RESEARCH TOOLS 2011 LECTURE 10

2011-Oct-04
Kurt Schwehr
http://schwehr.org

UNH CCOM/JHC

ipython and python data types

http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchtools/

Our first full lecture covering python
I used the "Tom Boy"

emacs23@ubuntu

File   Edit   Options   Buffers   Tools   Minibuf   Help

```
#+STARTUP: showall

#+TITLE:      Class 11: ipython
#+AUTHOR:     Kurt Schwehr
#+EMAIL:      schwehr@ccom.unh.edu
#+DATE:       <2011-10-04 Tue>
#+DESCRIPTION: Marine Research Data Manipulation and Practices
#+KEYWORDS: ipython matplotlib
#+LANGUAGE:   en
#+OPTIONS:    H:3 num:nil toc:t \n:nil @:t ::t |:t ^:t -:t f:t *:t <:t
#+OPTIONS:    TeX:t LaTeX:nil skip:t d:nil todo:t pri:nil tags:not-in-toc
#+INFOJS_OPT: view:nil toc:nil ltoc:t mouse:underline buttons:0 path:http://orgm
#+LINK_HOME: http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchto

* Setup

Before you start class, make sure you have your environment set up.
Here is what I suggest

#+BEGIN_SRC sh
mkdir -p ~/class/11
cd ~/class/11
wget http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchtools/src/
#+END_SRC

Make sure you have this org file for class open in emacs from
~/class/11/11-ipython-matplotlib.org

Open a terminal and =cd ~/class/11=.

* Introduction

** TODO Homework 3 due today!
```

--:---   11-ipython-matplotlib.org   Top L1   (Org)-------------------
IRC server: researchtoo

Lecture 11

Q Search   L

Lecture 11

http://vislab-ccom

Kurt Schwehr, 201

researchtools@ub

File   Edit   View   Search   T

researchtools@ubuntu:~/cl
total 24
-rw-r--r-- 1 researchtool
otlib.org
researchtools@ubuntu:~/class/11$

class

Dropbox

hw

[researchtools@ubun...]   Lecture 11: ipython an...   researchtools@ubunt...   emacs23@ubuntu

Wednesday, October 5, 11

I tried using the emacs ERC client for IRC during this class. That was tough as I really do not have enough space up on the projector.
M-x erc
IRC server: researchtools.ccom.nh
port: 6667
set your nickname to something other than researchtools!!!!
/join #unhresearchtools

emacs23@ubuntu

File Edit Options Buffers Tools Org Tbl Help

#+STARTUP: showall

#+TITLE: Class 11: ipython
#+AUTHOR: Kurt Schwehr
#+EMAIL: schwehr@ccom.unh.edu
#+DATE: <2011-10-04 Tue>
#+DESCRIPTION: Marine Research Data Manipulation and Practices
#+KEYWORDS: ipython matplotlib
#+LANGUAGE: en

Lecture 11: ipython and python data structures

Search   Link   Text   Notebook

Lecture 11: ipython and python data structures

http://vislab-ccom.unh.edu/~schwehr/rt/11-ipython.html

Kurt Schwehr, 2011-Oct-4

researchtools@ub

File Edit View Search Te
researchtools@ubuntu:~/cla
total 24
-rw-r--r-- 1 researchtools
otlib.org
researchtools@ubuntu:~/cla

[Tue Oct 4 2011]
*** You have joined channel #unhresearchtools   [10:57]
*** Topic for #unhresearchtools: UNH channel for ubuntu, bash, python, emacs,
    org-babel, and marine geospatial
*** #unhresearchtools: topic set by schwehr, 16:53:14 2011/09/30
*** Users on #unhresearchtools: schwehrvm @goatbar
*** #unhresearchtools modes: +
ERC>

-U:**- #unhresearchtools@Unknown   All L11   (ERC)------------------------

[researchtools@ubun...   Lecture 11: ipython an...   researchtools@ubunt...   emacs23@ubuntu
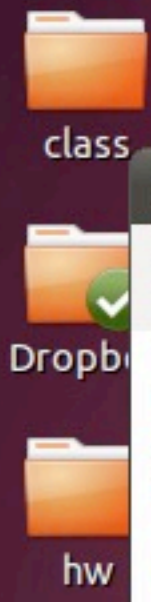
emacs23@ubuntu

File   Edit   Options   Buffers   Tools   ERC   Help

Lecture 11: ipython and python data structures

Search   Link   Text   Notebook

Lecture 11: ipython and python data structures

http://vislab-ccom.unh.edu/~schwehr/rt/11-ipython.html

Kurt Schwehr, 2011-Oct-4

nvironment set up.

2011/esci895-researchtools/src/

make sure you have this org file for class open in emacs from
~/class/11/11-ipython-matplotlib.org

Open a terminal and =cd ~/class/11=.

* Introduction

---:---   11-ipython-matplotlib.org   3% L23   (Org)----------

schwehrvm on #unhresearchtools (+,lag:0) UNH channel for ubuntu, bash, python, emacs
*** berrya (~chatzill@lab2.ccom.nh) has joined channel #unhresearchtools
*** sthein (~chatzill@lab9.ccom.nh) has joined channel #unhresearchtools
<sthein> Hi !
<berrya> good morning. Should we open this in Emacs?   [11:05]
<schwehrvm> yes. open the org file in emacs
*** ygh2 (~chatzill@lab10.ccom.nh) has joined channel #unhresearchtools
*** mohammad (~chatzill@lab7.ccom.nh) has joined channel #unhresearchtools
*** matt_w (~chatzill@192.168.8.223) has joined channel #unhresearchtools
                                                              [11:06]
<mohammad> hio   [11:07]
*** Gmasetti (~chatzill@192.168.8.241) has joined channel #unhresearchtools
*** prasadh (~chatzill@lab5.ccom.nh) has joined channel #unhresearchtools
<prasadh> hi
ERC>

-U:**-   #unhresearchtools@Unknown   Bot L30   (ERC)-----------

researchtools@ubuntu: ~/class/11

File   Edit   View   Search   Terminal   Help

researchtools@ubuntu:~/class/11$ ls -l
total 24
-rw-r--r-- 1 researchtools researchtools
otlib.org
researchtools@ubuntu:~/class/11$

class

Dropb

hw

[researchtools@ubun...   Lecture 11: ipython an...   researchtools@ubunt...   emacs23@ubuntu

Wednesday, October 5, 11

emacs23@ubuntu

File Edit Options Buffers Tools Org Tbl Help

class

Search

Dropb Lecture

http://vislab-

hw Kurt Schwehr

Here's a quick video preview:
http://www.wolfram.com/common/includes/m8videos/quicktour.html

** UNH Signals   :unh:

UNH has an Information Technology (IT) newsletter called Signals.

Vantagepoint: Inside UNH IT with Chief Information Officer Joanna Young

You can meet our CIO. If you read her answers to questions, you will
see that I think she missed something *huge* with passwords: all your
passwords should be different. I worry less about people changing
their passwords and more about each password being unrelated to
compartmentalize any damage. If someone grabbed your password for a
site requiring your password, there is a non-zero chance that if you
change your password that they will get that new password the same way

--:--- 11-ipython-matplotlib.org 10% L73 (Org)--------------------------

researchtools@

File Edit View Search

researchtools@ubuntu:~$
total 12
drwxr-xr-x 6 researcht
drwx------ 16 researcht
drwxr-xr-x 3 researcht
researchtools@ubuntu:~$
researchtools@ubuntu:~/
total 16
drwxr-xr-x 2 researchto
drwxr-xr-x 2 researchto
drwxr-xr-x 2 researchto
drwxr-xr-x 5 researchto
researchtools@ubuntu:~/
researchtools@ubuntu:~/
total 24
-rw-r--r-- 1 researchto
otlib.org
researchtools@ubuntu:~/

schwehrvm on #unhresearchtools (+,lag:0) UNH channel for ubuntu, bash, python, emacs, org-babel, and
<bwelton> morning!   [11:10]
<schwehrvm> wget
        http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchtools/src/
                                                                       [11:11]
*** hminami (~chatzill@192.168.8.245) has joined channel #unhresearchtools
<hminami> hi
ERC> /names
*** Users on #unhresearchtools: hminami bwelton kjerram ben nhassan prasadh
    Gmasetti matt_w mohammad ygh2 sthein berrya mluke schwehrvm @goatbar
*** cenglert (~chatzill@lab8.ccom.nh) has joined channel #unhresearchtools
                                                                       [11:12]
<cenglert> hello
ERC>

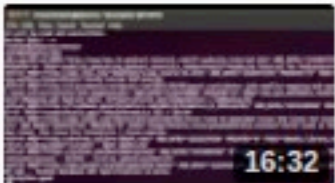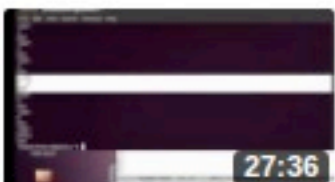-U:**- #unhresearchtools@Unknown   Bot L54   (ERC)----------------------

[researchtools@ubun...] Lecture 11: ipython an... researchtools@ubunt... emacs23@ubuntu

Applications   Places   System   11:18 AM   researchtools

emacs23@ubuntu

File   Edit   Options   Buffers   Tools   Org   Tbl   Help

```
** What was that strange command in the homework?

Did you try it with an echo command?

#+BEGIN_SRC sh
echo ~/hw/03/log-$USER-$(date +%Y%m%d).org
#+END_SRC

On my Mac laptop, I get:

#+results:
```

class

Dropb

hw

Search

Lecture

http://vislab-

Kurt Schweh

researchtools@ubuntu: ~/class/11

File   Edit   View   Search   Terminal   Help

```
drwxr-xr-x  3 researchtools researchtools 4096 2011-09-26 19:40 hw
researchtools@ubuntu:~$ cd class
researchtools@ubuntu:~/class$ ls -l
total 16
drwxr-xr-x 2 researchtools researchtools 4096 2011-09-29 11:25 09
drwxr-xr-x 2 researchtools researchtools 4096 2011-09-29 12:32 10
drwxr-xr-x 2 researchtools researchtools 4096 2011-10-04 10:42 11
drwxr-xr-x 5 researchtools researchtools 4096 2011-10-04 10:36 screencapture
researchtools@ubuntu:~/class$ cd 11
researchtools@ubuntu:~/class/11$ ls -l
total 24
-rw-r--r-- 1 researchtools researchtools 21262 2011-10-04 10:28 11-ipython-matpl
otlib.org
researchtools@ubuntu:~/class/11$ echo ~/hw/03/log-$USER-$(date +%Y%m%d).org
/home/researchtools/hw/03/log-researchtools-20111004.org
researchtools@ubuntu:~/class/11$ echo $(date +%Y%m%d)
20111004
researchtools@ubuntu:~/class/11$ date +%Y%m%d
20111004
researchtools@ubuntu:~/class/11$ date --utc +%Y%m%d
20111004
researchtools@ubuntu:~/class/11$
```

ash part 2: shell variables

:youtube:video:
----
untu, bash, python, emacs, org-babel, and
                          [11:10]
2011/esci895-researchtools/src/
                          [11:11]
   #unhresearchtools

ben nhassan prasadh
hwehrvm @goatbar
   #unhresearchtools
                          [11:12]

[researchtools@ubun...   Lecture 11: ipython an...   researchtools@ubunt...   emacs23@ubuntu

Wednesday, October 5, 11

At offset 5:00

emacs23@ubuntu

File   Edit   Options   Buffers   Tools   Org   Tbl   Help

** Not Python 3

In this class we are using Python 2.7. You will want to avoid
reference material for python 3. While python 3 is even better than
python 2.x, there is still work to be done to get all of the add ons
ready for python 3 and you will have trouble with getting examples to
work. To reduce confusion, just avoid python 3 for now. If you
learn python 2.7, the switch to python 3 will be very easy and there
is even a program to automatically make the number of small changes
required for code to work with python 3.

