

Unix command line; editors

Tools for Reproducible Research

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Course web: kbroman.org/Tools4RR

Windows vs. Mac OSX vs. Linux

Remote vs. Not

If you're stuck with Windows...

Consider **Cygwin** (and perhaps **Mintty**)

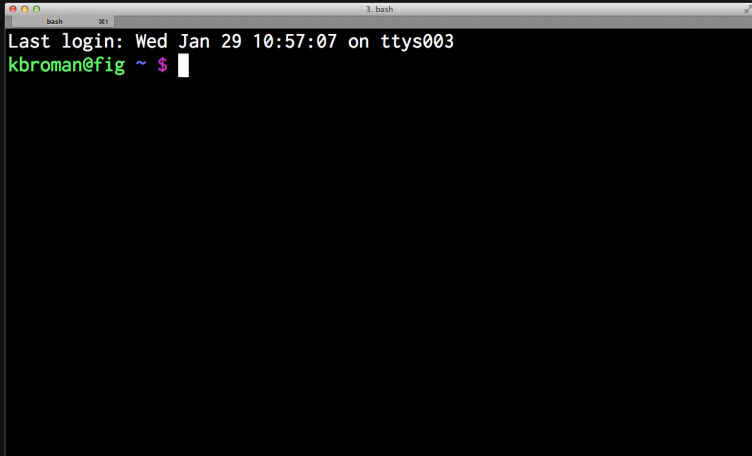
If you use a Mac...

Consider Homebrew and iTerm2

The command line is your friend

- ▶ Don't touch that mouse!
- ▶ Scriptable
- ▶ Flexible

The shell

A screenshot of a terminal window. The window has a title bar with three colored buttons (red, yellow, green) on the left and the text "3. bash" on the right. Below the title bar, the text "bash" and "001" are visible. The main content of the terminal shows the message "Last login: Wed Jan 29 10:57:07 on ttys003" in white. Below this, the prompt "kbroman@fig ~ \$" is displayed in green, with a white cursor character following the dollar sign.

```
bash 001 3. bash
Last login: Wed Jan 29 10:57:07 on ttys003
kbroman@fig ~ $
```

Options: tcsh, bash, zsh

Basics

- ▶ Directory structure

Absolute vs. relative paths

```
ls -l ~/..
```

- ▶ Creating, removing, changing directories

```
mkdir
```

```
rmdir
```

```
cd
```

```
cd -
```

- ▶ Moving, copying, removing files

```
mv
```

```
cp
```

```
rm -i
```

~/ .bash_profile

```
export PATH=./usr/local/bin:$PATH
export LD_LIBRARY_PATH=/usr/local/lib

noclobber=1      # prevent overwriting of files
IGNOREEOF=1      # disable Ctrl-D as a way to exit
HISTCONTROL=ignoredups

alias cl='clear;cd'
alias rm='rm -i'
alias mv='mv -i'
alias cp='cp -i'
alias ls='ls -GF'
alias 'l.='='ls -d .[a-zA-Z]*'
alias ll='ls -lh'
alias md='mkdir'
alias rd='rmdir'
alias rmb='rm .*~ *~ *.bak *.bk!'

alias Rb='R CMD build --force --resave-data'
alias Ri='R CMD INSTALL --library=/Users/kbroman/Rlibs'
alias Rc='R CMD check --library=/Users/kbroman/Rlibs'
alias Rcc='R CMD check --as-cran --library=/Users/kbroman/Rlibs'
```


Redirection and pipes

```
$ locate article.cls > output.txt
$ locate book.cls >> output.txt
$ grep texmf output.txt

$ locate article.cls | grep texmf

$ locate article.cls | grep texmf | less

$ locate article.cls | wc -l
$ locate article.cls | grep texmf | wc -l

$ cat file1.txt file2.txt > combined.txt
```

Wild cards

```
$ grep blah *.txt
```

```
$ ls blah.???
```

```
$ ls [a-z]*
```

```
$ ls /usr/bin/[auz]*
```

```
$ ls /usr/bin/[auz]*.*
```

Suspend/foreground/background

```
$ R CMD BATCH input.R output.txt &  
  
$ R CMD BATCH input.R output.txt  
[ctrl-Z]  
$ bg  
  
$ emacs afile.txt  
[ctrl-Z]  
$ fg
```

