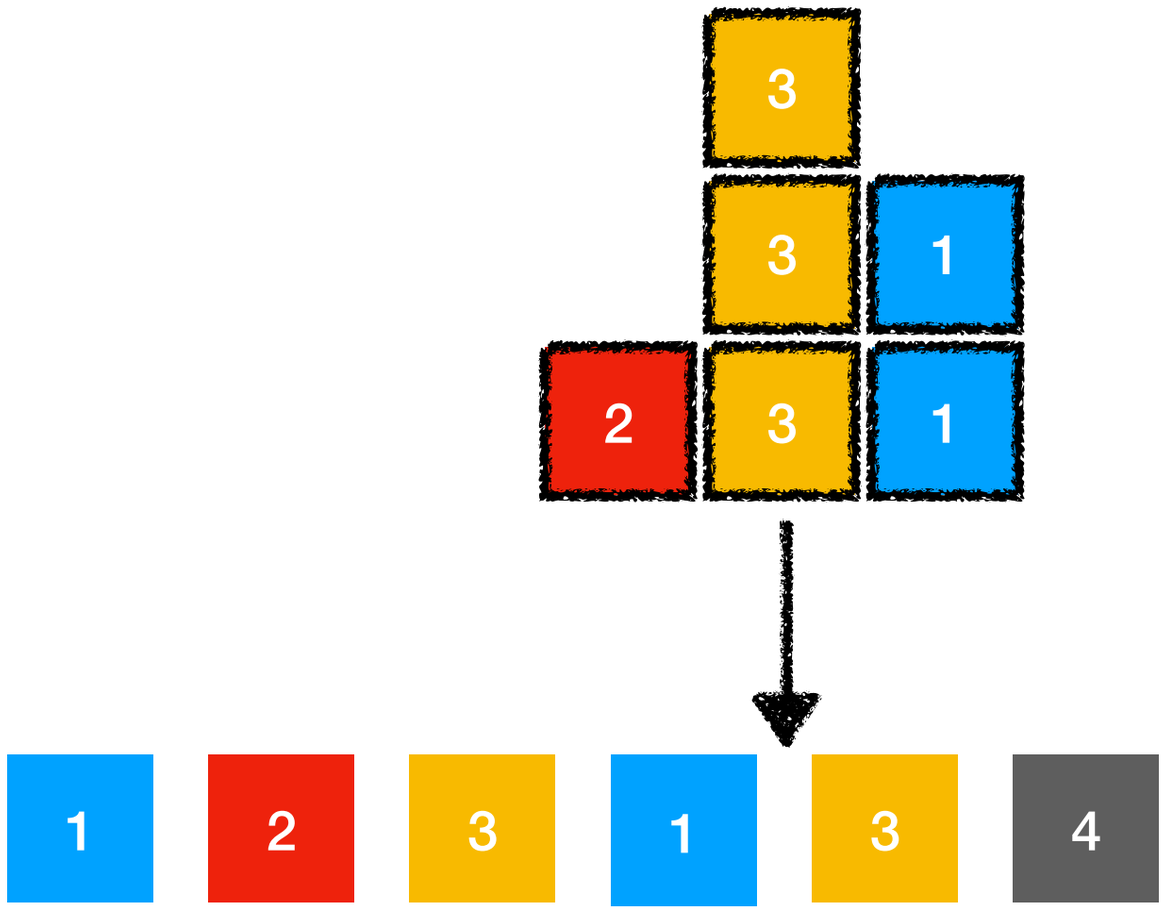
Natural construction doesn’t work with the single use restriction,
but there is another one that does:



