Text editors

Bioinformatics Applications (PLPTH813)

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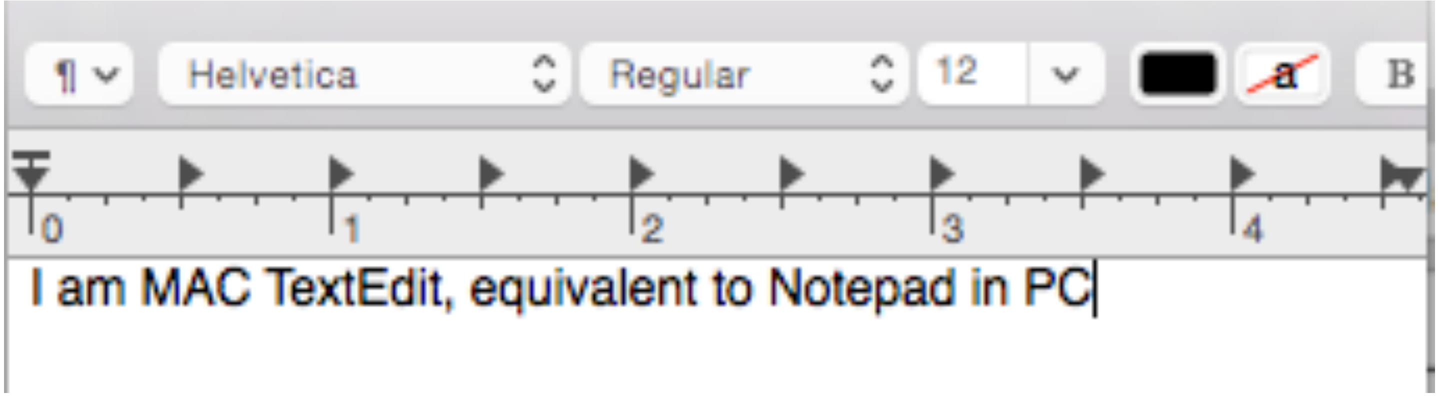
Outline

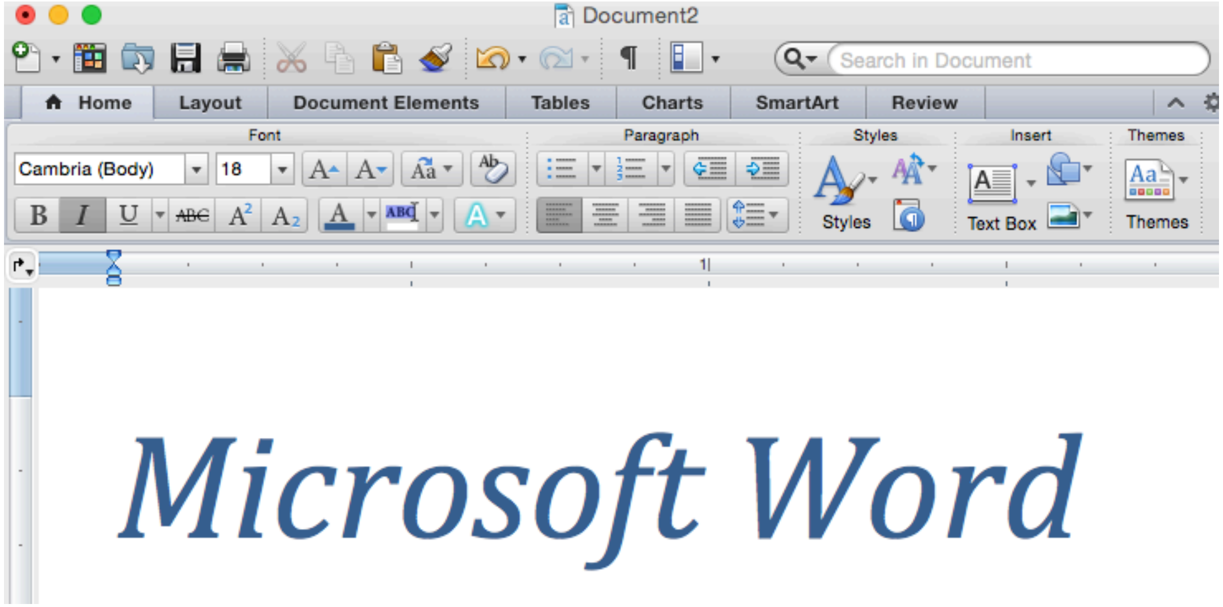
Goal: to understand how to organize data in a proper format and efficiently input and edit data.