** See Also

If you like the concept of a 1 double sided reference card, here some
for python and ipython:

--:--- **11-ipython-matplotlib.org**   19% L106   (Org)--------------------------------
schwehrvm on #unhresearchtools (+,lag:0) UNH channel for ubuntu, bash, python, emacs, org-babel, and
<bwelton> morning!   [11:10]
<schwehrvm> wget
            http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchtools/src/
                                                                          [11:11]
*** hminami (~chatzill@192.168.8.245) has joined channel #unhresearchtools
<hminami> hi
ERC> /names
*** Users on #unhresearchtools: hminami bwelton kjerram ben nhassan prasadh
    Gmasetti matt_w mohammad ygh2 sthein berrya mluke schwehrvm @goatbar
*** cenglert (~chatzill@lab8.ccom.nh) has joined channel #unhresearchtools
                                                                          [11:12]
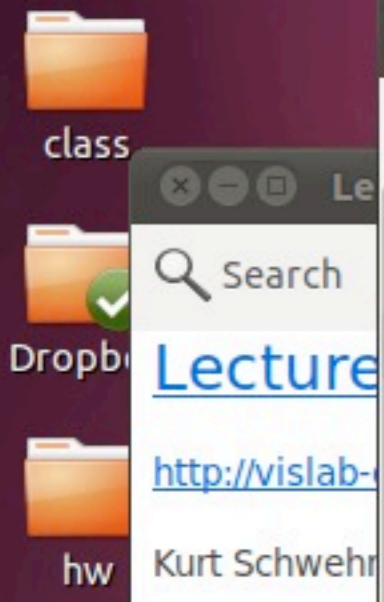<cenglert> hello
ERC>

-U:**-   #unhresearchtools@Unknown   Bot L54   (ERC)-----------------------------

Le   Search
Lecture
http://vislab-
Kurt Schwehr

class
Dropb
hw

researchtools@
File   Edit   View   Search
drwxr-xr-x 3 researcht
researchtools@ubuntu:~$
researchtools@ubuntu:~/
total 16
drwxr-xr-x 2 researchto
drwxr-xr-x 2 researchto
drwxr-xr-x 2 researchto
drwxr-xr-x 5 researchto
researchtools@ubuntu:~/
researchtools@ubuntu:~/
total 24
-rw-r--r-- 1 researchto
otlib.org
researchtools@ubuntu:~/
/home/researchtools/hw/
researchtools@ubuntu:~/
20111004
researchtools@ubuntu:~/
20111004
researchtools@ubuntu:~/
20111004
researchtools@ubuntu:~/class/11$

[researchtools@ubun...   Lecture 11: ipython an...   researchtools@ubunt...   emacs23@ubuntu

emacs23@ubuntu

File   Edit   Options   Buffers   Tools   Org   Tbl   Help

- http://asd.gsfc.nasa.gov/Rodrigo.Nemmen/ipython_quickref.pdf
http://www.packtpub.com/matplotlib-python-development/book?utm_source=matplotlib.sourceforge.ne

There are a number of very good free books to get you started. I've
sorted them in the order that I think you might want to approach them.

- Dive Into Python by Mark Pilgram
- Python Quick Reference by Richard Gruet
- http://en.wikibooks.org/wiki/Python_Programming
- Think Python by Allen Downey
- Byte of Python by Swaroop C H. Make sure to get the 2.x version.
  Not 3!
- Data Structures and Algorithms with Object-Oriented Design Patterns in Python by Bruno R. Preis
- The Programming Historian by William J. Turkel and Alan MacEachern
  (for a research area focused take on python)

--:--- 11-ipython-matplotlib.org   22% L135   (Org)------------------
schwehrvm on #unhresearchtools (+,lag:0) UNH channel for ubuntu, bash, python, emacs, org-babel, and
     Gmasetti matt_w mohammad ygh2 sthein berrya mluke schwehrvm @goatbar
*** cenglert (~chatzill@lab8.ccom.nh) has joined channel #unhresearchtools
                                                              [11:12]

<cenglert> hello
*** ahyde (~chatzill@lab4.ccom.nh) has joined channel #unhresearchtools
                                                              [11:21]

<ahyde> hi
ERC>

-U:**- #unhresearchtools@Unknown   Bot L57   (ERC)--------------------

class

Search

Lecture

http://vislab-

hw   Kurt Schwehr

researchtools@

File   Edit   View   Search

drwxr-xr-x 3 researcht
researchtools@ubuntu:~$
researchtools@ubuntu:~/
total 16
drwxr-xr-x 2 researchto
drwxr-xr-x 2 researchto
drwxr-xr-x 2 researchto
drwxr-xr-x 5 researchto
researchtools@ubuntu:~/
researchtools@ubuntu:~/
total 24
-rw-r--r-- 1 researchto
otlib.org
researchtools@ubuntu:~/
/home/researchtools/hw/
researchtools@ubuntu:~/
20111004
researchtools@ubuntu:~/
20111004
researchtools@ubuntu:~/
20111004
researchtools@ubuntu:~/class/11$

Wednesday, October 5, 11

11:22 AM   researchtools

emacs23@ubuntu

File   Edit   Options   Buffers   Tools   Org   Tbl   Help

```
Exit()
#+END_EXAMPLE

That ":q!" is the vi command to "quit without saving".

We can set the bash shell variable =EDITOR= to emacs, but then every
time we want to edit a file, ipython is going to wait for us to
"finish" editing and exit emacs.  We will loose our place each time.
There is a special way to setup emacs as a "server" that can be told
to open a file from somewhere else.  emacs will stay running and can
get multiple requests.  Here is how to make it work!

Start emacs.  =Applications -> Programming -> GNU Emacs 23=.

In emacs, we need to start the server that will listen for requests to
edit a file.
```

--:---   11-ipython-matplotlib.org   30% L157   (Org)---------------------------

```
schwehrvm on #unhresearchtools (+,lag:0) UNH channel for ubuntu, bash, python, emacs, org-babel, and
     Gmasetti matt_w mohammad ygh2 sthein berrya mluke schwehrvm @goatbar
*** cenglert (~chatzill@lab8.ccom.nh) has joined channel #unhresearchtools
                                                                         [11:12]

<cenglert> hello
*** ahyde (~chatzill@lab4.ccom.nh) has joined channel #unhresearchtools
                                                                         [11:21]

<ahyde> hi
ERC> 
```

-U:**-   #unhresearchtools@Unknown   Bot L57   (ERC)----------------------

class

Dropb

hw   Kurt Schweh

Search

Lecture

http://vislab-

File   Edit   View   Search

```
drwxr-xr-x  3 researcht
researchtools@ubuntu:~$
researchtools@ubuntu:~/
total 16
drwxr-xr-x 2 researcht
drwxr-xr-x 2 researcht
drwxr-xr-x 2 researcht
drwxr-xr-x 5 researcht
researchtools@ubuntu:~/
researchtools@ubuntu:~/
total 24
-rw-r--r-- 1 researcht
otlib.org
researchtools@ubuntu:~/
/home/researchtools/hw/
researchtools@ubuntu:~/
20111004
researchtools@ubuntu:~/
20111004
researchtools@ubuntu:~/
20111004
researchtools@ubuntu:~/class/11$
```

[researchtools@ubun...   Lecture 11: ipython an...   researchtools@ubunt...   emacs23@ubuntu

Wednesday, October 5, 11

At offset 10:30

emacs23@ubuntu

File   Edit   Options   Buffers   Tools   Org   Tbl   Help

Now in ipython, editing a file should look like this. When you use
=C-x #= in emacs to let ipython know that you are done editing,
ipython will try to run your code.

#+BEGIN_EXAMPLE
In [1]: edit "helloworld.py"
Editing...Waiting for Emacs...
#+END_EXAMPLE

In emacs, make the file look like this:

researchtools@ubuntu: ~/class/11

File   Edit   View   Search   Terminal   Help

```
researchtools@ubuntu:~/class/11$ echo $(date +%Y%m%d)
20111004
researchtools@ubuntu:~/class/11$ date +%Y%m%d
20111004
researchtools@ubuntu:~/class/11$ date --utc +%Y%m%d
20111004
researchtools@ubuntu:~/class/11$ ipython
Python 2.7.1+ (r271:86832, Apr 11 2011, 18:05:24)
Type "copyright", "credits" or "license" for more information.

IPython 0.10.1 -- An enhanced Interactive Python.
?         -> Introduction and overview of IPython's features.
%quickref -> Quick reference.
help      -> Python's own help system.
object?   -> Details about 'object'. ?object also works, ?? prints more.

In [1]: pwd
Out[1]: '/home/researchtools/class/11'

In [2]: # cd class/11

In [3]:
```

:help:documentation:

cs.python.org/

g for help on

[researchtools@ubun...]   Lecture 11: ipython an...   researchtools@ubunt...   emacs23@ubuntu

At 11:47
Run pwd to make sure you are in ~/class/11

At 13:30
You can run any bash shell command by putting a "!" as the first character of the line.

researchtools@ubuntu: ~/class/11

File   Edit   View   Search   Terminal   Help

```
In [10]:

In [11]: !wget http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-research
tools/src/11-ipython.org
--2011-10-04 11:28:22--  http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci89
5-researchtools/src/11-ipython.org
Resolving vislab-ccom.unh.edu... 192.168.3.3
Connecting to vislab-ccom.unh.edu|192.168.3.3|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 21269 (21K) [text/plain]
Saving to: `11-ipython.org.1'

100%[=======================================>] 21,269      --.-K/s   in 0s

2011-10-04 11:28:22 (52.9 MB/s) - `11-ipython.org.1' saved [21269/21269]


In [12]: help open
------->  help(open)


In [13]: open?
```

buntu, bash, python, emacs, org-babel, and

chwehrvm @goatbar

#unhresearchtools

[11:12]

unhresearchtools

[11:21]

/2011/esci895-researchtools/src/11-ipython▶

[11:28]

:help:documentation:

```
The main web page for python documentation is: http://docs.python.org/

Inside of python, there are a number of ways to get help.

First, you can directly ask for help.  Here we are asking for help on
the open "function":

#+BEGIN_SRC python
help open
#+END_SRC

You can also put a "?" after a bunch of text and it will try to tell
you what it can about that string.  You can put the "?" before or
```
--:--- **11-ipython-matplotlib.org**   43% L257   (Org)----------------------

[researchtools@ubun...]   Lecture 11: ipython an...   researchtools@ubunt...   ⓔ emacs23@ubuntu

At 15:05
ipython will put in parentheses if you leave them out

researchtools@ubuntu: ~/class/11

File   Edit   View   Search   Terminal   Help

```
String Form:      <built-in function open>
Namespace:        Python builtin
Docstring:
    open(name[, mode[, buffering]]) -> file object

    Open a file using the file() type, returns a file object.  This is the
    preferred way to open a file.  See file.__doc__ for further information.


In [14]: open??
Type:             builtin_function_or_method
Base Class:       <type 'builtin_function_or_method'>
String Form:      <built-in function open>
Namespace:        Python builtin
Docstring [source file open failed]:
    open(name[, mode[, buffering]]) -> file object

    Open a file using the file() type, returns a file object.  This is the
    preferred way to open a file.  See file.__doc__ for further information.


In [15]:
```

untu, bash, python, emacs, org-babel, and
chwehrvm @goatbar
| #unhresearchtools
                      [11:12]

unhresearchtools
                      [11:21]

/2011/esci895-researchtools/src/11-ipython
                      [11:28]

:help:documentation:

The main web page for python documentation is: http://docs.python.org/

Inside of python, there are a number of ways to get help.

