

PEP Scala (4)

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Slides & Code: KEATS

Office Hours: Thursdays 12:00 – 14:00
Additionally: (for Scala) Tuesdays 10:45 – 11:45

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[PDF: A Crash-Course in Scala](#)

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Hints in CW

Hints

For Preliminary Part: useful operations involving regular expressions:

```
reg.findAllIn(s).toList
```

finds all substrings in `s` according to a regular regular expression `reg`; useful list operations: `.distinct` removing duplicates from a list, `.count` counts the number of elements in a list that satisfy some condition, `.toMap` transfers a list of pairs into a Map, `.sum` adds up a list of integers, `.max` calculates the maximum of a list.

For Core Part: use `.split(",").toList` for splitting strings according to commas (similarly `\n`), `.getOrElse(..,..)` allows to query a Map, but also gives a default value if the Map is not defined, a Map can be 'updated' by using `+`, `.contains` and `.filter` can test whether an element is included in a list, and respectively filter out elements in a list, `.sortBy(_._2)` sorts a list of pairs according to the second elements in the pairs—the sorting is done from smallest to highest, `.take(n)` for taking some elements in a list (takes fewer if the list contains less than `n` elements).

- Scala Library, e.g. `span` in <https://www.scala-lang.org/api/current/scala/collection/immutable/List.html>

Discussion Forum



Re: Core 6 - Getting a little off the target numbers for Part7

by Christian Urban - Saturday, 23 November 2019, 1:06 AM

Hi,

It is a subtle problem, but unfortunately Scala calculates different results according to when you round numbers. As a result yearly_yield needs to be careful when numbers are rounded to Longs. For example, if your balance is \$100 and your calculated profit is negative, say -20.5, then

```
100 + ((-20.5).toLong) = 80
```

while

```
(100 + (-20.5)).toLong = 79
```

Hope this helps,
Christian

Preliminary 7

Raw marks (261 submissions):

- 4%: 236
- 3%: 10
- 2%: 1
- 1%: 0
- 0%: 15

(plagiarism/collusion interviews ongoing!)

```
def is_legal(dim: Int, p: Path, x: Pos) = {  
  if (...some_really_long_condition...) false  
  else true  
}
```

```
def is_legal(dim: Int, p: Path, x: Pos) = {  
  if (...some_really_long_condition...) false  
  else true  
}
```

```
def is_legal(dim: Int, p: Path, x: Pos) =  
  !(...some_really_long_condition...)
```

```
def foobar(...) = {  
  val cs = for (c <- str) yield c.toLowerCase  
  ...  
}
```



```
def foobar(...) = {  
  val cs = for (c <- str) yield c.toLowerCase  
  ...  
}
```

```
def foobar(...) = {  
  val cs = str.map(_.toLowerCase)  
  ...  
}
```

```
def RomanNumeral2Int(rs: RomanNumeral): Int =  
  rs match {  
    case Nil => 0  
    case M::r    => 1000 + RomanNumeral2Int(r)  
    case C::M::r => 900 + RomanNumeral2Int(r)  
    case D::r    => 500 + RomanNumeral2Int(r)  
    case C::D::r => 400 + RomanNumeral2Int(r)  
    case C::r    => 100 + RomanNumeral2Int(r)  
    case X::C::r => 90 + RomanNumeral2Int(r)  
    case L::r    => 50 + RomanNumeral2Int(r)  
    case X::L::r => 40 + RomanNumeral2Int(r)  
    case X::r    => 10 + RomanNumeral2Int(r)  
    case I::X::r => 9 + RomanNumeral2Int(r)  
    case V::r    => 5 + RomanNumeral2Int(r)  
    case I::V::r => 4 + RomanNumeral2Int(r)  
    case I::r    => 1 + RomanNumeral2Int(r)  
  }
```

Last Week: Pattern Matching

```
def fizz_buzz(n: Int) : String =  
  (n % 3, n % 5) match {  
    case (0, 0) => "fizz buzz"  
    case (0, _) => "fizz"  
    case (_, 0) => "buzz"  
    case _ => n.toString  
  }
```