- Formats of text data files
- Excel to generate a text file and tips in Excel
- TextWrangler (Mac) Notepad++ (PC): text editor
- Regular expression
- *vi*: another text editor

Software for text editing



I am MAC TextEdit, equivalent to Notepad in PC



Microsoft Word

Text file – flat file

- **Flat file**

1. Simple format, consisting of readable characters

- ASCII (American Standard Code for Information Interchange, 128 characters)
- No rich format control (e.g. bold or Italics, etc)

2. Easy for sharing

- **The organization of data in a text file**

1. Most popular formats for tabular data: space or tab separated data file (.txt) and comma-separated values (.csv)
2. Most popular format for DNA/protein sequences: FASTA format (.fa, .fas, .fasta)

File formats

- Tab separated file (.txt)

```
name    age >30?    gender
Josh    23  FALSE   male
Rose    35  TRUE    female
```

- Comma-separated file (.csv)

```
name,age,>30?,gender
Josh,23,FALSE,male
Rose,35,TRUE,female
```

- FASTA (.fa, .fas, .fasta)

```
>Aa1
CCATCTCATCCCTGCGTGTCTCCGACTCAG
>Aa2
CTGAGTCGGAGACACGCAGGGATGAGATGGTT
```

Text editors

- Notepad or Notepad++ (PC)
- TextEdit (Mac)
- TextWrangler (Mac)
- vi (Unix and Linux)
- Emacs

- *Word* (PC and Mac): save as …
- *Excel* (PC and Mac): save as …
- etc

Newline – end of line (EOL)

Two types of EOL: line feed (LF) and carriage return (CR):

LF: \n
CR: \r

- LF: Unix, Linux, OS X
- CR: Mac OS up to version 9 and OS-9
- CR+LF: Microsoft Windows

http://en.wikipedia.org/wiki/Newline

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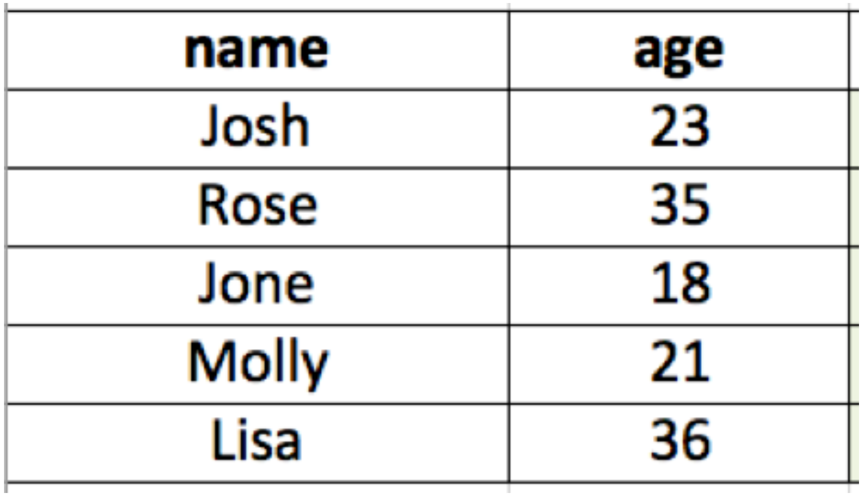
Excel to generate a text file



name	age
Josh	23
Rose	35
Jone	18
Molly	21
Lisa	36

- copy and paste to a text editor (e.g. vi)
- save as …

Excel function - examples

Q1: =**AVERAGE**(B3:B7)

