GTK CYBER

GET ON THE FAST TRACK

Regular Expressions Overview

What is a Regular Expression?

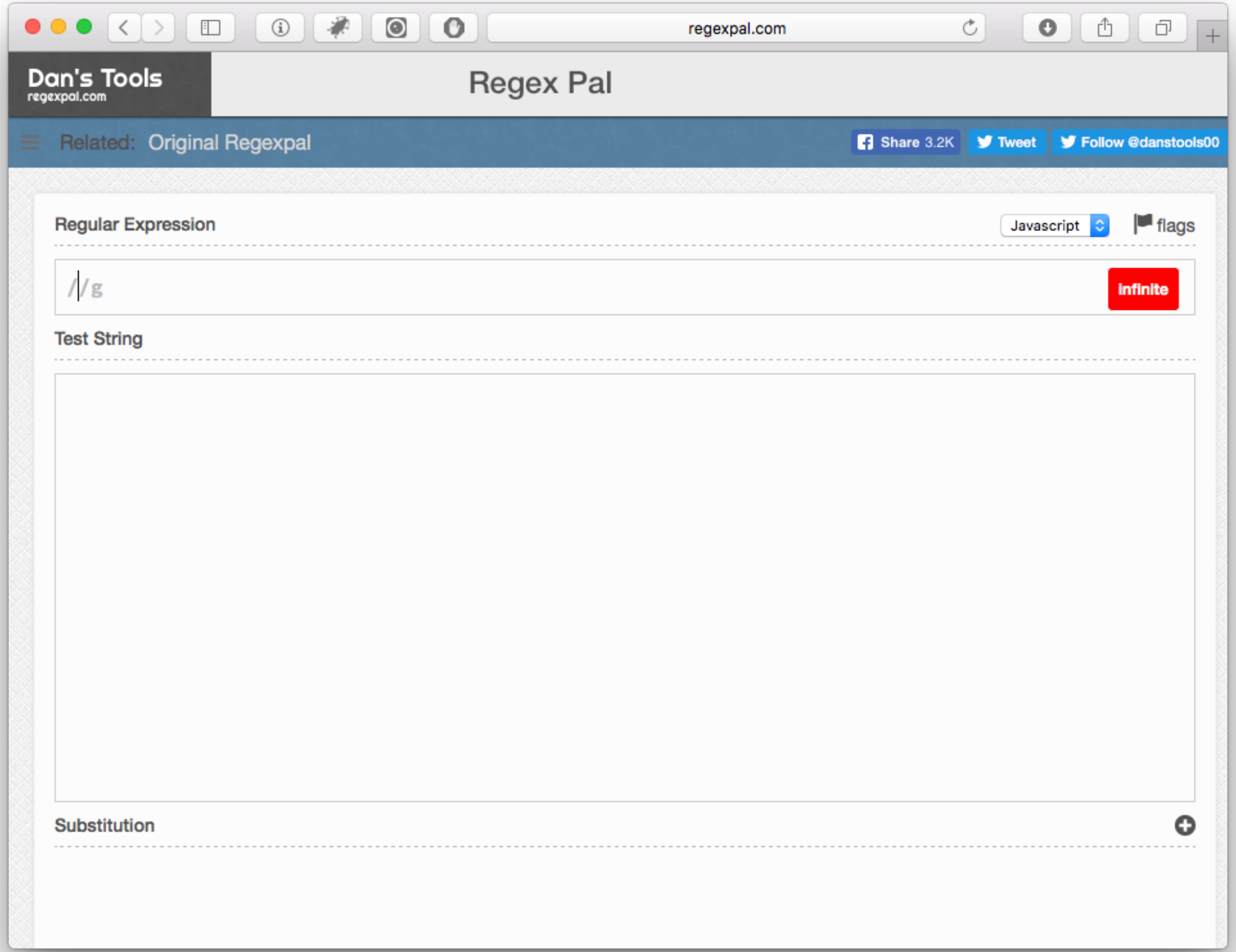
A regular expression defines a pattern of characters.

