Assignment 1
5DV037

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February 13, 2023

1 Failing to count

$$L = \{w \in \{a, b\} * \mid |w|_a < |w|_b\}$$

Suppose L is a regular language Let m be a positive integer denoting the pumping length.
If we consider the string:

$$w = a^m b^{m+1} \in L$$

Where:

$$|w| \geq m$$

According the pumping lemma, the word w can be decomposed as:

- $w = xyz$
- $|xy| \leq m$
- $|y| \geq 1$

Since we have:

$$|xy| \leq m$$

We will only get as for y such that:

$$y = a^k, 1 \leq k \leq m$$

Which means that we will get $k - 1$ more as than bs Thus when pumping $xy^i z$ with $i \geq 2$ we violate the rule for L:

$$|w|a < |w|b$$

Since we for w_1 with $i \geq 2$ get:

$$length(a^{m+k}) \geq length(b^{m+1})$$

2 Be an email spammer

- The first line matches word characters, whitespace, . or - of variable length
- The second line matches @, at or AT where all can be nested in (, [, or in any combination, at needs to be nested
- The third line matches either word characters, spaces, ., dot or DOT nested in (, [, or in any combination, dot needs to be nested.
- The fourth line matches word characters or whitespace of variable length
- The fifth line makes sure that the email ends in a word character

```
^[\w\s\.\-]+
((@|AT)|([\(\[\{]+(@|at|AT)[\}\]\)]+))
(([\w\s\-]+|(\.|DOT))|(\(\[\{]+(\.|dot|DOT)[\}\]\)]+))+
[\w\s]+
[\w]$
```

3 Parsing Hex

To solve the *Parsing Hex*[1] problem, the following code was implemented in Ruby

```
$<.read.scan(/0x[a-f\d]{1,8}/i) {|x|
    puts "#{x} #{x.to_i(16)}"
}
```

The regex /0x[a-f]1,8/i searches for an occurence of 0x and the string after can contain the letters a-f, any digit and be 1 to 8 characters long, the *i* flag is set because the case of a hexadecimal does not matter, and we can therefore avoid having to check the case of *x* and [a-f]. The hexadecimal is converted to decimal format using the to_i(16) function.

[1] https://umu.kattis.com/problems/parsinghex