Q2: =**COUNTIF**(B3:B7, ">20")

Q3: =B3**>**30

Q4: search information at Table 2

1. define the Table 2: gender (control + l)

2. =**VLOOKUP**(A3, gender, 2, FALSE)

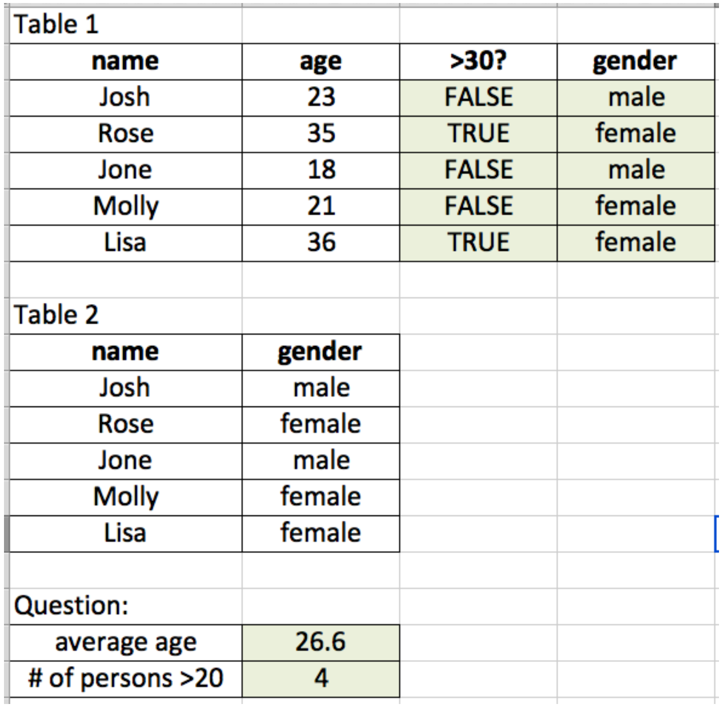
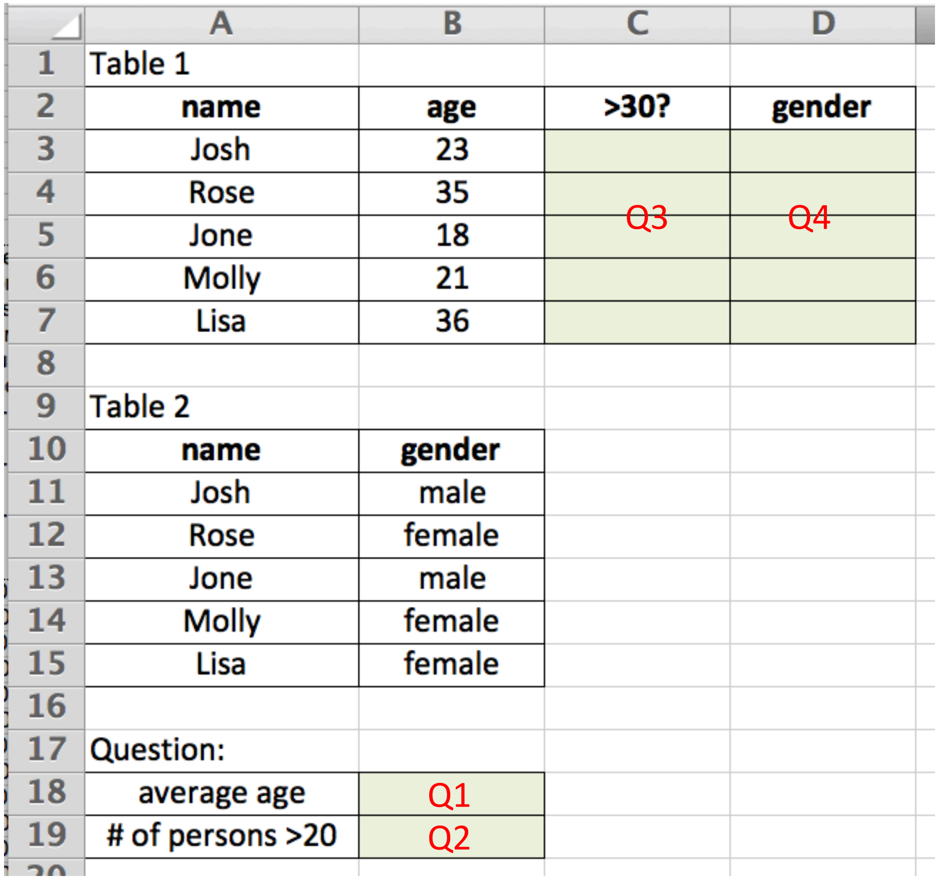