First, you can directly ask for help. Here we are asking for help on
the open "function":

```
#+BEGIN_SRC python
help open
#+END_SRC
```

You can also put a "?" after a bunch of text and it will try to tell
you what it can about that string. You can put the "?" before or

--:---   **11-ipython-matplotlib.org**   43% L257   (Org)------------------------------

[researchtools@ubun...   Lecture 11: ipython an...   researchtools@ubunt...   emacs23@ubuntu

Wednesday, October 5, 11

At 15:29

researchtools@ubuntu: ~/class/11

File   Edit   View   Search   Terminal   Help

```
In [16]: ?Exit
Type:              Magic function
Base Class:        <type 'instancemethod'>
String Form:       <bound method InteractiveShell.magic_Exit of <IPython.iplib.Inte
ractiveShell object at 0xb76e138c>>
Namespace:         IPython internal
File:              /usr/lib/python2.7/dist-packages/IPython/Magic.py
Definition:        Exit(self, parameter_s='')
Docstring:
    Exit IPython without confirmation.


In [17]: Exit()
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)

/home/researchtools/class/11/<ipython console> in <module>()

NameError: name 'Exit' is not defined

In [18]: Exit
researchtools@ubuntu:~/class/11$
```

buntu, bash, python, emacs, org-babel, and
chwehrvm @goatbar
#unhresearchtools
[11:12]

unhresearchtools
[11:21]

2011/esci895-researchtools/src/11-ipython
[11:28]

between exit() and Exit(). We just have to ask!

```
#+BEGIN_SRC python
?exit
?Exit
#+END_SRC
```

The key is to read through all that and ignore most of it. The last
line of =?Exit= tells us the key detail: "Exit IPython without
confirmation." That can also be said: you will not be asked =yes/no=
when you quit ipython with =Exit()=.

Later on, we will see more about functions or "methods" on variables

--:--- 11-ipython-matplotlib.org   46% L269   (Org)-------------------------

[researchtools@ubun...]   Lecture 11: ipython an...   researchtools@ubunt...   emacs23@ubuntu

Wednesday, October 5, 11

At 15:50

researchtools@   emacs23@ubuntu

File Edit View Search   File Edit Options Buffers Tools Org Tbl Help

NameError

/home/researchtools/cla

NameError: name 'Exit'

In [18]: Exit
researchtools@ubuntu:~/
Python 2.7.1+ (r271:868
Type "copyright", "cred

IPython 0.10.1 -- An en
?   -> Introducti
%quickref -> Quick refe
help   -> Python's o
object?   -> Details ab

In [1]: help open
------> help(open)

In [2]:

```
#+STARTUP: showall

#+TITLE:        Class 11: ipython and python data types
#+AUTHOR:       Kurt Schwehr
#+EMAIL:        schwehr@ccom.unh.edu
#+DATE:         <2011-10-04 Tue>
#+DESCRIPTION: Marine Research Data Manipulation and Practices
#+KEYWORDS: ipython matplotlib
#+LANGUAGE:   en
#+OPTIONS:    H:3 num:nil toc:t \n:nil @:t ::t |:t ^:t -:t f:t *:t <:t
#+OPTIONS:    TeX:t LaTeX:nil skip:t d:nil todo:t pri:nil tags:not-in-toc
#+INFOJS_OPT: view:nil toc:nil ltoc:t mouse:underline buttons:0 path:http://orgmode.org/org-info.
#+LINK_HOME: http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchtools/

* Setup...
* Introduction...
* Today's class has an associated video                    :youtube:video:...
* Introduction to python and ipython                       :ipython:python:...
* Data types in python                                     :int:float:str:list:...
* A little ipython before we go on                         :ipython:...
* Trying out the data types                   :str:list:int:float:list:...
* Working with files                                       :file:...
* A for loop                                               :for:...
* Making a function                                        :function:...
* Checking your code with pylint                           :pylint:...
```

--:--- 11-ipython.org   All L31   (Org)-----------------------

[researchtools@ubun...]   Lecture 11: ipython an...   researchtools@ubunt...   emacs23@ubuntu

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At 17:01
I used S-<TAB> to collapse the whole document to the top level headings

researchtools@   emacs23@ubuntu

File Edit View Search   File Edit Options Buffers Tools Org Tbl Help

```
NameError: name 'Exit'

In [18]: Exit
researchtools@ubuntu:~/
Python 2.7.1+ (r271:868
Type "copyright", "cred

IPython 0.10.1 -- An enl
?          -> Introducti
%quickref -> Quick refe
help       -> Python's o
object?    -> Details ab

In [1]: help open
------> help(open)


In [2]: print 1
1

In [3]:
```

```
** Getting help                                    :help:documentation:...
** Examples with org-babel and ipython             :orgbabel:ipython:

Here we are faced with a little problem before we go on.  I would like
the examples to be runnable both in org-mode with =C-c C-c= and as
something you can paste into ipython without modification.  However,
that is not possible.  The setup for python in org-babel is that it
ignores what we will print.  So if I try a print statement in python
and run it with org-babel:

#+BEGIN_SRC python
print 1
#+END_SRC

#+results:
: None

The results above are "None".  Say what?!?!  It turns out that we have
to "return" what we want org-babel to print.

#+BEGIN_SRC python
return 1
#+END_SRC

#+results:
: 1

That is more like what we wanted.  If you just paste the text without
the return, all will be well.  So, in ipython, it will look like this:

#+BEGIN_EXAMPLE
ipython
Python 2.7.1+ (r271:86832, Apr 11 2011, 18:05:24)
```

--:**- **11-ipython.org**   43% L317   (Org)-----------------------------

[researchtools@ubun...   Lecture 11: ipython an...   researchtools@ubunt...   emacs23@ubuntu

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At 18:27

In: [4] at 19:05

```
Out[4]: 'This is a string'

In [5]: 'this is a string'.upper()
Out[5]: 'THIS IS A STRING'

In [6]: 'this is a string'.title()
Out[6]: 'This Is A String'

In [7]: 'this' + 'is' + 'a' + 'string'
Out[7]: 'thisisastring'

In [8]: 'this' + ' is' + ' a' + ' string'
Out[8]: 'this is a string'

In [9]: type ('this is a string')
Out[9]: <type 'str'>

In [10]: type 33
-------> type(33)
Out[10]: <type 'int'>

In [11]:
```
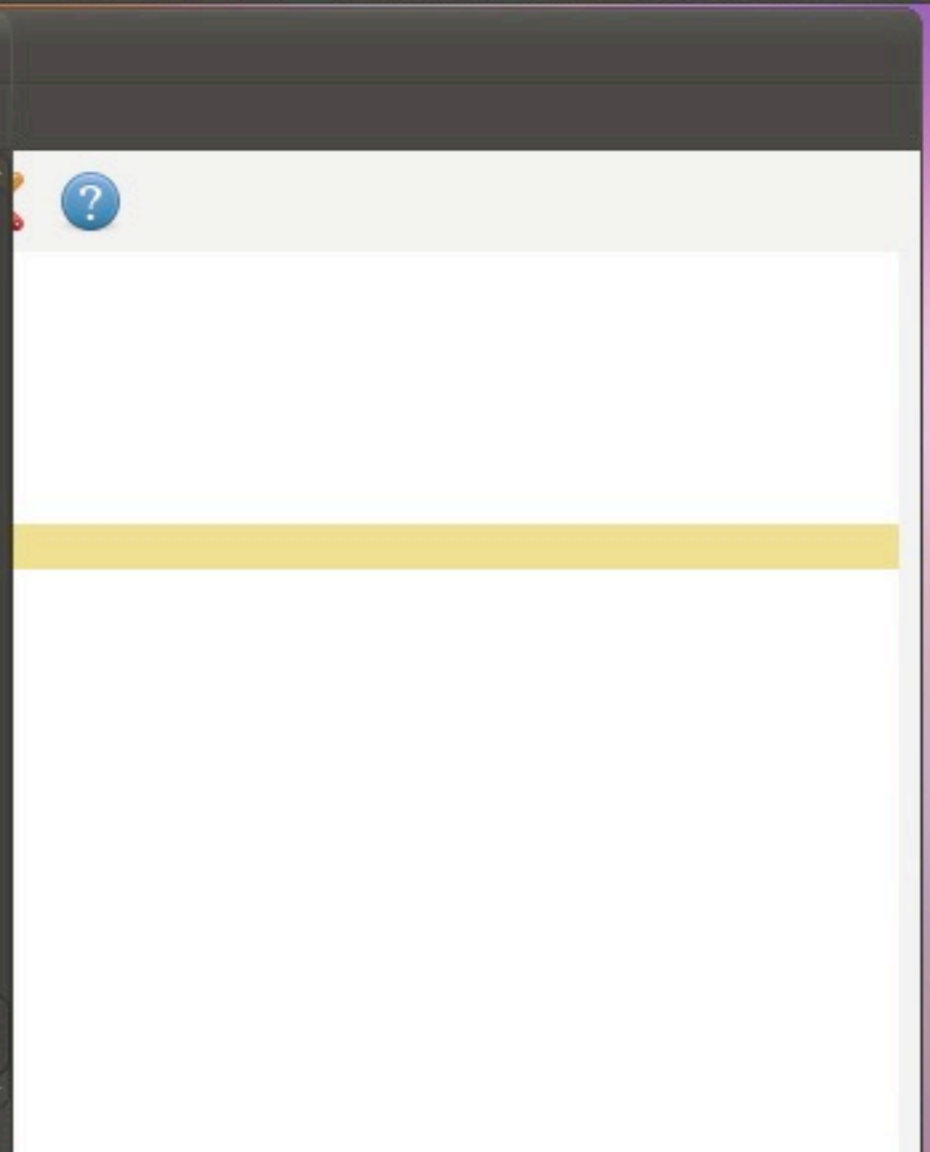
```
#+BEGIN_SRC python
return type('my string')
#+END_SRC

#+results:
: <type 'str'>

* Data types in python                      :int:float:str:list:...
* A little ipython before we go on                   :ipython:...
* Trying out the data types          :str:list:int:float:list:...
* Working with files                                    :file:...
* A for loop                                             :for:...
* Making a function                                 :function:...
--:**-  11-ipython.org   61% L387   (Org)----------------------
```

researchtools@ubuntu: ~/class/11

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[researchtools@ubun...] Lecture 11: ipython an... researchtools@ubunt... emacs23@ubuntu

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In [9]: at 20:15

researchtools@   emacs23@ubuntu

File Edit View Search   File Edit Options Buffers Tools Org Tbl Help

```
Out[4]: 'This is a stri
In [5]: 'this is a stri
Out[5]: 'THIS IS A STRI
In [6]: 'this is a stri
Out[6]: 'This Is A Stri
In [7]: 'this' + 'is' +
Out[7]: 'thisisastring'
In [8]: 'this' + ' is'
Out[8]: 'this is a stri
In [9]: type ('this is
Out[9]: <type 'str'>
In [10]: type 33
-------> type(33)
Out[10]: <type 'int'>
In [11]:
```

Data types in python   :int:float:str:list:

There are several basic data types in python.