Reverse Polish Notation

$$(3 + 1) * (2 + 9)$$

\Rightarrow

$$3 \ 1 \ + \ 2 \ 9 \ + \ *$$

Reverse Polish Notation

$(3 + 1) * (2 + 9)$

\Rightarrow

3 1 + 2 9 + *

ldc 3

ldc 1

iadd

ldc 2

ldc 9

iadd

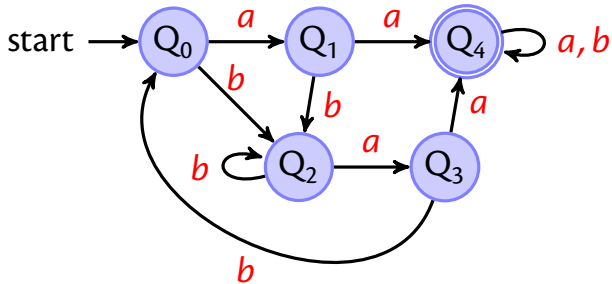
imul

Sudoku

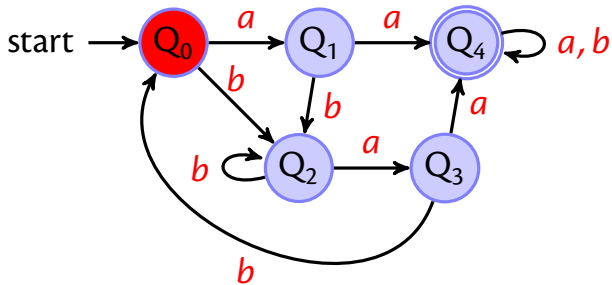
A very simple-minded version on 110 problems:

- 1 core: 800 secs
- 2 cores: 400 secs
- 8 cores: 290 secs
- 18 cores: 142 secs

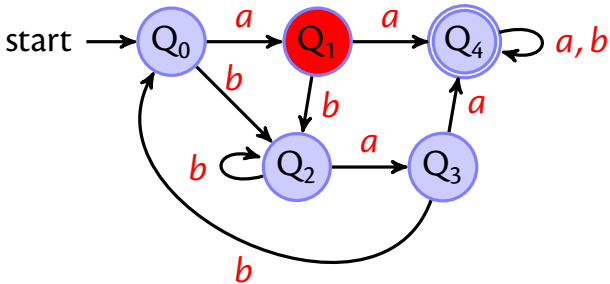
DFAs



DFAs

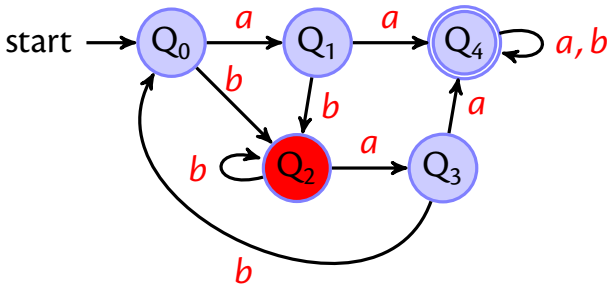


DFAs



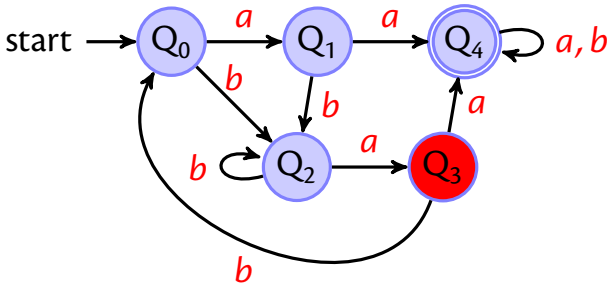
a

DFAs



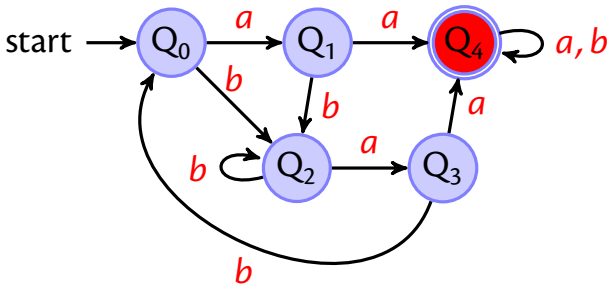
ab

DFAs



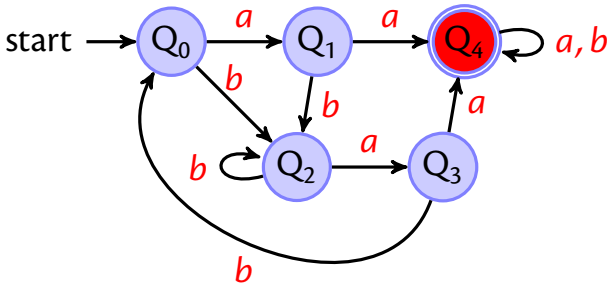
aba

DFAs



abaa

DFAs



abaaa \Rightarrow *yes*

DFAs

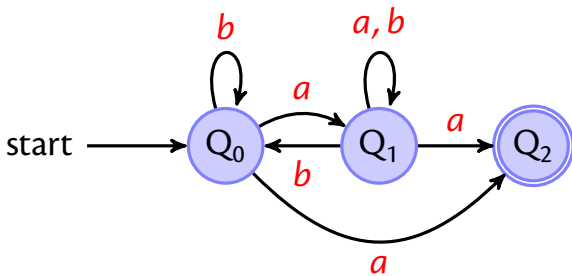
A **deterministic finite automaton**, DFA, consists of 5 things:

- an alphabet Σ
- a set of states Q_s
- one of these states is the start state Q_0
- some states are accepting states F , and
- there is transition function δ

which takes a state and a character as arguments and produces a new state; this function might not be everywhere defined

$$A(\Sigma, Q_s, Q_0, F, \delta)$$

NFAs





Mind-Blowing Regular Expressions: in Python, JavaScript, Java

Regular Expressions

Suppose you have the regular expression $(a^*)b$:

”aaaaaaaaaaaaaaaaab”

Regular Expressions

Suppose you have the regular expression $(a^*)b$:

”aaaaa.....aaaaaaaaaaaaaaaaaaaaab”

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Regular Expressions

Suppose you have the regular expression $(a^*)^*b$:

”aaaaa.....aaaaaaaaaaaaaaaaaaaaaa”

Regular Expressions

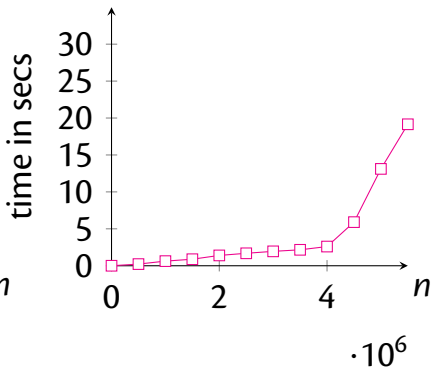
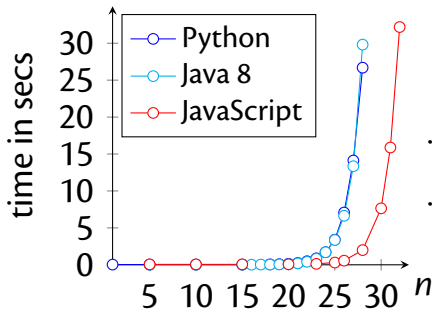
Suppose you have the regular expression $(a^*)^*b$:

”aaaaa.....aaaaaaaaaaaaaaaaaaaaaa”

How long does Python need to find out?

CW 9: Regexes

Graphs: $(a^*)^*b$ and strings $\underbrace{a \dots a}_n$



<https://vimeo.com/112065252>

Register to Vote by Tuesday 26th November!

The UK General Election is on Thursday 12th December

Make sure you are registered vote by going online: <https://www.gov.uk/register-to-vote> - it takes 5 minutes!

You can register to vote if you are 18 years old or over, and:

- a UK or Irish citizen
- a qualifying Commonwealth citizen living in the UK
- an EU citizen living in the UK

For more information from KCLSU go to:

<https://www.kclsu.org/news/article/6015/Registered-to-Vote-If-not-get-on-it/>

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