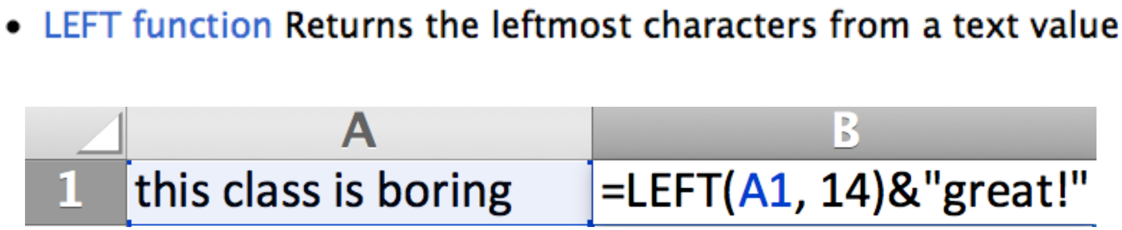
Table 1			
name	**age**	**>30?**	**gender**
Josh	23	FALSE	male
Rose	35	TRUE	female
Jone	18	FALSE	male
Molly	21	FALSE	female
Lisa	36	TRUE	female
Table 2			
name	**gender**		
Josh	male		
Rose	female		
Jone	male		
Molly	female		
Lisa	female		
Question:			
average age	26.6		
# of persons >20	4		



	A	B	C	D
1	Table 1			
2	**name**	**age**	**>30?**	**gender**
3	Josh	23		
4	Rose	35		
5	Jone	18	Q3	Q4
6	Molly	21		
7	Lisa	36		
8				
9	Table 2			
10	**name**	**gender**		
11	Josh	male		
12	Rose	female		
13	Jone	male		
14	Molly	female		
15	Lisa	female		
16				
17	Question:			
18	average age	Q1		
19	# of persons >20	Q2		
20				

Useful functions in Excel

- max/min/average/sum
- len/left/right
- if/countif
- >, <, =
- & (concatenate)
- vlookup



- LEFT function Returns the leftmost characters from a text value

	A	B
1	this class is boring	=LEFT(A1, 14)&"great!"

Functions can be combined.

Problem 1

Replace the words containing "genome" with "XXX" regardless of letter case.

Genome old and new charted the emergence of agriculture. Contemporary Europeans carry DNA inherited from light-skinned, brown-eyed farmers who migrated from the Middle East beginning 7,000–8,000 years ago, in addition to more-ancient ancestry. The achievements of these early farmers — domestication of crops such as wheat and barley — are also being understood through genome sequencing.

Which software and what trick will you use?

Problem 2

Replace the words containing “genome” with “XXX” regardless of letter case (e.g., Genome = genome = genomes = Genomes).

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Which software and what trick will you use?