Can be used for:

Validation

Data Extraction

Data Cleaning



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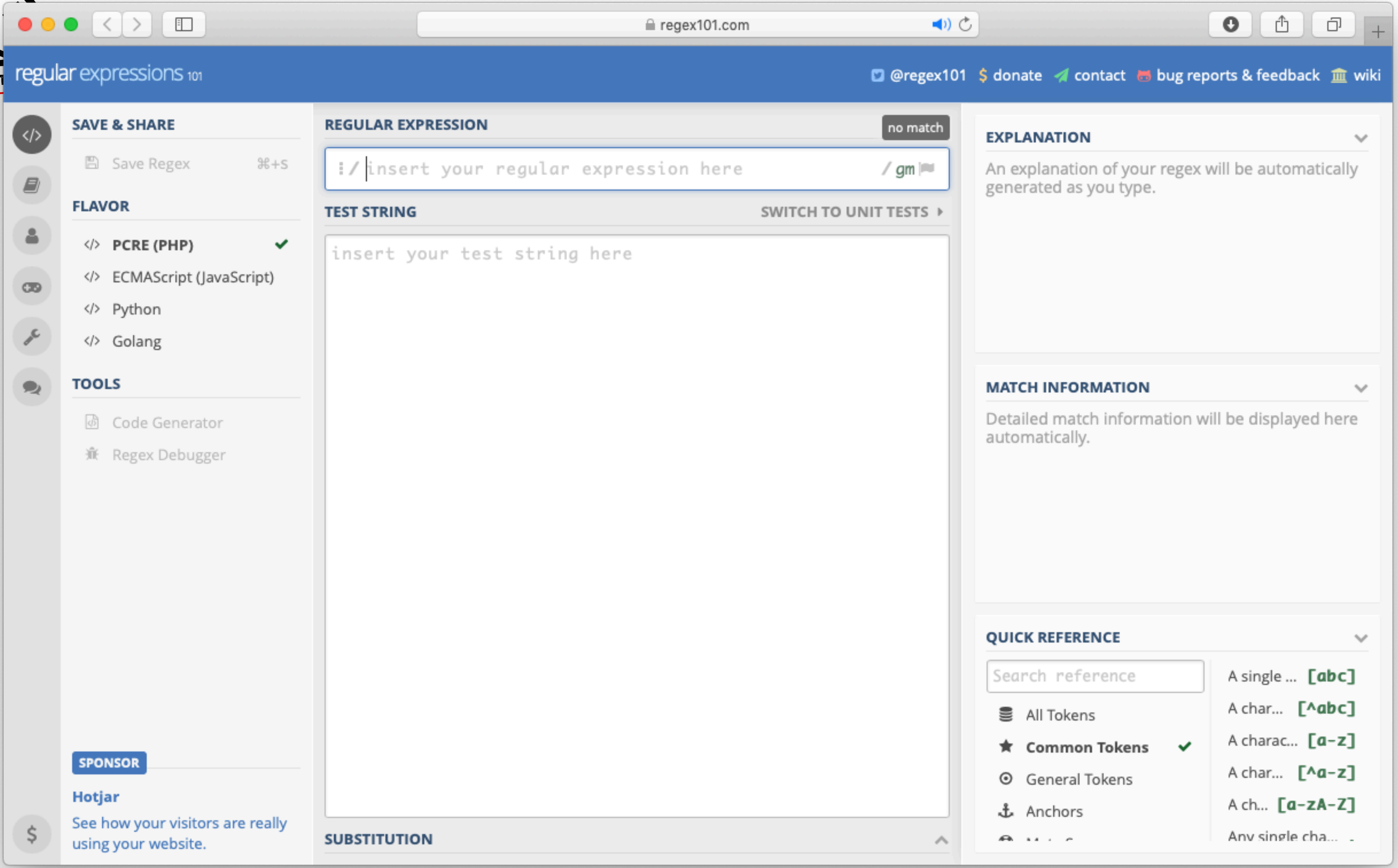
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SAVE & SHARE

Save Regex ⌘+S

FLAVOR

- PCRE (PHP) ✓
- ECMAScript (JavaScript)
- Python
- Golang

TOOLS

Code Generator

Regex Debugger

SPONSOR

Hotjar

See how your visitors are really using your website.

REGULAR EXPRESSION no match

/ insert your regular expression here / gm

TEST STRING SWITCH TO UNIT TESTS

insert your test string here

SUBSTITUTION

EXPLANATION

An explanation of your regex will be automatically generated as you type.

MATCH INFORMATION

Detailed match information will be displayed here automatically.

QUICK REFERENCE

Search reference

All Tokens	A single ...	[abc]
Common Tokens ✓	A char...	[^abc]
General Tokens	A charac...	[a-z]
Anchors	A char...	[^a-z]
	A ch...	[a-zA-Z]
	Any single cha...	

regex101.com

Challenge 1

Let's write a pattern that matches a date. Such as…

07/30/2016

Challenge 1

We could do the following but that would only match this exact string, so to do better than that, we need to use character classes.