- =str= - a character or string --> 'a' 'hello' "world"
  '''lists with three quote characters
  can span multiple lines'''
- numbers
  - =int= - integers (aka whole numbers) 1, 2, -1, 0
  - =float= - real numbers 3.1415, 0.0, -9e20
  - =complex= - imaginary numbers. complex(1,4)
- =bool= - Booleans.   True or False
- sequences of items
  - =list= - ordered sequence of items that can change.
    [1, -3, 1.3, 'hello', ['list', 'inside', 'a', 'list']]
  - =tuple= - ordered sequence that can *not* change. (1,-3,'hi')
  - =set= - only one of each item
    set([1,4,1,1]) -> set([1, 4])
- =dict= - a fast lookup table or "dictionary"
  { 1: 2, 99: 'second', 'third': 333 }
- =file= - you can read and write to files
- =None= - A special case

Note that =str=, =dict= and =file= also act as sequences of items. For
example... Jumping ahead and using a for loop before I've explained the
concept of a for loop. Sorry!

```python
#+BEGIN_SRC python
  for c in 'geology':
      print c
#+END_SRC
```

--:**- **11-ipython.org**   63% L407   (Org)-------------------------
SUBTREE (NO CHILDREN)

[researchtools@ubun...   Lecture 11: ipython an...   researchtools@ubunt...   emacs23@ubuntu

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At 20:50
http://en.wikipedia.org/wiki/Integer_%28computer_science%29
http://en.wikipedia.org/wiki/Floating_point
http://en.wikipedia.org/wiki/Complex_data_type
http://en.wikipedia.org/wiki/Boolean_data_type

researchtools@

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```
Out[5]: 'THIS IS A STRI

In [6]: 'this is a strir
Out[6]: 'This Is A Strir

In [7]: 'this' + 'is' +
Out[7]: 'thisisastring'


In [8]: 'this' + ' is' +
Out[8]: 'this is a strir

In [9]: type ('this is a
Out[9]: <type 'str'>

In [10]: type 33
-------> type(33)
Out[10]: <type 'int'>

In [11]: 1.2e21
Out[11]: 1.2e+21

In [12]: ▯
```

emacs23@ubuntu

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```
* Data types in python                        :int:float:str:list:

There are several basic data types in python.

- =str= - a character or string --> 'a'  'hello'  "world"
  '''lists with three quote characters
  can span multiple lines'''
- numbers
  - =int= - integers (aka whole numbers)  1, 2, -1, 0
  - =float= - real numbers  3.1415, 0.0, -9e20
  - =complex= - imaginary numbers.  complex(1,4)
- =bool= - Booleans.    True or False
- sequences of items
  - =list= - ordered sequence of items that can change.
    [1, -3, 1.3, 'hello', ['list', 'inside', 'a', 'list']
  - =tuple= - ordered sequence that can *not* change.  (1,-3,'hi')
  - =set= - only one of each item
    set( [1,4,1,1] )  -> set([1, 4])
- =dict= - a fast lookup table or "dictionary"
  { 1: 2, 99: 'second', 'third': 333 }
- =file= - you can read and write to files
- =None= - A special case

Note that =str=, =dict= and =file= also act as sequences of items.  For
example...  Jumping ahead and using a for loop before I've explained the
concept of a for loop.  Sorry!


#+BEGIN_SRC python
  for c in 'geology':
      print c
#+END_SRC
```

```
--:**-   11-ipython.org    63% L407   (Org)-----------------------------
SUBTREE (NO CHILDREN)
```

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File Edit View Search Terminal Help

```
Variable    Type       Data/Info
----------------------------
shipname    str        R/V Cocheco

In [21]: ls -l
total 96
-rw-r--r-- 1 researchtools researchtools 21262 2011-10-04 10:28 11-ipython-matpl
otlib.org
-rw-r--r-- 1 researchtools researchtools 21269 2011-10-04 11:43 #11-ipython.org#
-rw-r--r-- 1 researchtools researchtools 21269 2011-10-04 10:34 11-ipython.org
-rw-r--r-- 1 researchtools researchtools 21269 2011-10-04 10:34 11-ipython.org.1

In [22]: logstart
Activating auto-logging. Current session state plus future input saved.
Filename        : ipython_log.py
Mode            : rotate
Output logging  : False
Raw input log   : False
Timestamping    : False
State           : active

In [23]: histor
```

```
                logstart
                a = 1+2
                b = 3+4
                who
                logstop
                less ipython_log.py
        #+END_SRC


        For the logging commands, type "%log" in ipython and then press <TAB>


        #+BEGIN_EXAMPLE
        In [1]: %log
        %logoff     %logon      %logstart   %logstate   %logstop
---:**-    11-ipython.org    70% L480    (Org)-----------------------------
```

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At 27:04
%logstart
history
%logstop

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File   Edit   View   Search   Terminal   Help

```
18: del shipename
19: _ip.magic("who ")
20: _ip.magic("whos ")
21: _ip.system("ls -F -l")
22: _ip.magic("logstart ")
23: _ip.magic("history ")

In [24]: ls -l
total 100
-rw-r--r-- 1 researchtools researchtools 21262 2011-10-04 10:28 11-ipython-matpl
otlib.org
-rw-r--r-- 1 researchtools researchtools 21269 2011-10-04 11:43 #11-ipython.org#
-rw-r--r-- 1 researchtools researchtools 21269 2011-10-04 10:34 11-ipython.org
-rw-r--r-- 1 researchtools researchtools 21269 2011-10-04 10:34 11-ipython.org.1
-rw-r--r-- 1 researchtools researchtools   820 2011-10-04 11:47 ipython_log.py

In [25]: logst
%logstart  %logstate  %logstop

In [25]: %logstop

In [26]: logstop
```

```
logstart
a = 1+2
b = 3+4
who
logstop
less ipython_log.py
#+END_SRC


For the logging commands, type "%log" in ipython and then press <TAB>


#+BEGIN_EXAMPLE
In [1]: %log
%logoff     %logon      %logstart  %logstate  %logstop
--:**-   11-ipython.org   70% L480   (Org)---------------------------
```

[researchtools@ubun...]   Lecture 11: ipython an...   researchtools@ubunt...   emacs23@ubuntu

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researchtools@ubuntu: ~/class/11

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```
In [28]: shipname='Coastal Surveyor'

In [29]: len shipname
-------> len(shipname)
Out[29]: 16

In [30]: shipname[0]
Out[30]: 'C'

In [31]: shipname[1]
Out[31]: 'o'

In [32]: shipname[5:8]
Out[32]: 'al '

In [33]: shipname.find('S')
Out[33]: 8

In [34]: shipname[8:]
Out[34]: 'Surveyor'

In [35]:
```

en press <TAB>

don't need to

r:list:int:float:list:

```
** str - strings

#+BEGIN_SRC python
shipname='Coastal Surveyor'
len(shipname)
shipname[0] # Count from zero
shipname[5:8]
shipname.find('S') # returns 8
shipname.find('x') # returns -1 ... not found
shipname[8:] # from position 8 to the end
shipname[-4:] # last 4 characters
#+END_SRC
```

--:**- **11-ipython.org**   72% L504   (Org)-------------------------

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At 28:40

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```
In [36]: shipname[-4]
Out[36]: 'e'

In [37]: shipname[-4:]
Out[37]: 'eyor'

In [38]: 1
Out[38]: 1

In [39]: type 1
-------> type(1)
Out[39]: <type 'int'>

In [40]: 1.1
Out[40]: 1.1

In [41]: type 1.1
-------> type(1.1)
Out[41]: <type 'float'>

In [42]: float('3.1415')
```

```
type(1)
1.1
type(1.1)
str(1.1)
float('3.1415')
import math
math.pi
math.sin(math.pi/2)█
math.radians(180)
math.degrees(2*math.pi)
math. # then press the <TAB> key to get a list

complex(1,4j)
```
--:**- **11-ipython.org**   75% L539   (Org)----------------------------------

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At 30:30

researchtools@ubuntu: ~/class/11

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```
Out[40]: 1.1

In [41]: type 1.1
------> type(1.1)
Out[41]: <type 'float'>

In [42]: float('3.1415')
Out[42]: 3.1415

In [43]: type float('3.1415')
------> type(float('3.1415'))
Out[43]: <type 'float'>

In [44]: float('hi mom')
---------------------------------------------------------------------
ValueError                              Traceback (most recent call last)

/home/researchtools/class/11/<ipython console> in <module>()

ValueError: could not convert string to float: hi mom

In [45]: import math
```

```
type(1)
1.1
type(1.1)
str(1.1)
float('3.1415')
import math
math.pi
math.sin(math.pi/2)
math.radians(180)
math.degrees(2*math.pi)
math. # then press the <TAB> key to get a list

complex(1,4j)
--:**-  11-ipython.org   75% L539   (Org)------------------------
```

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At 30:50

researchtools@ubuntu: ~/class/11

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```
-------------------------------------------------------------
ValueError                          Traceback (most recent call last)

/home/researchtools/class/11/<ipython console> in <module>()

ValueError: could not convert string to float: hi mom

In [45]: import math

In [46]: math.pi
Out[46]: 3.141592653589793

In [47]: math.sin(math.pi/2)
Out[47]: 1.0

In [48]: math.radians(180)
Out[48]: 3.141592653589793

In [49]: math.radians(180*2)
Out[49]: 6.283185307179586

In [50]: math.de
```

```
type(1)
1.1
type(1.1)
str(1.1)
float('3.1415')
import math
math.pi
math.sin(math.pi/2)□
math.radians(180)
math.degrees(2*math.pi)
math. # then press the <TAB> key to get a list

complex(1,4j)
--:**-  11-ipython.org    75% L539    (Org)-------------------------------
```