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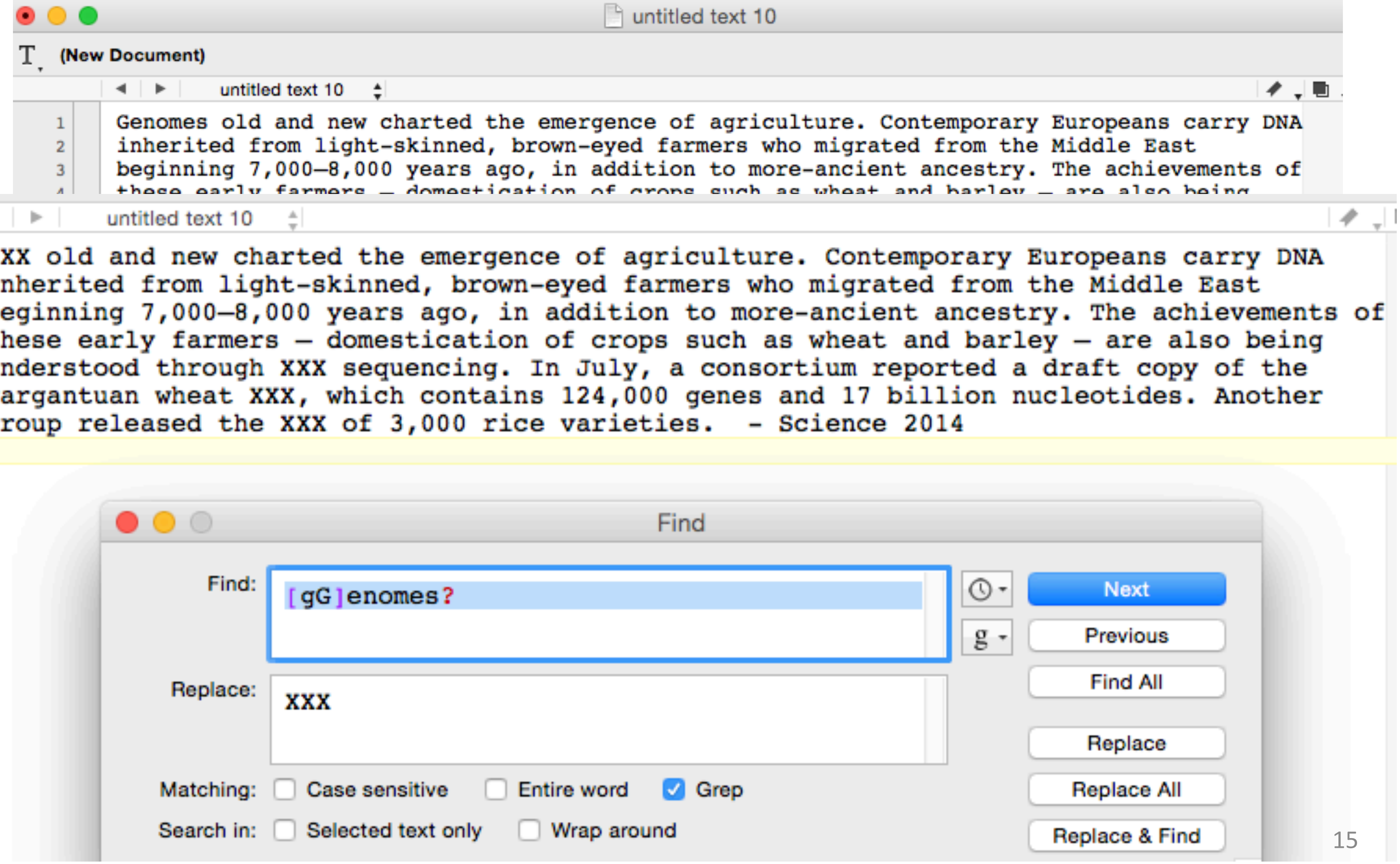
- Regular expression
- *vi*: another text editor

TextWrangler

A flexible text editor with powerful functions of searching and editing.



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inherited from light-skinned, brown-eyed farmers who migrated from the Middle East
beginning 7,000–8,000 years ago, in addition to more-ancient ancestry. The achievements of
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Find: [gG]enomes?