Special characters: []*.|{}()^$-+

```
7/30/2019
```

Character Sets

- Can explicitly define a set of characters
  - [aeoiu]

- Can define a range of characters
  - [a-z0-9]

- Can represent *not* characters
  - [^aeiou]
  - \D

Each Regex Character Represents a Character in a String

[0-9]	[0-9]	/	[0-9]	[0-9]	/	[0-9]	[0-9]	[0-9]	[0-9]

10 boxes for 10 characters

Shorthand for Character Sets

There are shortcuts for commonly used character sets:

Shortcut	Definition	Example
\s	Any whitespace character	/a\sb/ matches: a b
\S	Any non-whitespace character	/a\Sb/ matches : abb
\d	Any digit	\d\d-\d matches 12-3
\D	Any non-digit	/a\Db/ matches aBc or abc
\w	Any alpha-numeric character	
\W	Any non-alpha-numeric character	

One pattern can match one or many sets of characters

English	Pattern	Matches	Does Not Match
4 numbers in a row	\d\d\d\d or \d{4}	1234 2222 3333	a1234 AAsaaaa 123
2 numbers, a slash, two numbers, a slash, 4 numbers	\d\d/\d\d/\d\d\d\d or \d{2}/\d{2}/\d{4}	11/01/2013 10/22/2015 23/45/2222	11/1/2013 1/11/2015 aa/aa/aaaa dsifjosdijfoas

Each Regex Character Represents a Character in a String

10 boxes for 10 characters

0	7	/	3	0	/	2	0	1	6

But this will only
match our one date.

Shortcuts

Literal Characters

0	7	/	3	0	/	2	0	1	6

Character Sets

\d	\d	/	\d	\d	/	\d	\d	\d	\d

Literal Characters

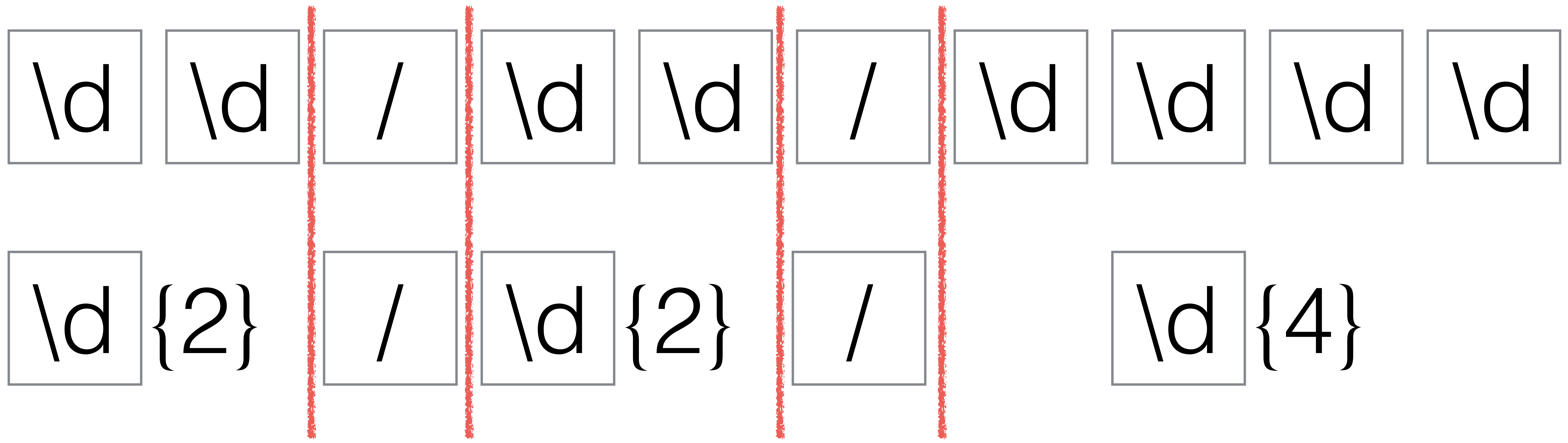
- Escape certain characters that have special meaning
    - \ can define a character set or escape a special character (\d or \. or \\)

Wildcard

.

Repetition

We don’t have to use 10 boxes when we have repeated characters.