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At 32:00

researchtools@ubuntu: ~/class/11

File   Edit   View   Search   Terminal   Help

```
In [47]: math.sin(math.pi/2)
Out[47]: 1.0

In [48]: math.radians(180)
Out[48]: 3.141592653589793

In [49]: math.radians(180*2)
Out[49]: 6.283185307179586

In [50]: math.degress(2*math.pi)
---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call last)

/home/researchtools/class/11/<ipython console> in <module>()

AttributeError: 'module' object has no attribute 'degress'

In [51]: math.degrees(2*math.pi)
Out[51]: 360.0

In [52]:
```

```
type(1)
1.1
type(1.1)
str(1.1)
float('3.1415')
import math
math.pi
math.sin(math.pi/2)
math.radians(180)
math.degrees(2*math.pi)
math. # then press the <TAB> key to get a list

complex(1,4j)
--:**-   11-ipython.org   75% L539   (Org)------------------------
```

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At 32:15

researchtools@ubuntu: ~/class/11

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```
math.__class__          math.asin           math.fsum
math.__delattr__        math.asinh          math.gamma
math.__dict__           math.atan           math.hypot
math.__doc__            math.atan2          math.isinf
math.__format__         math.atanh          math.isnan
math.__getattribute__   math.ceil           math.ldexp
math.__hash__           math.copysign       math.lgamma
math.__init__           math.cos            math.log
math.__name__           math.cosh           math.log10
math.__new__            math.degrees        math.log1p
math.__package__        math.e              math.modf
math.__reduce__         math.erf            math.pi
math.__reduce_ex__      math.erfc           math.pow
math.__repr__           math.exp            math.radians
math.__setattr__        math.expm1          math.sin
math.__sizeof__         math.fabs           math.sinh
math.__str__            math.factorial      math.sqrt
math.__subclasshook__   math.floor          math.tan
math.acos               math.fmod           math.tanh
math.acosh              math.frexp          math.trunc

In [52]: math.
```

```
type(1)
1.1
type(1.1)
str(1.1)
float('3.1415')
import math
math.pi
math.sin(math.pi/2)
math.radians(180)
math.degrees(2*math.pi)
math. # then press the <TAB> key to get a list

complex(1,4j)
```

--:**-   11-ipython.org   75% L539   (Org)------------------------------

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At 33:05

researchtools@ubuntu: ~/class/11

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```
math.__setattr__        math.expm1          math.sin
math.__sizeof__         math.fabs           math.sinh
math.__str__            math.factorial      math.sqrt
math.__subclasshook__   math.floor          math.tan
math.acos               math.fmod           math.tanh
math.acosh              math.frexp          math.trunc


In [52]: math.pow?
Type:           builtin_function_or_method
Base Class:     <type 'builtin_function_or_method'>
String Form:    <built-in function pow>
Namespace:      Interactive
Docstring:
    pow(x, y)

    Return x**y (x to the power of y).


In [53]: complex(1,4j)
Out[53]: (-3+0j)


In [54]:
```

```
* Making a function
* Checking your code with pylint
```

```
                                        :file:...
                                         :for:...
                                    :function:...
                                      :pylint:...
```

```
--:**-   11-ipython.org    Bot L533   (Org)------------------------------
```

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At 33:38

researchtools@   emacs23@ubuntu

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```
In [52]: math.pow?
Type:           builtin
Base Class:     <type '
String Form:    <built-
Namespace:      Interac
Docstring:
    pow(x, y)

    Return x**y (x to th

In [53]: complex(1,4j)
Out[53]: (-3+0j)

In [54]: 4j * (2+9j)
Out[54]: (-36+8j)

In [55]: 4j + (2+9j)
Out[55]: (2+13j)

In [56]: 
```

```
shipname.find('S') # returns 8
shipname.find('x') # returns -1 ... not found
shipname[8:] # from position 8 to the end
shipname[-4:] # last 4 characters
#+END_SRC

** =int= and =float= numbers

#+BEGIN_SRC python
1
type(1)
1.1
type(1.1)
str(1.1)
float('3.1415')
import math
math.pi
math.sin(math.pi/2)
math.radians(180)
math.degrees(2*math.pi)
math. # then press the <TAB> key to get a list

complex(1,4j)
4j * (2 + 9j)
#+END_SRC

** =list= of items ...
** Basic operations on strings...
* Working with files                                    :file:...
* A for loop                                            :for:...
* Making a function                               :function:...
* Checking your code with pylint                     :pylint:...
```

--:**- 11-ipython.org   Bot L546   (Org)------------------------

[researchtools@ubun...   Lecture 11: ipython an...   researchtools@ubunt...   emacs23@ubuntu

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researchtools@ubuntu: ~/class/11

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```
In [55]: 4j + (2+9j)
Out[55]: (2+13j)

In [56]: range(5)
Out[56]: [0, 1, 2, 3, 4]

In [57]: range(2,5)
Out[57]: [2, 3, 4]

In [58]: range(3,28,5)
Out[58]: [3, 8, 13, 18, 23]

In [59]: ship = ['tug', 'row boat', 'r/v']

In [60]: type ship
-------> type(ship)
Out[60]: <type 'list'>

In [61]: ship
ship        shipname

In [61]: ship = ('tug', 'row boat', 'r/v']
```
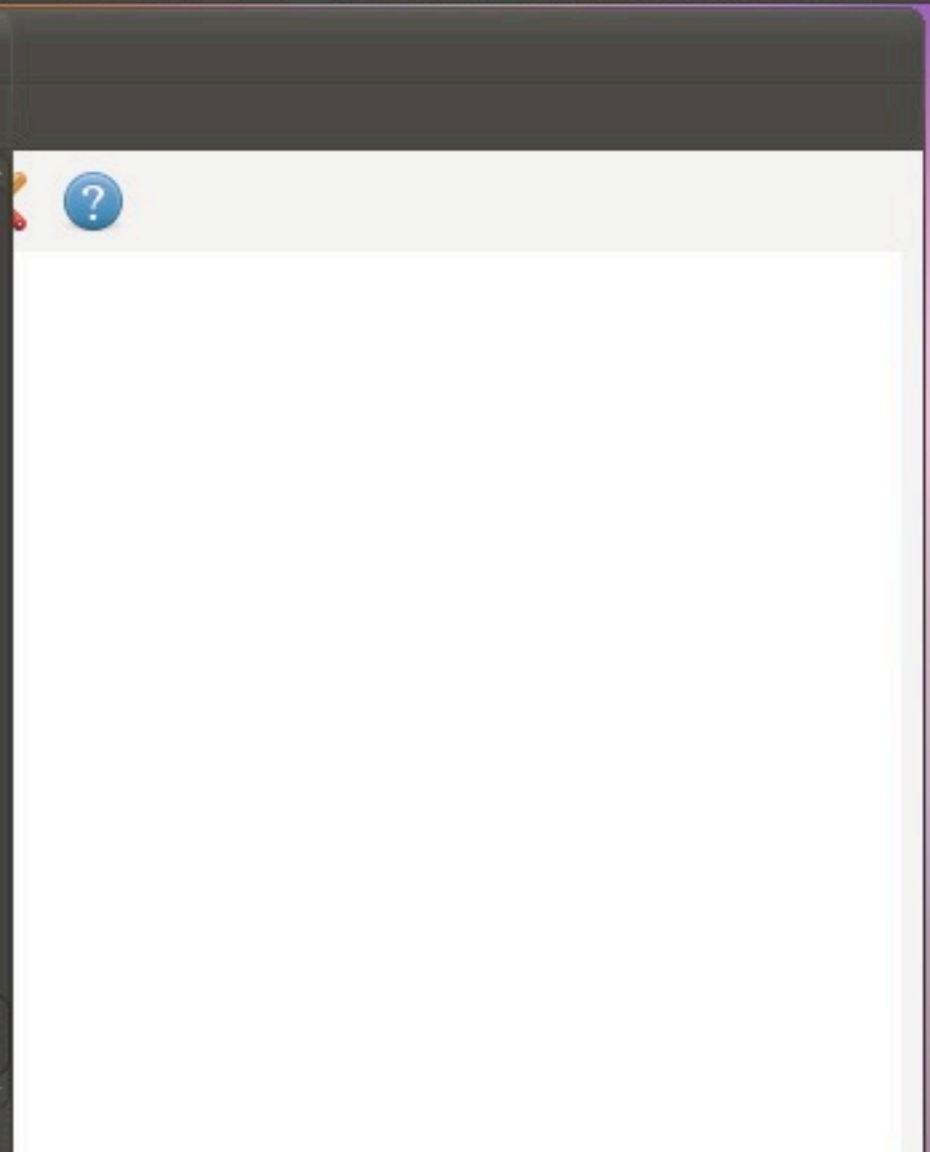
```
** =list= of items

#+BEGIN_SRC python
range(4)
range(3,7)
range(3,28,5)

ships = [ 'tug','row boat', 303902000, 123456789 ]
type(ships)
ships.append(369970120)
ships.sort()
ships[0]
```
--:**-   11-ipython.org   76% L558   (Org)------------------------

[researchtools@ubun...   Lecture 11: ipython an...   researchtools@ubunt...   emacs23@ubuntu

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Lists start at 34:40 with range
At 36:00 is the ship list

```
researchtools@ubuntu: ~/class/11

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ship        shipname

In [61]: tmp = ('tug', 'row boat', 'r/v')

In [62]: type tmp
-------> type(tmp)
Out[62]: <type 'tuple'>

In [63]: list(tmp)
Out[63]: ['tug', 'row boat', 'r/v']

In [64]: tuple(ship)
Out[64]: ('tug', 'row boat', 'r/v')

In [65]: ship
Out[65]: ['tug', 'row boat', 'r/v']

In [66]: len ship
-------> len(ship)
Out[66]: 3

In [67]: ship.append('
```

```
** =list= of items

#+BEGIN_SRC python
range(4)
range(3,7)
range(3,28,5)

ships = [ 'tug','row boat', 303902000, 123456789 ]
type(ships)
ships.append(369970120)
ships.sort()
ships[0]
--:**-   11-ipython.org    76% L558    (Org)---------------
```

[researchtools@ubun...]   Lecture 11: ipython an...   researchtools@ubunt...   emacs23@ubuntu

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37:10 for tuples
To modify a fixed tuple, the only thing you can do is over write it with a new and better tuple
mytuple = (1,3,5)
mytuple = mytuple + (4,1,2)

researchtools@ubuntu: ~/class/11

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```
In [67]: ship.append('passenger')

In [68]: ship
Out[68]: ['tug', 'row boat', 'r/v', 'passenger']

In [69]: ship.sort()

In [70]: ship
Out[70]: ['passenger', 'r/v', 'row boat', 'tug']

In [71]: ship.sort?
Type:            builtin_function_or_method
Base Class:      <type 'builtin_function_or_method'>
String Form:     <built-in method sort of list object at 0x95d89ec>
Namespace:       Interactive
Docstring:
    L.sort(cmp=None, key=None, reverse=False) -- stable sort *IN PLACE*;
    cmp(x, y) -> -1, 0, 1