Replace: XXX

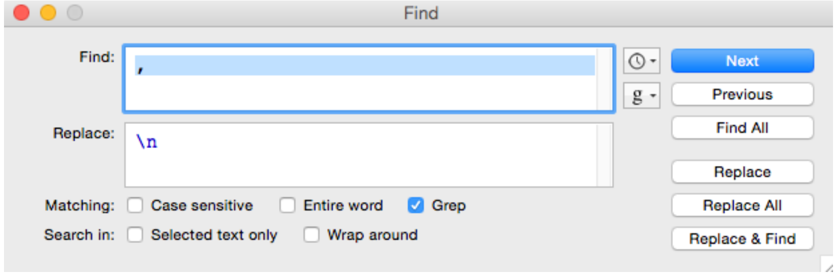
Matching: □ Case sensitive □ Entire word ☑ Grep

Search in: □ Selected text only □ Wrap around

TextWrangler – more examples

Class participation 15%, Homework 15%, Midterm Exam 20%, Project 20%, Final Exam 30%

Class participation 15%
Homework 15%
Midterm Exam 20%
Project 20%
Final Exam 30%



Find: ,

Replace: \n

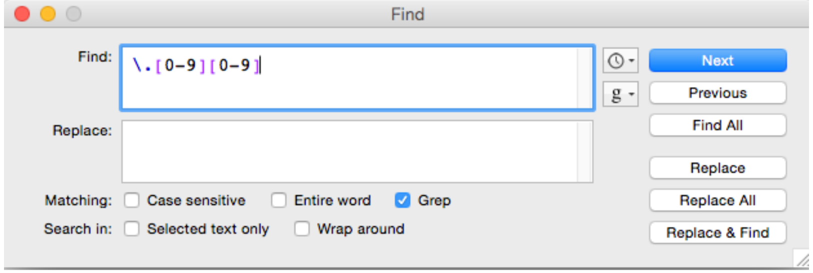
Matching: □ Case sensitive □ Entire word ☑ Grep

Search in: □ Selected text only □ Wrap around

\n: end of line character (line separator)

Class participation 15.01%, Homework 15.03%, Midterm Exam 20.10%, Project 20.10%, Final Exam 30.01%

\.[0-9][0-9]



Find: \.[0-9][0-9]

Replace:

Matching: □ Case sensitive □ Entire word ☑ Grep

Search in: □ Selected text only □ Wrap around

\.: the character of "."
. : any character

Regular expression

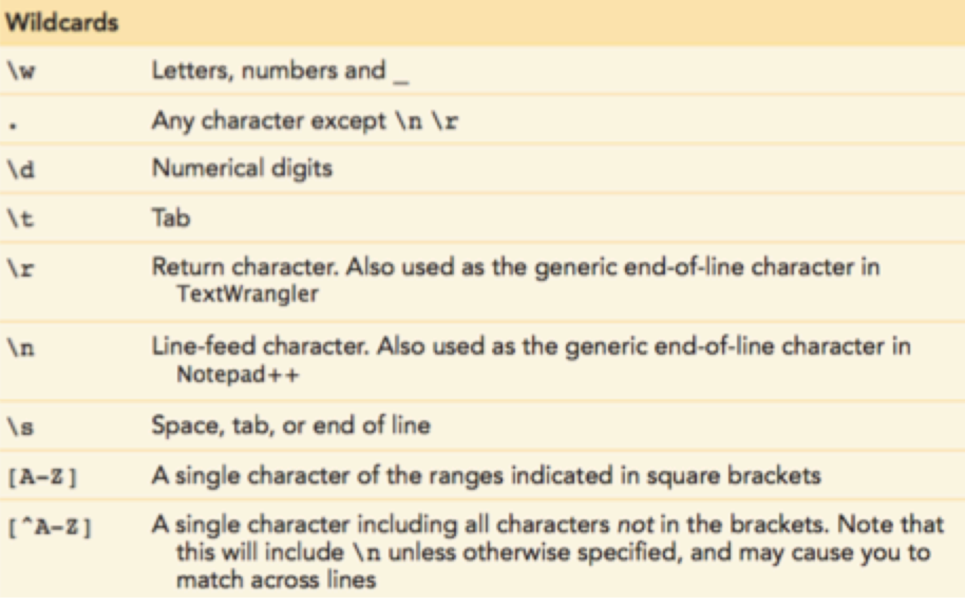
- **Regular expression** (regex or regexp) is a sequence of characters that forms a search pattern.