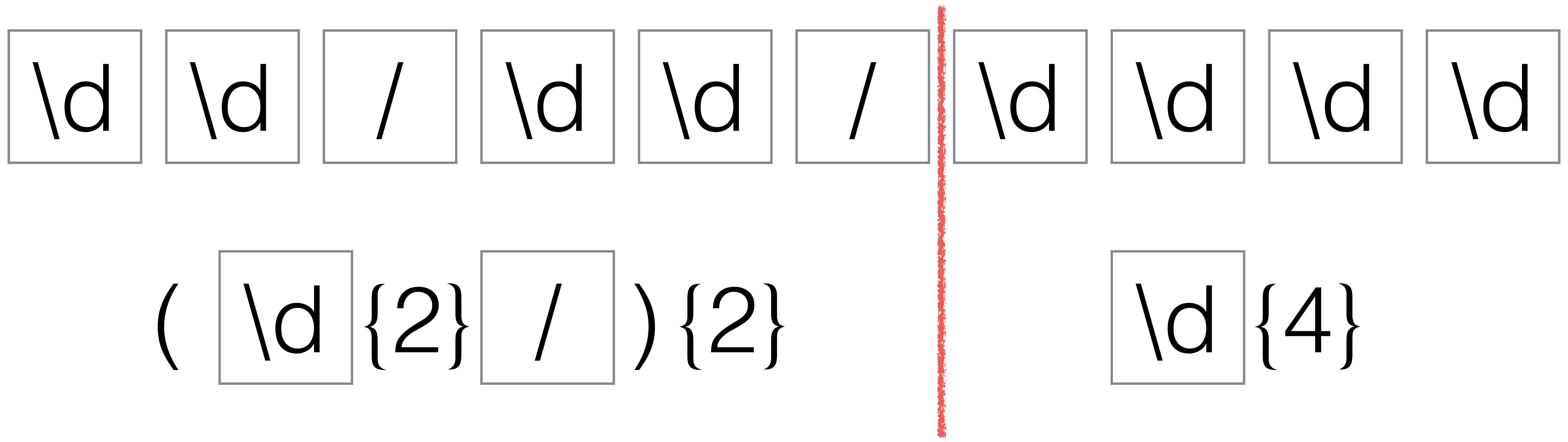
{min, max}

Repetition

- {6} Matches 6 of the previous element
- {6,} Matches 6 or more of the previous element
- {5,8} Matches between 5 and 8 of the previous element
- {,6} Matches up to 6 of the previous element

Grouping

Parentheses articulate groups of characters that can be extracted or repeated.