In [72]:
```

```
** =list= of items

#+BEGIN_SRC python
range(4)
range(3,7)
range(3,28,5)

ships = [ 'tug','row boat', 303902000, 123456789 ]
type(ships)
ships.append(369970120)
ships.sort()
ships[0]
```

---:**-   **11-ipython.org**   76% L558   (Org)----------------------

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38:30

```
⊗⊖▣   researchtools@ubuntu: ~/class/11

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String Form:      <built-in method sort of list object at 0x95d89ec>
Namespace:        Interactive
Docstring:
    L.sort(cmp=None, key=None, reverse=False) -- stable sort *IN PLACE*;
    cmp(x, y) -> -1, 0, 1


In [72]: ships[0]
----------------------------------------------------------------------
NameError                            Traceback (most recent call last)

/home/researchtools/class/11/<ipython console> in <module>()

NameError: name 'ships' is not defined

In [73]: ship[0]
Out[73]: 'passenger'

In [74]: ship[-1]
Out[74]: 'tug'

In [75]: ship.
```
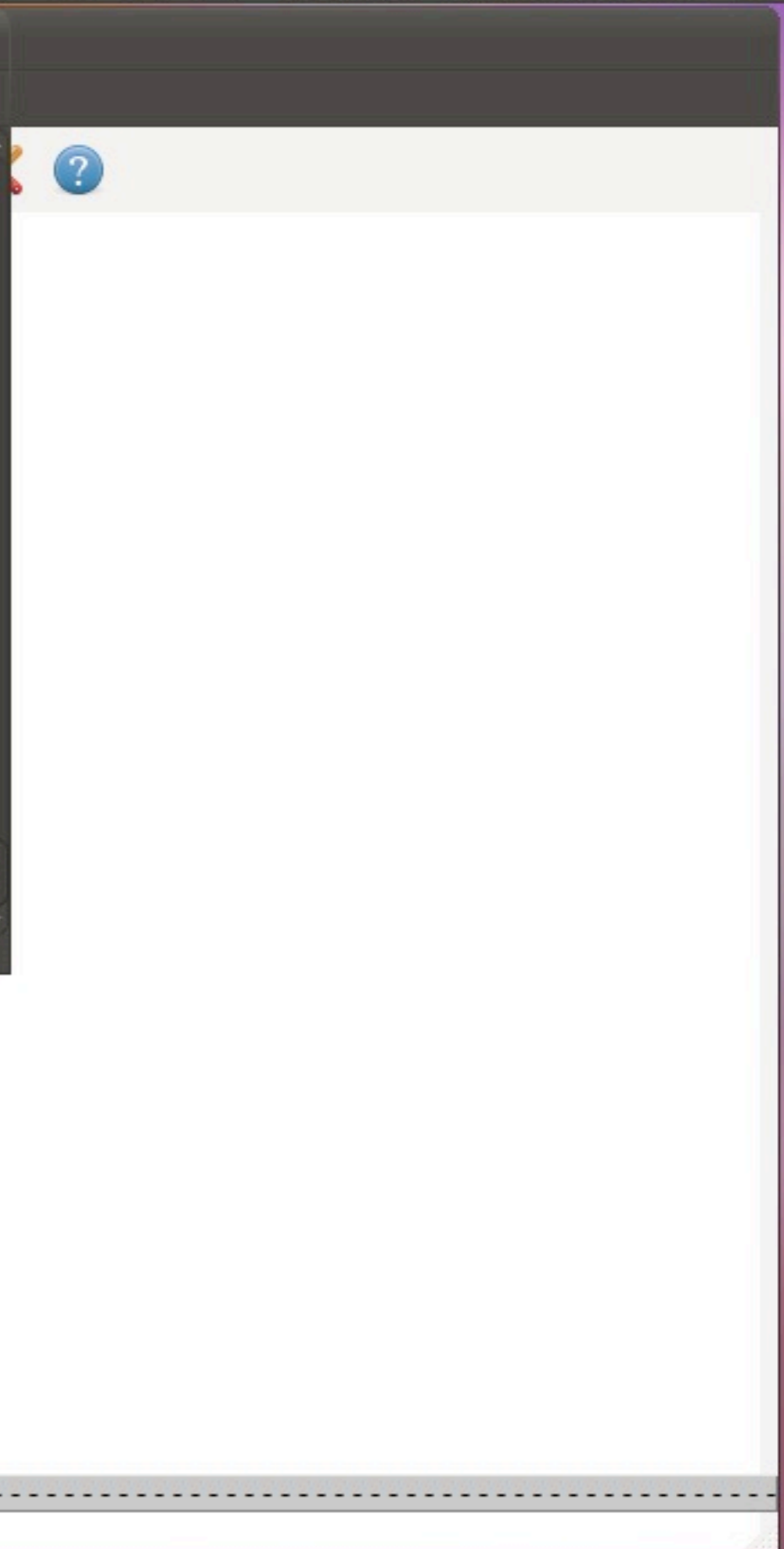
```
range(3,7)
range(3,28,5)

ships = [ 'tug','row boat', 303902000, 123456789 ]
type(ships)
ships.append(369970120)
ships.sort()
ships[0]
ships[-1]
ships.remove('row boat')
ships. # press <TAB>
#+END_SRC

--:**-  11-ipython.org   77% L549   (Org)--------------------------------
```

38:50
Asking ship.sort() if if can sort any other way. Yes, but writing a cmp (compare) function is a slightly advanced topic.

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```
ship.__delattr__         ship.__iter__          ship.__sizeof__
ship.__delitem__         ship.__le__            ship.__str__
ship.__delslice__        ship.__len__           ship.__subclasshook__
ship.__doc__             ship.__lt__            ship.append
ship.__eq__              ship.__mul__           ship.count
ship.__format__          ship.__ne__            ship.extend
ship.__ge__              ship.__new__           ship.index
ship.__getattribute__    ship.__reduce__        ship.insert
ship.__getitem__         ship.__reduce_ex__     ship.pop
ship.__getslice__        ship.__repr__          ship.remove
ship.__gt__              ship.__reversed__      ship.reverse
ship.__hash__            ship.__rmul__          ship.sort

In [75]: ship.remove('tug')

In [76]: ship
Out[76]: ['passenger', 'r/v', 'row boat']

In [77]: ship.pop()
Out[77]: 'row boat'

In [78]:
```

```
range(3,7)
range(3,28,5)

ships = [ 'tug','row boat', 303902000, 123456789 ]
type(ships)
ships.append(369970120)
ships.sort()
ships[0]
ships[-1]
ships.remove('row boat')
ships. # press <TAB>
#+END_SRC
```

--:**-   11-ipython.org   77% L549   (Org)------------------------

[researchtools@ubun...   Lecture 11: ipython an...   researchtools@ubunt...   emacs23@ubuntu

47:25

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```
ship.__gt__              ship.__reversed__        ship.reverse
ship.__hash__            ship.__rmul__            ship.sort

In [75]: ship.remove('tug')

In [76]: ship
Out[76]: ['passenger', 'r/v', 'row boat']

In [77]: ship.pop()
Out[77]: 'row boat'

In [78]: ship.pop?
Type:            builtin_function_or_method
Base Class:      <type 'builtin_function_or_method'>
String Form:     <built-in method pop of list object at 0x95d89ec>
Namespace:       Interactive
Docstring:
    L.pop([index]) -> item -- remove and return item at index (default last).
    Raises IndexError if list is empty or index is out of range.


In [79]:
```

```
range(3,7)
range(3,28,5)

ships = [ 'tug','row boat', 303902000, 123456789 ]
type(ships)
ships.append(369970120)
ships.sort()
ships[0]
ships[-1]
ships.remove('row boat')
ships. # press <TAB>
#+END_SRC
```

--:**-   **11-ipython.org**   77% L549   (Org)----------------------------------

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pop at 40:45
ship.pop? at 41:28

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```
String Form:    <built-in method pop of list object at 0x95d89ec>
Namespace:      Interactive
Docstring:
    L.pop([index]) -> item -- remove and return item at index (default last).
    Raises IndexError if list is empty or index is out of range.


In [79]: ship?
Type:           list
Base Class:     <type 'list'>
String Form:    ['passenger', 'r/v']
Namespace:      Interactive
Length:         2
Docstring:
    list() -> new empty list
    list(iterable) -> new list initialized from iterable's items


In [80]: ships?
Object `ships` not found.


In [81]: 
```

```
range(3,7)
range(3,28,5)

ships = [ 'tug','row boat', 303902000, 123456789 ]
type(ships)
ships.append(369970120)
ships.sort()
ships[0]
ships[-1]
ships.remove('row boat')
ships. # press <TAB>
#+END_SRC
```

--:**-   **11-ipython.org**   77% L549   (Org)---------------------------------

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41:50 ship?

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```
Object `ships` not found.

In [81]: who
math     ship      shipname           tmp

In [82]: whos
Variable    Type        Data/Info
------------------------------------
math        module      <module 'math' (built-in)>
ship        list        ['passenger', 'r/v']
shipname    str         Coastal Surveyor
tmp         tuple       ('tug', 'row boat', 'r/v')

In [83]: numbers = '1 2 3 4 99'

In [84]: numbers = '1 2 3 4 99 ten'