Search genome or genomes:

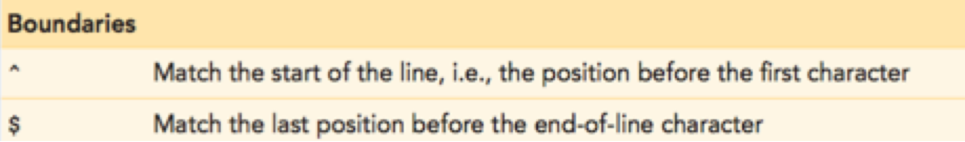
[gG]enomes?

[] : a single character of a range indicated in the square brackets
?: no matches or just one match

More regex characters



Wildcards	
\w	Letters, numbers and _
.	Any character except \n \r
\d	Numerical digits
\t	Tab
\r	Return character. Also used as the generic end-of-line character in TextWrangler
\n	Line-feed character. Also used as the generic end-of-line character in Notepad++
\s	Space, tab, or end of line
[A-Z]	A single character of the ranges indicated in square brackets
[^A-Z]	A single character including all characters *not* in the brackets. Note that this will include \n unless otherwise specified, and may cause you to match across lines



Boundaries	
^	Match the start of the line, i.e., the position before the first character
$	Match the last position before the end-of-line character

Regular expression (I)

\t : a tab character

\r (or \n): end-of-line

Potato,apple,orange

Regexp	Replace
,	\t

Potato apple	orange

Regexp	Replace
\t	\n

Potato

apple

orange

Regular expression (II)

- **^** beginnings
- **$** endings

Potato
apple
orange

Regexp	Replace
^	-

-Potato
-apple
-orange

Potato
apple
orange

Regexp	Replace
$	s

Potatos
apples
oranges

Regular expression (II)

- **\w** a ***w***ord character, including letters, numbers and underscore
- **\d** : numerical ***d***igits

I have 5 apples.

Regexp	Replace
^\w	We

We have 5 apples.

I have 5 apples.

Regexp	Replace
\d	a lot of

I have a lot of apples.

Regular expression (III)

+ : 1 or more previous regular expression

? : 0 or 1 previous regular expression

. : any character except \n \r

potato,apple,orange

Regexp	Replace
p+	-

-otato,a-le,orange

potato,apple,orange

Regexp	Replace
p?	-

--o-t-a-t-o-,-a---l-e-,-o-r-a-n-g-e

potato,apple,orange

Regexp	Replace
p.	-

-tato,a-le,orange

Regular expression (IV)

[A-Z] : any single letter

NspI

5'...RCATG▼Y...3'
3'...Y▲GTACR...5'

[AG]CATG[CT]

select 2012, 2013, 2014 201[2-4]

{} : specify a range of numbers to repeat the match of the immediately preceding character.

Poly A (12 A in a row)	A{12}
Poly A (10-12 A in a row)	A{10,12}
Poly A (>=10 A in a row)	A{10,}

Problem 3: Guess what this represents

```
K-?[Ss]tate|KSU
```

Regular expression

- Regular expression is for pattern searches
- It is commonly employed in programming languages
- The rules vary depending on the specific implementation (or programming languages or versions) in use.

Does Google provide search with regular expressions?

"genome * sequencing"

vi

- *vi* is a text editor created for the Unix operating system.
- fast and powerful
- *vi* has two modes:

1. insert mode (edit as other text editors)
2. command mode (commands that control the edit session).

switch modes by using “i” and “ESC” key

Your keyboard controls “everything”.

Actions in command mode

Search: to search content using “/”

- /<text or regular expression>

Delete contents for example by lines

Copy and **paste**

Goal of today's lab

- Familiar to Excel functions
- Try *vi* at Beocat
- Practice using regular expression in TextWrangler

for PC, download the software "putty" and "notepad++"
for mac, download "textWrangler"