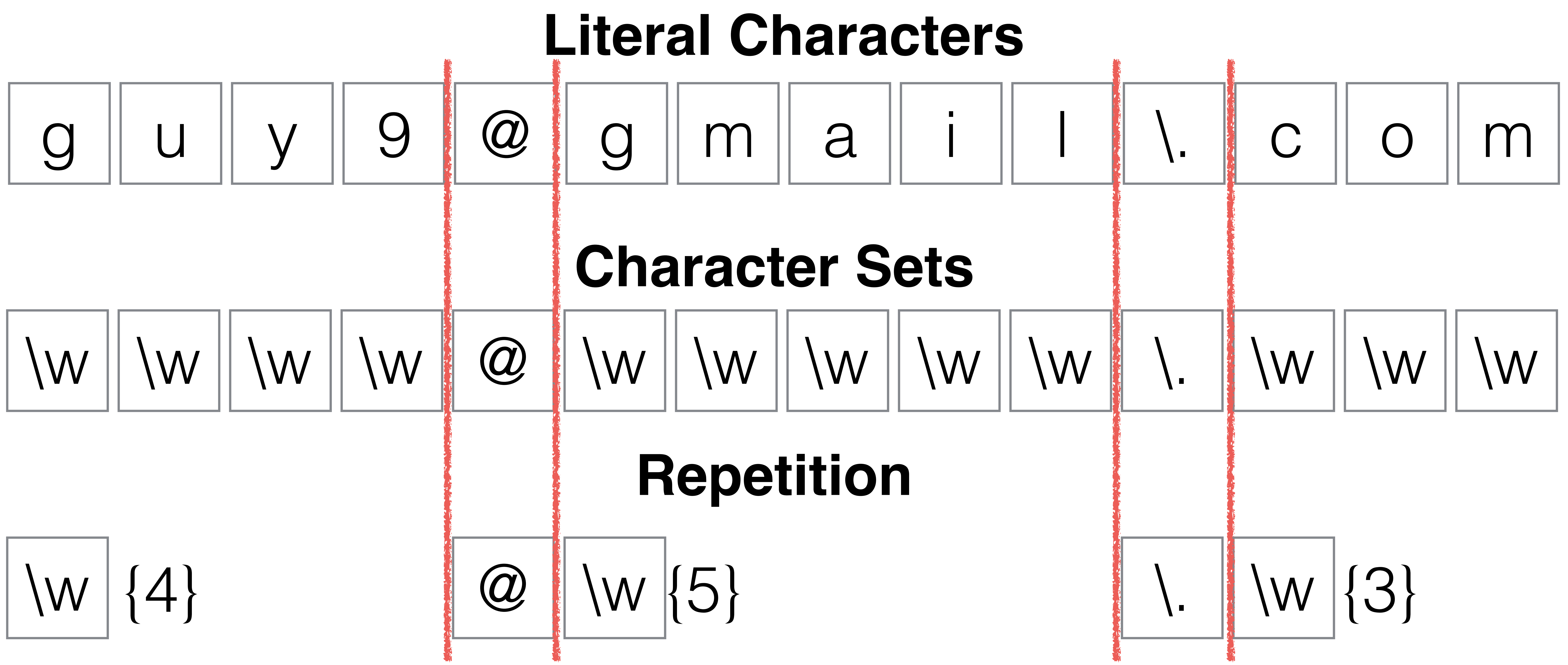
Challenge 2

Let's write a pattern that matches an email. Such as…

guy9@gmail.com

You try! Write a pattern that uses characters sets and repetition to match the email.

Less defined repetition


Literal Characters
g u y 9 @ g m a i l \. c o m
Character Sets
\w \w \w \w @ \w \w \w \w \w \. \w \w \w
Repetition
\w {4} @ \w {5} \. \w {3}

But what if there are 6 characters in the first part of the email?

Question, Star, and Plus

? match the previous character 0 or 1 times

***** match the previous character 0 or more times

+ match the previous character 1 or more times

Greedy vs Lazy

Sometimes **.+** can match too much.

If we throw **<.+>** at *<h1>Welcome</h1>* to find opening tags, we get back the entire string when we only wanted the beginning.

Using **.+?** makes the **+** lazy, meaning it will only grab as many characters are needed in order to continue the match.

Application

$\boxed{\backslash w}\ \{4\}\ \boxed{@}\ \boxed{\backslash w}\{5\}\ \boxed{\backslash .}\ \boxed{\backslash w}\ \{3\}$

$\boxed{\backslash w}\ +\ \boxed{@}\ \boxed{\backslash w}\ +\ \boxed{\backslash .}\ \boxed{\backslash w}\ +$

Exercises

Write regular expressions for the following:

- Filenames in the following format: yyyymmdd-data.xls
- IP Addresses in the format XXX.XXX.XXX.XXX
- Social Security Numbers in the format XXX-XX-XXXX
- Any 4 letter word beginning with a vowel
- Any 4 letter word with a number at the end

Regex in Python

- Python has regex support via the re module, which must be imported.
- The re module has four basic functions
  - match(<pattern>, <text>): finds the ***first*** occurrence of the pattern in the given text.
  - search(<pattern>, <text>): finds any occurrence of the pattern in the given text
  - findall(<pattern>, <text>)/finditer(<pattern>, <text>): finds all occurrences of the pattern in a given text.
  - split(<pattern>, <text>): Splits the text by the regex.
  - sub(<old>,<new>, <text>): Replaces old with the new in the given text.

Regex Option Flags

Flag	Description
re.I / re.IGNORECASE	Performs case insensitive matching
re.L / re.LOCALE	Interprets words according to locale
re.M / re.MULTILINE	Make begin consider each line
re.S / re.DOTALL	Makes a period match any character including a newline.
re.U / re.UNICODE	Interprets letters according to the Unicode character set. This flag affects the behavior of \w, \W, \b, \B.
re.X / re.VERBOSE	Allows comments in regex

Regex in Python

```
import re

text = "some 4444 text"
regex = "\d{4}"

matchObj = re.match(regex, text, re.U)

if matchObj:
   # Successful Match

else:
   #No match
```

Regex in Python

```
import re

text = "some 4444 text"
regex = r"\d{4}"

# Compiling Regex will improve performance
compiled_regex = re.compile(regex)
matchObj = compiled_regex.search(regex, text, re.U)

if matchObj:
   # Successful Match

else:
   #No match
```

Grouping Parentheses

- When you put parens around sections of a regex you use these to extract parts of the text

- Python uses the **`.group(n)`** function to access parts of a match

- **`group(0)`** will get you the entire matched text, whereas **`group(1)`** gets the first match.

Extracting Data with Regex

```
import re

emailAddress = "account@domain.com"
emailRegex = r"(\w+)@(\w+\.\w+)"

emailMatch = re.search(emailRegex, emailAddress)

if emailMatch:
    account = emailMatch.group(1)
    domain = emailMatch.group(2)
    completeEmail = emailMatch.group(0)
else:
   #No match
```

Back References

- Back references allow you to refer to previously matched blocks of text.
- Python uses the syntax `\1, \2, \3` in a regex to refer to previously matched groups
- Can be used in `re.sub()` to re-arrange matched parts.

In Class Exercise

Please take 20 minutes and complete

Worksheet 0.1: Regular Expressions in Python

Questions?