In [85]: type numbers
-------> type(numbers)
Out[85]: <type 'str'>

In [86]:
```
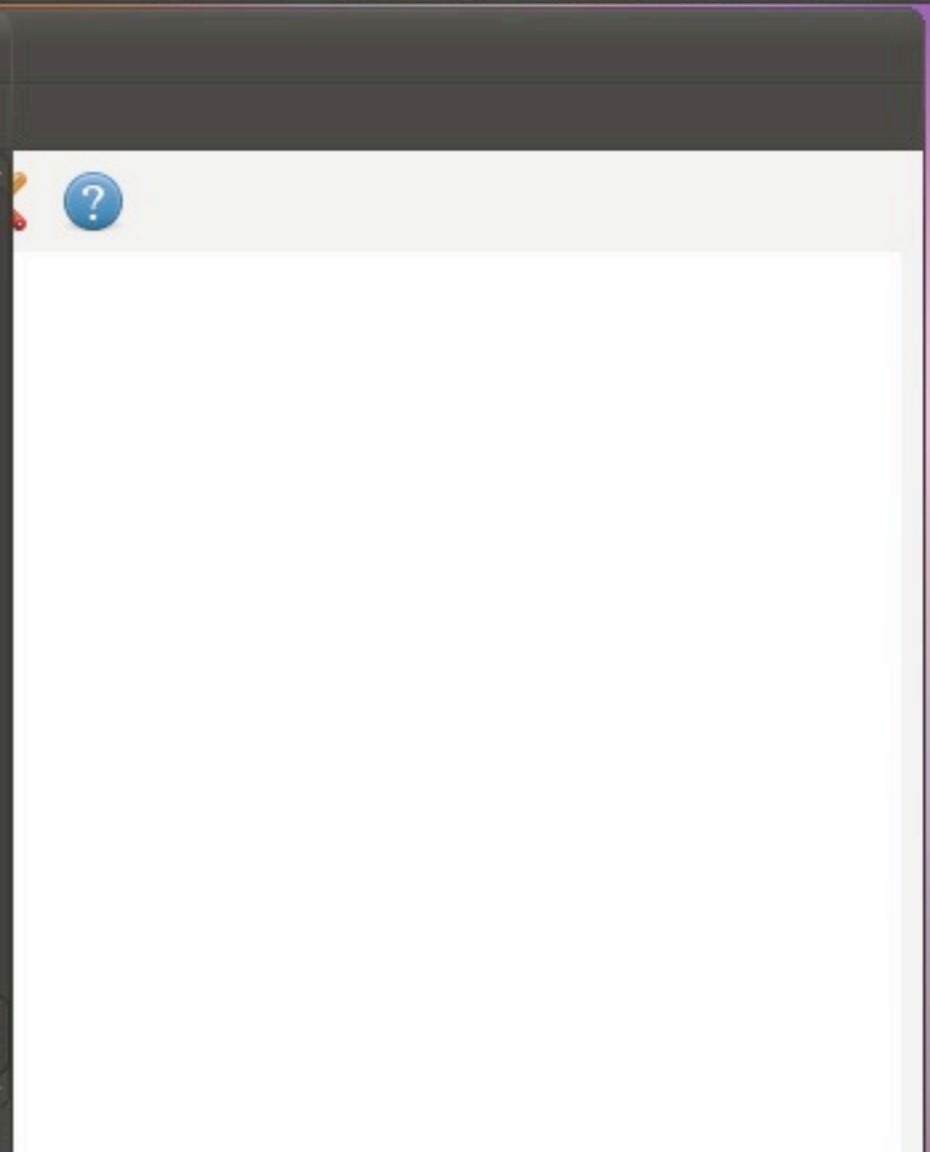
```
#+BEGIN_SRC python
shipname='Gulf Challenger, R/V'
shipname.split()
fields = shipname.split(',')
len(fields)
name = fields[0]
name * 4
' -- '.join(fields)
#+END_SRC

* Working with files                                    :file:...
* A for loop                                            :for:...
* Making a function                                     :function:...
--:**-   11-ipython.org     78% L565     (Org)---------------------------
SUBTREE (NO CHILDREN)
```

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42:00

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File Edit View Search Terminal Help

```
numbers._formatter_field_name_split    numbers.title
numbers._formatter_parser              numbers.translate
numbers.capitalize                     numbers.upper
numbers.center                         numbers.zfill
numbers.count

In [86]: numbers.split?
Type:           builtin_function_or_method
Base Class:     <type 'builtin_function_or_method'>
String Form:    <built-in method split of str object at 0x95da2a0>
Namespace:      Interactive
Docstring:
    S.split([sep [,maxsplit]]) -> list of strings

    Return a list of the words in the string S, using sep as the
    delimiter string.  If maxsplit is given, at most maxsplit
    splits are done. If sep is not specified or is None, any
    whitespace string is a separator and empty strings are removed
    from the result.


In [87]:
```
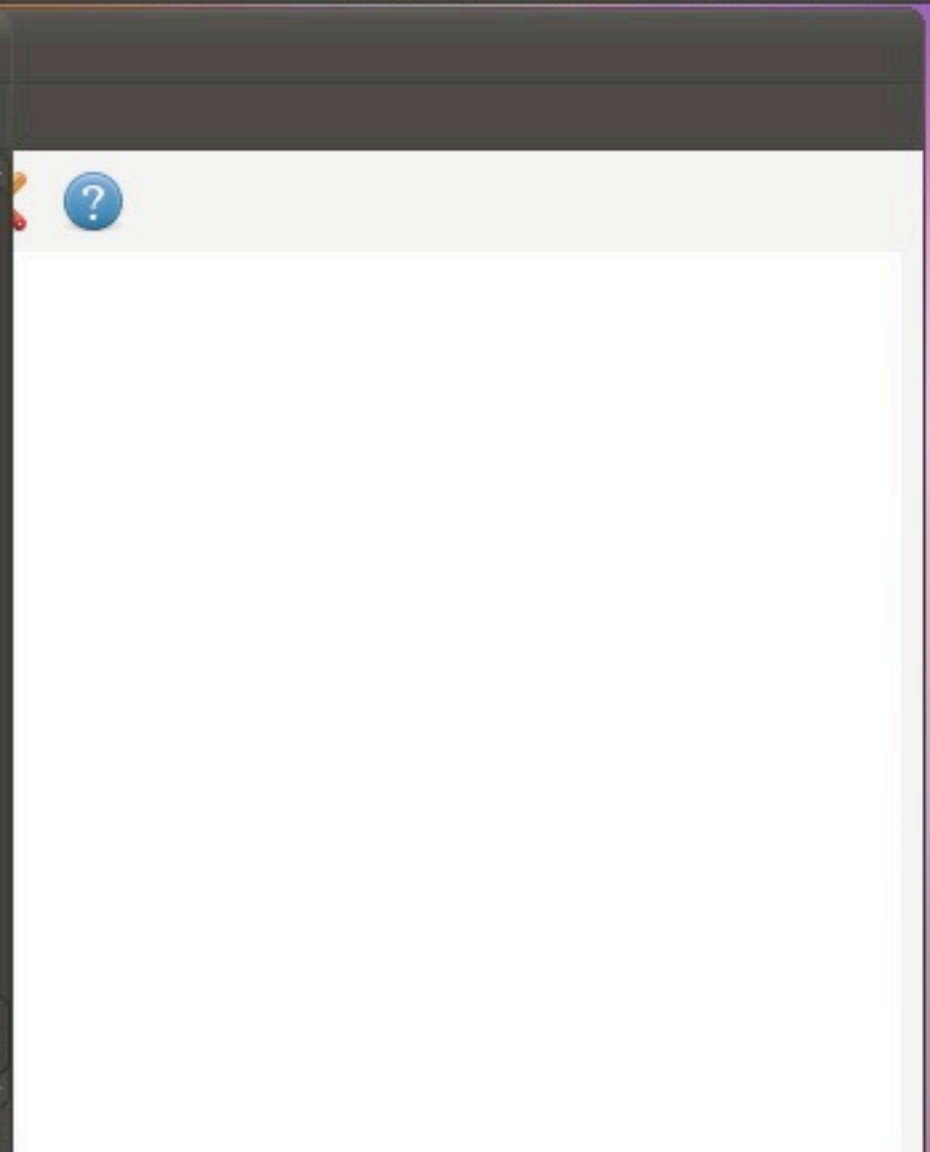
```
#+BEGIN_SRC python
shipname='Gulf Challenger, R/V'
shipname.split()
fields = shipname.split(',')
len(fields)
name = fields[0]
name * 4
' -- '.join(fields)
#+END_SRC

* Working with files                              :file:...
* A for loop                                      :for:...
* Making a function                               :function:...
--:**-  11-ipython.org    78% L565    (Org)----------------------------
SUBTREE (NO CHILDREN)
```

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```
In [88]: numbers
Out[88]: '1 2 3 4 99 ten'

In [89]: shipname = 'Gulf Challenger, R/V'

In [90]: shipname.split()
Out[90]: ['Gulf', 'Challenger,', 'R/V']

In [91]: shipname.split(',')
Out[91]: ['Gulf Challenger', ' R/V']

In [92]: shipname.split(',')[0]
Out[92]: 'Gulf Challenger'

In [93]: fields = ship
ship        shipname

In [93]: fields = shipname.spli
shipname.split        shipname.splitlines

In [93]: fields = shipname.split
```

```
#+BEGIN_SRC python
shipname='Gulf Challenger, R/V'
shipname.split()
fields = shipname.split(',')
len(fields)
name = fields[0]
name * 4
' -- '.join(fields)
#+END_SRC

* Working with files                                    :file:...
* A for loop                                            :for:...
* Making a function                                     :function:...
--:**-   11-ipython.org    78% L565    (Org)--------------------------
SUBTREE (NO CHILDREN)
```

[researchtools@ubun...] Lecture 11: ipython an... researchtools@ubunt... emacs23@ubuntu

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```
In [93]: fields = ship
ship          shipname

In [93]: fields = shipname.spli
shipname.split          shipname.splitlines

In [93]: fields = shipname.split(',')

In [94]: fields
Out[94]: ['Gulf Challenger', ' R/V']

In [95]: type fields
-------> type(fields)
Out[95]: <type 'list'>

In [96]: name = fields[0]

In [97]: name
Out[97]: 'Gulf Challenger'

In [98]:
```
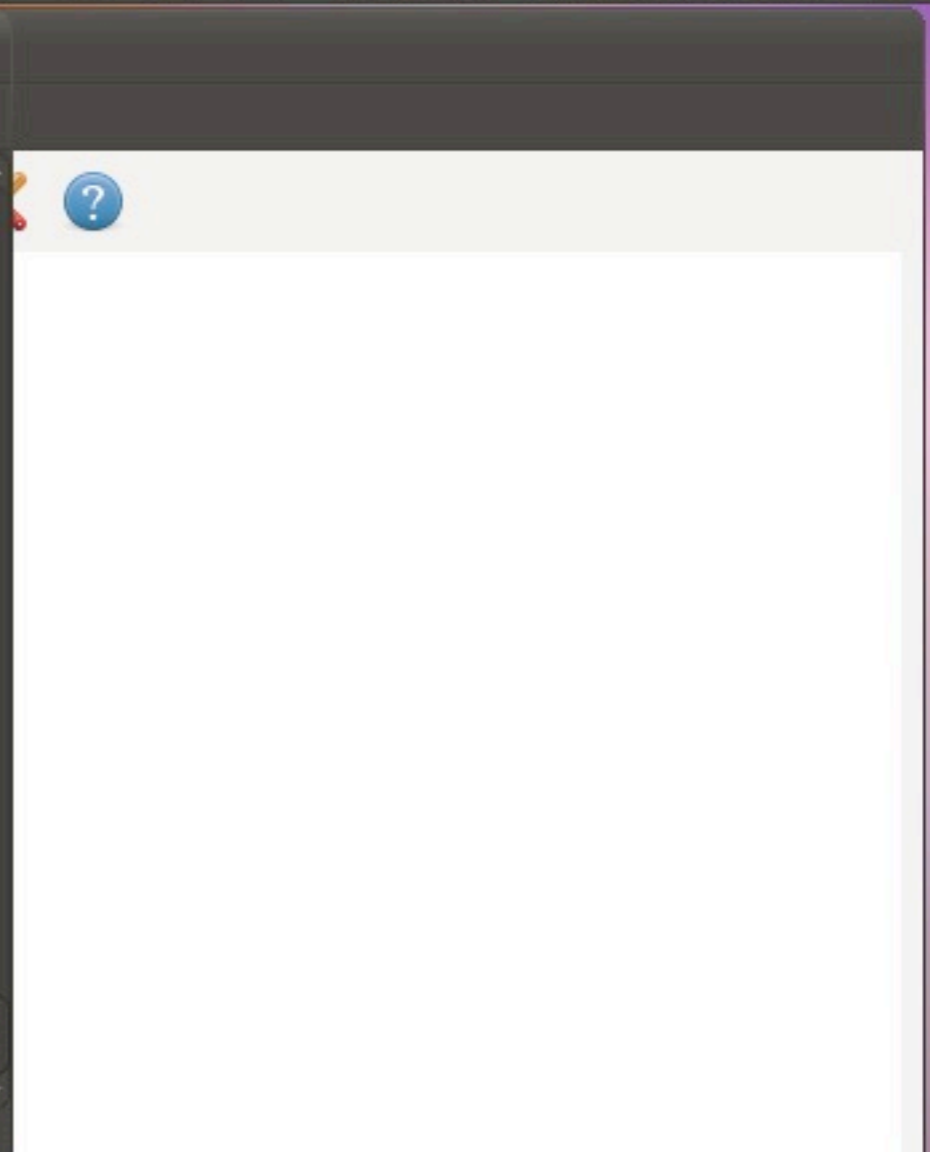
```
#+BEGIN_SRC python
shipname='Gulf Challenger, R/V'
shipname.split()
fields = shipname.split(',')
len(fields)
name = fields[0]
name * 4
' -- '.join(fields)
#+END_SRC