Other useful tools

```
$ find . -name *.py

$ ps ux

$ top

$ df -hk

$ du -h
$ du -hd2

$ ln -s ~/Projects/SomeFriend/Data
$ ln -s ~/Projects/SomeFriend/Data SomeFriend_Data

$ tar xzvf qtl_1.29-2.tar.gz
$ tar czvf blah.tgz Blah/
$ tar tzvf blah.tgz

$ wget http://kbroman.org/Tools4RR/pages/resources.html
```

Further useful tools

```
$ whereis bash
$ type rm
$ type emacs

$ pwd

$ head afile.txt
$ tail afile.txt
$ head -n20 afile.txt

$ man head

$ kill 8453
$ kill -9 8453

$ history
$ !!
$ !-2
$ !503

$ ping www.google.com

$ ispell afile.txt
```

Moving around the command line

<code>ctrl-f, ctrl-b</code>	move forward and back
<code>ctrl-a, ctrl-e</code>	move to beginning and end of line
<code>ctrl-k, ctrl-u</code>	delete rest of line, or to the start
<code>ctrl-l</code>	clear the screen
<code>ctrl-c</code>	cancel what you've typed
<code>tab</code>	autocomplete command or file
<code>ctrl-p, ctrl-n</code>	forward and backward in history
<code>ctrl-r</code>	search for a previous command

File modes

```
kbroman@fig ~/Teaching/Tools4RR/Lectures (master) $ ll
total 8
drwxr-xr-x 27 kbroman staff 918B Jan 27 11:35 01_Intro/
drwxr-xr-x 30 kbroman staff 1.0K Jan 29 11:38 02_Unix/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:28 03_KnitrMarkdown/
drwxr-xr-x 37 kbroman staff 1.2K Jan 20 23:05 04_Git/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:28 05_Organization/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:28 06_EDA/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:28 07_ClearCode/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:28 08_Rpack/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:28 09_TestingDebugging/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:29 10_BigJobs/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:29 11_KnitrPapers/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:29 12_KnitrTalks/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:29 13_KnitrPosters/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:29 14_Python/
drwxr-xr-x 2 kbroman staff 68B Jan 14 06:29 15_Licenses/
-rwxr-xr-x 1 kbroman staff 488B Oct 23 16:18 createVersionWithNotes.rb*
kbroman@fig ~/Teaching/Tools4RR/Lectures (master) $
```

File modes/owner/group

```
sudo chown kbroman .  
chgrp -R staff .  
chmod +x createVersionWithNotes.rb  
chmod 755 02_Unix  
chmod 644 02_Unix/02_unix.tex  
chmod 700 Private_stuff
```


How to solve computing problems

- ▶ Try stuff!
- ▶ man pages and help files
- ▶ `blah -h` or `blah --help`
- ▶ Google
- ▶ Stackoverflow and other StackExchange sites
- ▶ Google with `site:stackoverflow.com`
- ▶ email lists and google groups
- ▶ friends or colleagues
- ▶ Twitter
- ▶ Buy a book. Buy all of the books.

Examples

- ▶ How do you suppress warnings in knitr?
- ▶ What symbol corresponds to the unicode `\u00B1`?
- ▶ What's the difference between `curl` and `wget`?
- ▶ What does "502 Bad Gateway" mean?
- ▶ "To open `gs` you need to install X11"
- ▶ `mclapply` isn't working in Windows
- ▶ How to ping a server in Python?
- ▶ Font shape ``EU1/pplx/m/n'` undefined
- ▶ `except KeyError, k: raise AttributeError, k`

Important principle

Learn to code by looking at good code.

Choose a good editor

- ▶ Emacs
- ▶ VIM
- ▶ RStudio
- ▶ Textwrangler
- ▶ Notepad++
- ▶ Sublime Text
- ▶ Atom

A good editor

- ▶ Doesn't require pointing-and-clicking
- ▶ Easy to get code between R and a script
- ▶ Syntax highlighting of code
- ▶ Automatic indentation
- ▶ Close parentheses/brackets/braces
- ▶ Browse code across files
- ▶ Integrated with other tools (e.g., version control)

Don't forget to look at the resources page

kbroman.org/Tools4RR/pages/resources.html