An example

There are at most 3 different letters in the input word

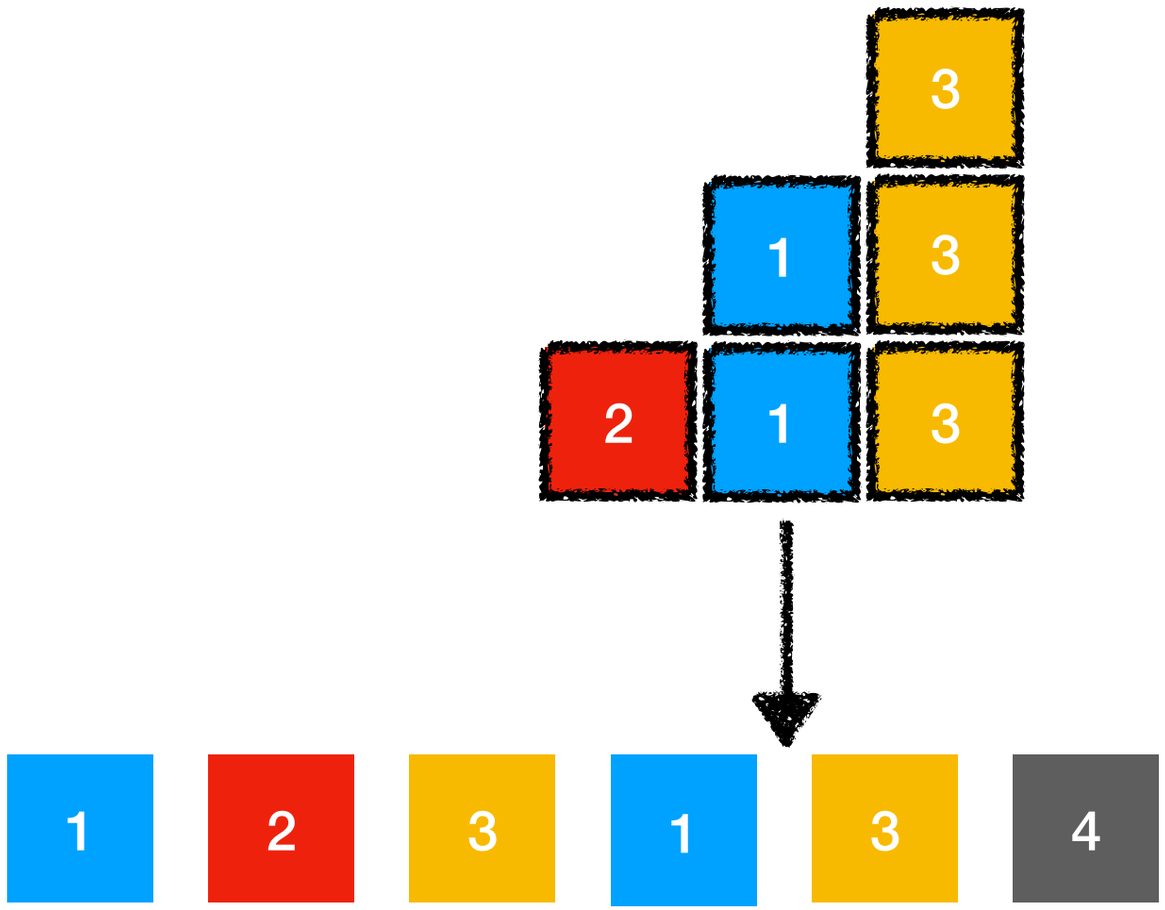
Natural construction doesn’t work with the single use restriction,
but there is another one that does:



An example

There are at most 3 different letters in the input word

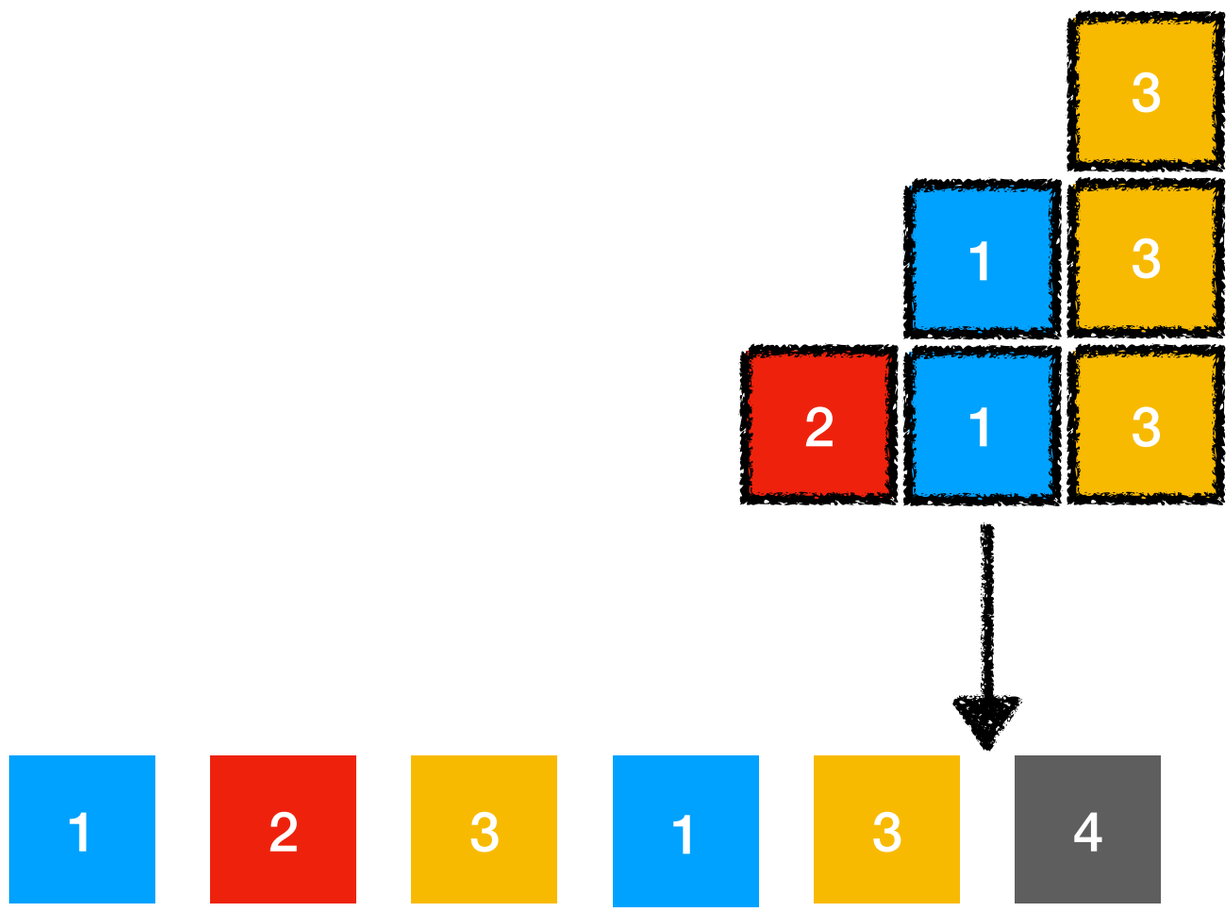
Natural construction doesn’t work with the single use restriction,
but there is another one that does:



An example

There are at most 3 different letters in the input word

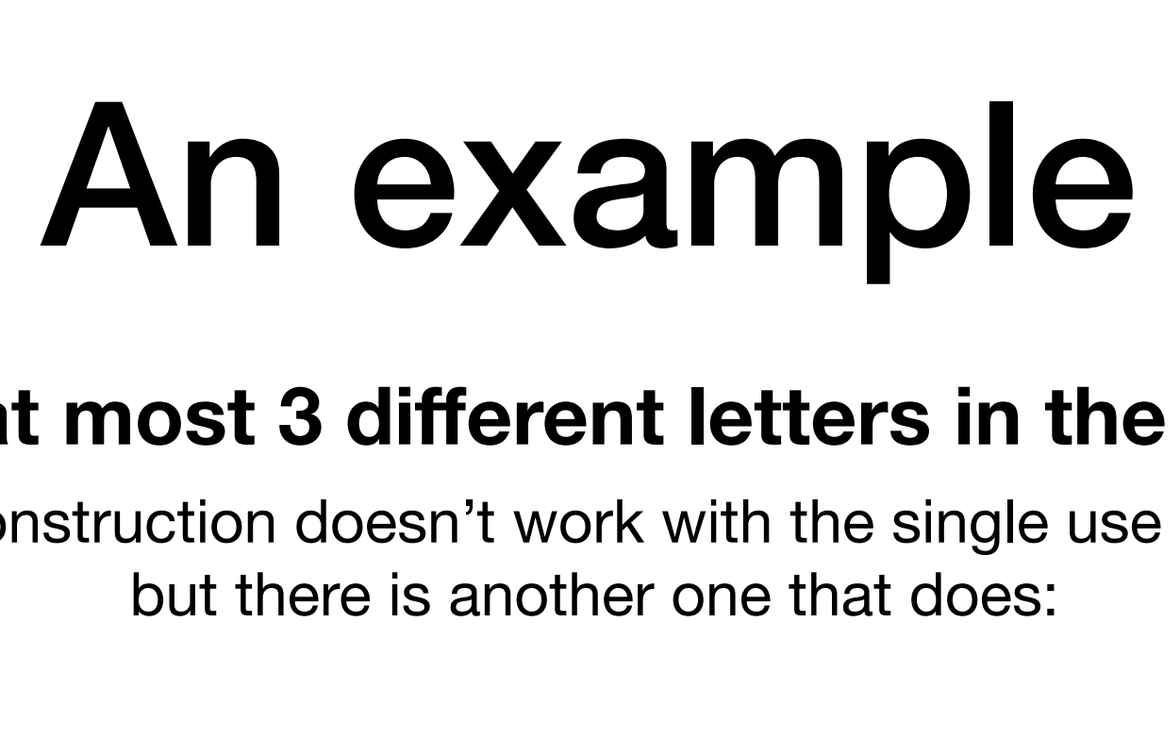
Natural construction doesn’t work with the single use restriction,
but there is another one that does:



An example

There are at most 3 different letters in the input word

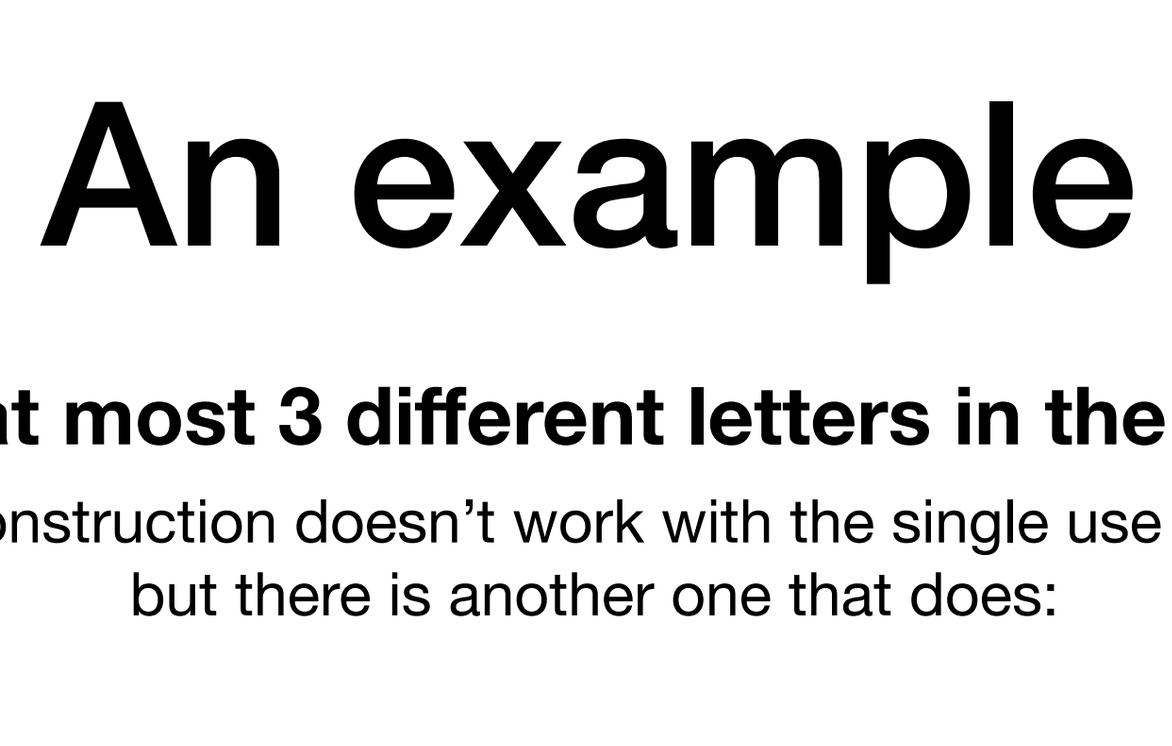
Natural construction doesn’t work with the single use restriction,
but there is another one that does:



An example

There are at most 3 different letters in the input word

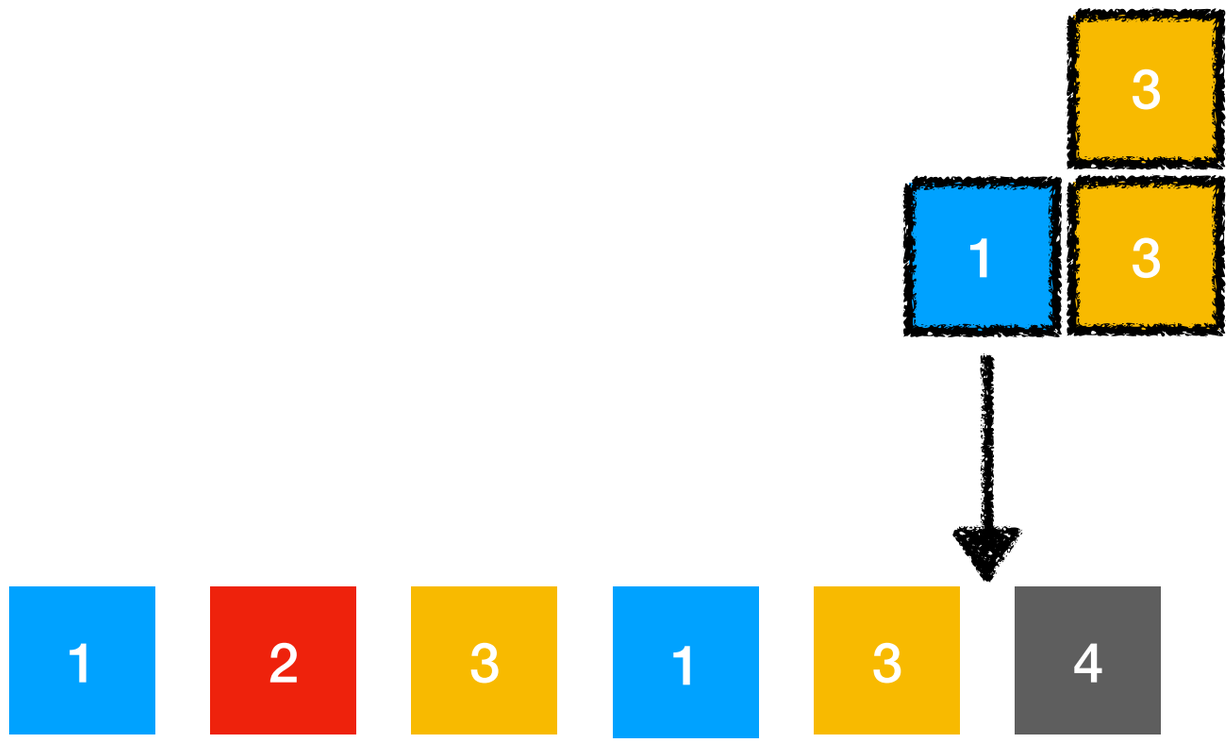
Natural construction doesn’t work with the single use restriction,
but there is another one that does:



An example

There are at most 3 different letters in the input word

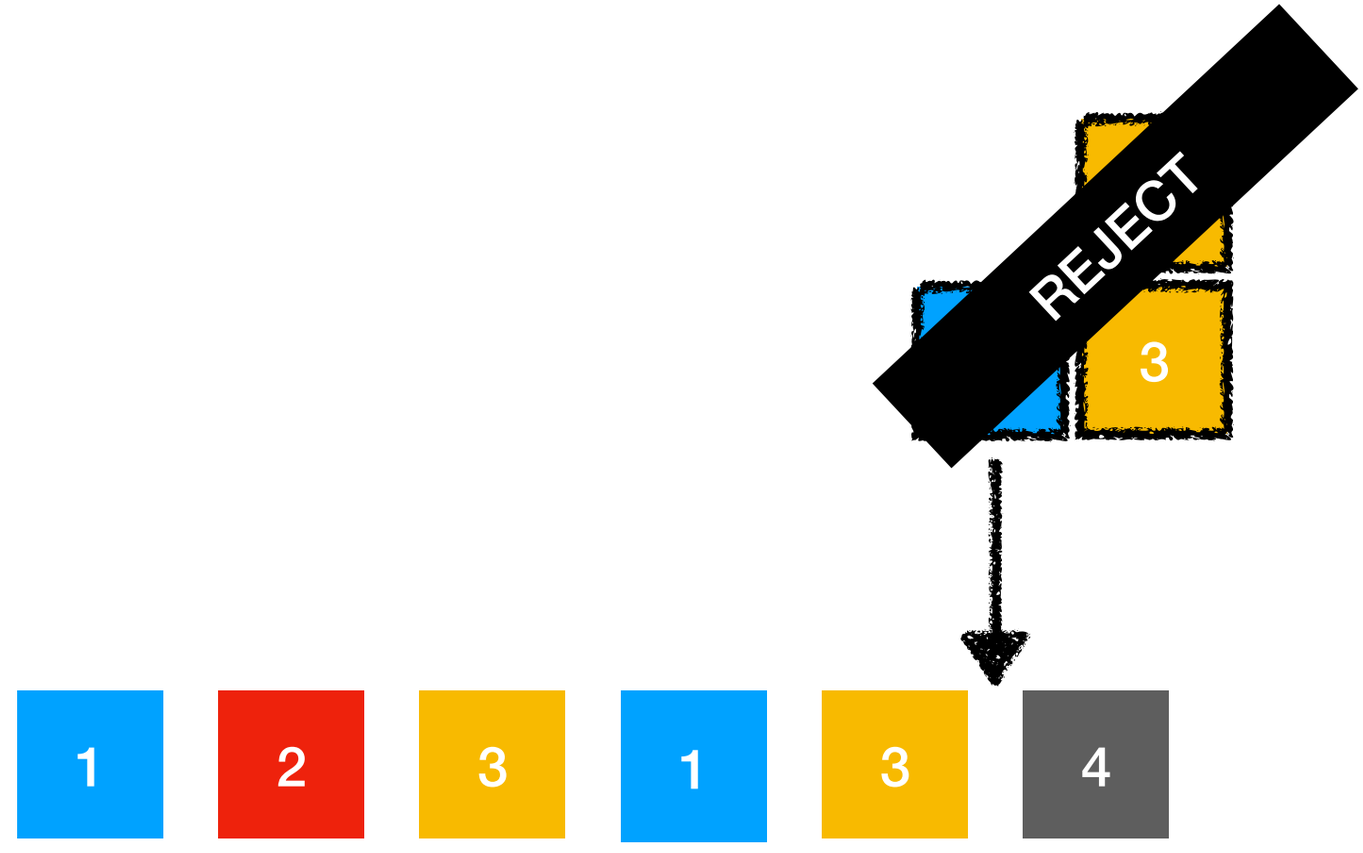
Natural construction doesn’t work with the single use restriction,
but there is another one that does:



An example

There are at most 3 different letters in the input word

Natural construction doesn’t work with the single use restriction,
but there is another one that does:



An example

There are at most 3 different letters in the input word

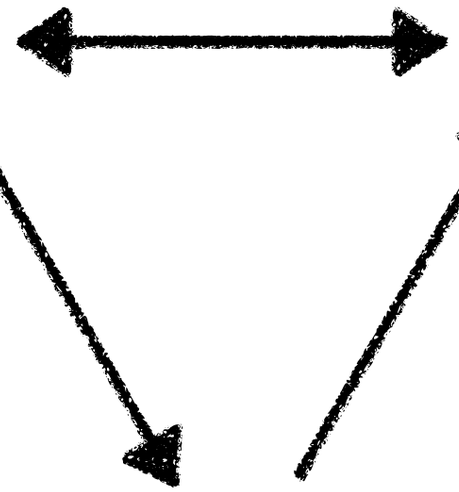
Natural construction doesn’t work with the single use restriction,
but there is another one that does:

First letter appears again

Cannot be expressed with the single use restriction

Main result

Two way single use deterministic register automata

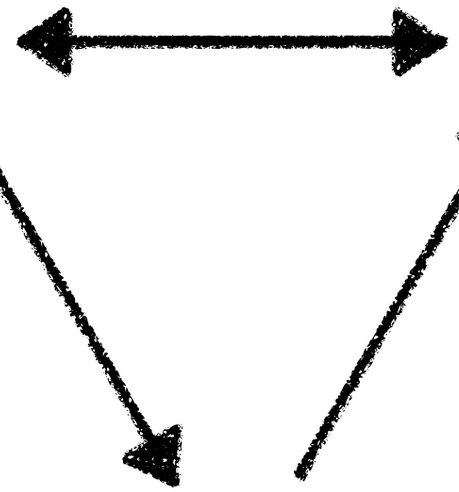


One way single use deterministic register automata

Orbit-finite semigroups

Main result

Two way single use deterministic register automata



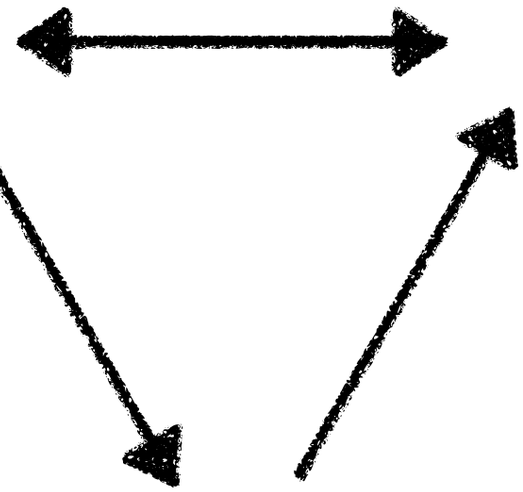
One way single use deterministic register automata

Orbit-finite semigroups

M. Bojańczyk 2013

Main result

Two way single use deterministic register automata



One way single use deterministic register automata

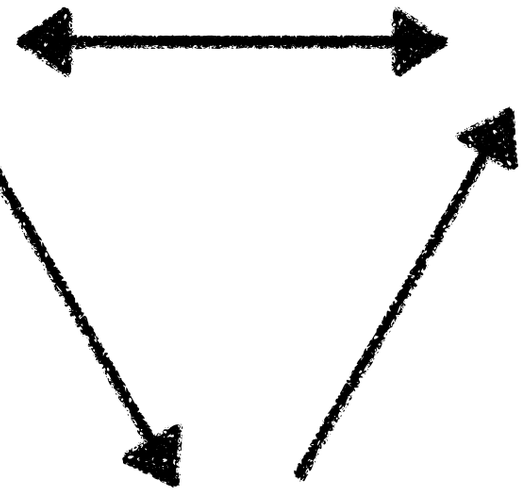
Orbit-finite semigroups
M. Bojańczyk 2013

T. Colcombet, C. Ley, G. Puppis 2015

Rigidly guarded MSO~
T. Colcombet, C. Ley, G. Puppis 2015

Main result

Two way single use deterministic register automata



One way single use deterministic register automata

Orbit-finite semigroups
M. Bojańczyk 2013

T. Colcombet, C. Ley, G. Puppis 2015

Rigidly guarded MSO~
T. Colcombet, C. Ley, G. Puppis 2015

The end