* Working with files                                              :file:...
* A for loop                                                      :for:...
* Making a function                                          :function:...
--:**-   11-ipython.org    78% L565    (Org)---------------------------------
SUBTREE (NO CHILDREN)
```

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44:10

Number 93 at 45:40 talking about the ".spli" with tab for completions and what happens when there is more than one option to complete to.

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```
In [93]: fields = shipname.spli
shipname.split        shipname.splitlines

In [93]: fields = shipname.split(',')

In [94]: fields
Out[94]: ['Gulf Challenger', ' R/V']

In [95]: type fields
-------> type(fields)
Out[95]: <type 'list'>

In [96]: name = fields[0]

In [97]: name
Out[97]: 'Gulf Challenger'

In [98]: name * 4
Out[98]: 'Gulf ChallengerGulf ChallengerGulf ChallengerGulf Challenger'

In [99]:

In [100]:

In [101]:

In [102]:

In [103]:

In [104]:
```
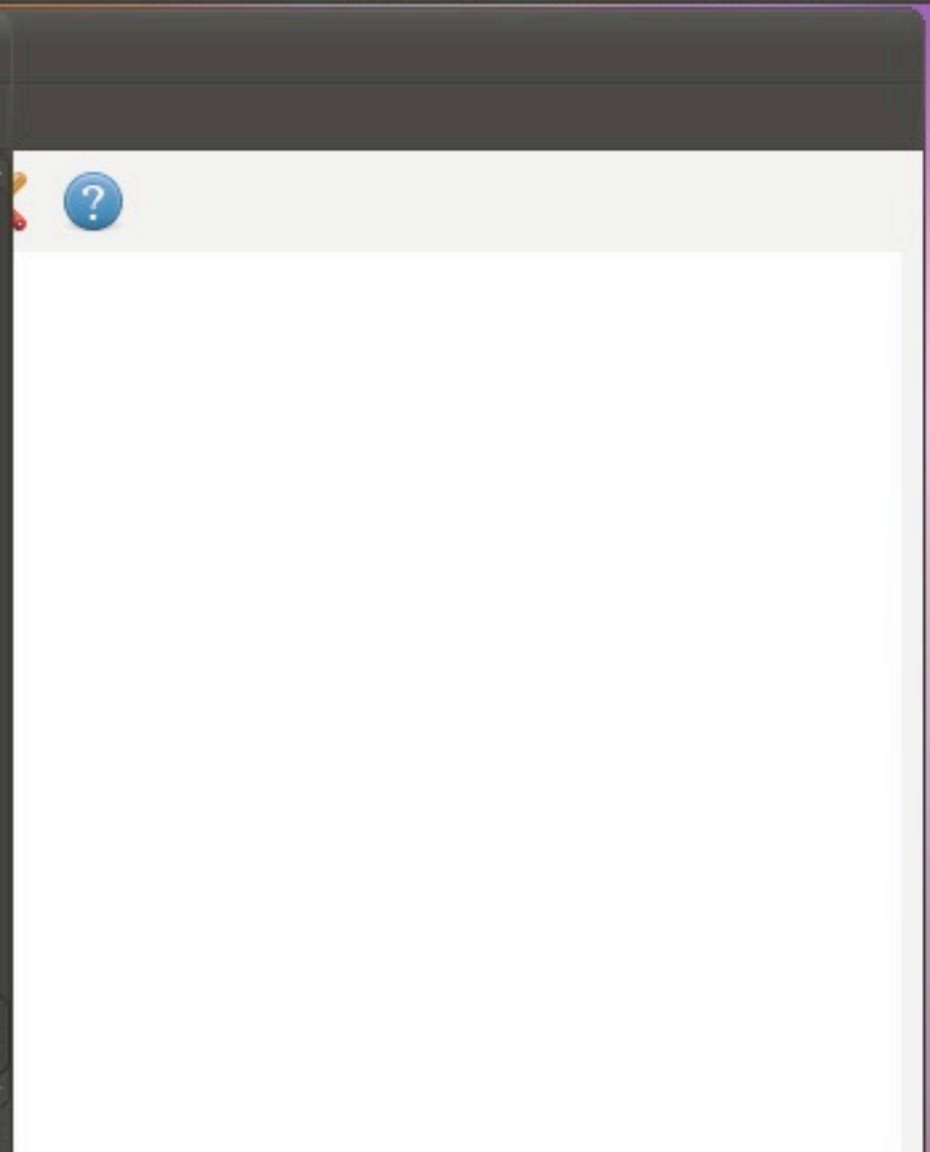
```
* A for loop                                              :for:...
* Making a function                                       :function:...
--:**-   11-ipython.org    78% L576    (Org)-----------------------------------
```

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45:00

47:45 In [96]

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```
In [169]:

In [170]:

In [171]:

In [172]:

In [173]:

In [174]:

In [175]:

In [176]: name * 4
Out[176]: 'Gulf ChallengerGulf ChallengerGulf ChallengerGulf Challenger'

In [177]: '-'*80
Out[177]: '--------------------------------------------------------------------------------
----------'

In [178]:
```

```
#+BEGIN_SRC python
shipname='Gulf Challenger, R/V'
shipname.split()
fields = shipname.split(',')
len(fields)
name = fields[0]
name * 4
' -- '.join(fields)
#+END_SRC

* Working with files                                              :file:...
* A for loop                                                       :for:...
* Making a function                                           :function:...
--:**-  11-ipython.org    78% L565    (Org)-------------------------------
SUBTREE (NO CHILDREN)
```

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47:00 Line 177 with the 80 dash characters

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```
Variable      Type         Data/Info
------------------------------------------
fields        list         ['Gulf Challenger', ' R/V']
math          module       <module 'math' (built-in)>
name          str          Gulf Challenger
numbers       str          1 2 3 4 99 ten
ship          list         ['passenger', 'r/v']
shipname      str          Gulf Challenger, R/V
tmp           tuple        ('tug', 'row boat', 'r/v')

In [180]: ' -- '.join?
Object `' -- '.join` not found.

In [181]: ' -- '.join(tmp)
Out[181]: 'tug -- row boat -- r/v'

In [182]: ','.join(tmp)
Out[182]: 'tug,row boat,r/v'

In [183]: my_csv = ','.join(tmp)

In [184]:
```

```
      out.write('9,-1\n')
      out.close()
      #+END_SRC

      Open up the file in emacs:   ~/class/11/data.csv

      We can now read that data from python!

      #+BEGIN_SRC python
      datafile = open('data.csv')
      type( datafile )
      datafile.readline()
      datafile.readline()
--:**-   11-ipython.org   80% L585   (Org)----------------------------
```

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49:15

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```
In [188]: %clear

In [189]: whos
Variable    Type      Data/Info
--------------------------------
fields      list      ['Gulf Challenger', ' R/V']
math        module    <module 'math' (built-in)>
my_csv      str       tug,row boat,r/v
name        str       Gulf Challenger
numbers     str       1 2 3 4 99 ten
ship        list      ['passenger', 'r/v']
shipname    str       Gulf Challenger, R/V
tmp         tuple     ('tug', 'row boat', 'r/v')

In [190]: out = open('data.csv','w')

In [191]: type out
--------> type(out)
Out[191]: <type 'file'>

In [192]: out.write('1,2\n') # \\ -> \
```

```
#+BEGIN_SRC python
out = open('data.csv','w')
out.write('1,2\n')
out.write('4,5\n')
out.write('9,-1\n')
out.close()
#+END_SRC

Open up the file in emacs:  ~/class/11/data.csv

We can now read that data from python!
```

--:**-   **11-ipython.org**   79% L602   (Org)---

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50:00 to create a file

51:15 write
53:10 out.close()

researchtools@ emacs23@ubuntu

File Edit View Search File Edit Options Buffers Tools Org Tbl Help

```
In [192]: out.write('1,
In [193]: out.write('4,
In [194]: out.write('9,
In [195]: ls -l
total 104
-rw-r--r-- 1 researchtoo
-rw-r--r-- 1 researchtoo
-rw-r--r-- 1 researchtoo
-rw-r--r-- 1 researchtoo
-rw-r--r-- 1 researchtoo
-rw-r--r-- 1 researchtoo
-rw-r--r-- 1 researchtoo
In [196]: out.close()
In [197]: ls -l data.csv
-rw-r--r-- 1 researchtoo
In [198]:
```

```
1,2
4,5
9,-1
```

--:--- data.csv   All L1   (CSV yas)--F1-------------------------

```
type( datafile )
datafile.readline()
datafile.readline()
datafile.readline()
datafile.readline()
del(datafile)

datafile = open('data.csv')
lines = datafile.readlines()
len(lines)
lines[0]
lines[0].strip()
lines[0].strip().split(',')  # yikes!  you can chain things together
#+END_SRC

* A for loop                                              :for:...
```

--:**- 11-ipython.org 83% L611 (Org)---------------------------------

[researchtools@ubun... Lecture 11: ipython an... researchtools@ubunt... emacs23@ubuntu

53:45

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```
In [200]: datafile.readlin
datafile.readline    datafile.readlines

In [200]: datafile.readlines()
Out[200]: ['1,2\n', '4,5\n', '9,-1\n']

In [201]: datafile = open('data.csv')

In [202]: datafile.readline()
Out[202]: '1,2\n'

In [203]: datafile.readline()
Out[203]: '4,5\n'

In [204]: datafile.readline()
Out[204]: '9,-1\n'

In [205]: datafile.readline()
Out[205]: ''

In [206]: %
```

```python
#+BEGIN_SRC python
datafile = open('data.csv')
type( datafile )
datafile.readline()
datafile.readline()
datafile.readline()
datafile.readline()
del(datafile)

datafile = open('data.csv')
lines = datafile.readlines()
len(lines)
lines[0]
```

--:**-   **11-ipython.org**   83% L608   [#] (Org)------------------------

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