In [ ]:
```
3*3
```

Out[ ]:
```
9
```

In [ ]:
```
5*8
```

Out[ ]:
```
40
```

In [ ]:
```
In[1]
```

Out[ ]:
```
"get_ipython().system('jupyter nbconvert --to html JupyterIntro.ipynb')"
```

In [ ]:
```
In
```

Out[ ]:
```
['',
 "get_ipython().system('jupyter nbconvert --to html JupyterIntro.ipynb')",
 '3*3',
 '5*8',
 'In[1]',
 'In']
```

In [ ]:
```
Out
```

Out[ ]:
```
{2: 9,
 3: 40,
 4: "get_ipython().system('jupyter nbconvert --to html JupyterIntro.ipynb')",
 5: ['',
  "get_ipython().system('jupyter nbconvert --to html JupyterIntro.ipynb')",
  '3*3',
  '5*8',
  'In[1]',
  'In',
  'Out']}
```

In [ ]:
```
_ # Shows last output
```

Out[ ]:
```
['',
 "get_ipython().system('jupyter nbconvert --to html JupyterIntro.ipynb')",
 '3*3',
 '5*8',
 'In[1]',
 'In',
 'Out',
 '_ # Shows last output ']
```

In [ ]:
```
1 + 6
```

Out[ ]:
```
7
```

In [ ]:
```
x = 1
```

In [ ]:
```
x = 5; x
```

Out[ ]:
```
5
```

In [ ]:
```
y = None; y
```

In [ ]:
```
y
```

In [ ]:
```
4 + 6
```

Out[ ]:
```
10
```

In [ ]:
```
4 + 6;
```

In [ ]:
```
import os
```

In [ ]:
```
#os.walk()
```

In [ ]:
```
import math
```

In [ ]:
```
math.cos?
```

```
Signature: math.cos(x, /)
Docstring: Return the cosine of x (measured in radians).
Type:      builtin_function_or_method
```

In [ ]:
```
math.sin??
```

```
Signature: math.sin(x, /)
Docstring: Return the sine of x (measured in radians).
Type:      builtin_function_or_method
```

In [ ]:
```
!ls
```

```
AggregateFunctions.jpg
AggregateFunctions2.jpg
ArrayOperations.jpg
BooleanFunctions.jpg
ElementWiseFunction.jpg
ElementWiseFunction2.jpg
ElementWiseOperators.jpg
Head_in.ipynb
Head_in.pdf
Indexing.jpg
JupyterIntro.html
JupyterIntro.ipynb
```

```
KroneckerProduct1.png
KroneckerProduct2.png
MatrixOperations.jpg
Numpy.html
Numpy.ipynb
OrderOfArraydataInMemory.png
OutterProduct1.png
OutterProduct2.png
OutterProduct3.png
OutterProduct4.png
PulseFunc.png
SetOperations.jpg
Vectorizing.jpg
fib.py
test.ipynb
```

In [ ]:
```
a = [1, 2, 3]
```

In [ ]:
```
a.append(10)
```

In [ ]:
```
a
```

Out[ ]:
```
[1, 2, 3, 10]
```

In [ ]:
```
a.extend([13])
```

In [ ]:
```
a
```

Out[ ]:
```
[1, 2, 3, 10, 13]
```

In [ ]:
```
a.append('ali')
```

In [ ]:
```
a
```

Out[ ]:
```
[1, 2, 3, 10, 13, 'ali']
```

In [ ]:
```
a.extend(['ali'])
```

In [ ]:
```
a
```

Out[ ]:
```
[1, 2, 3, 10, 13, 'ali', 'ali']
```

In [ ]:
```
a.extend('ali')
```

In [ ]:
```
a
```

Out[ ]:
```
[1, 2, 3, 10, 13, 'ali', 'ali', 'a', 'l', 'i']
```

In [ ]:
```
a.append([1, 2, 3, 4])
```

In [ ]:
```
a
```

Out[ ]:
```
[1, 2, 3, 10, 13, 'ali', 'ali', 'a', 'l', 'i', [1, 2, 3, 4]]
```

In [ ]:
```
dir
```

Out[ ]:
```
<function dir>
```

In [ ]:
```
!dir
```

```
 Volume in drive C has no label.
 Volume Serial Number is 1E5E-844D

 Directory of c:\Users\vision\Documents\MEGAsync\Cloud Drive\Python Codes\Jupyter Notebo
ok

11/30/2021  04:44 PM    <DIR>          .
11/30/2021  04:44 PM    <DIR>          ..
11/25/2021  05:51 PM    <DIR>          .ipynb_checkpoints
11/28/2021  12:22 PM           216,498 AggregateFunctions.jpg
11/28/2021  12:29 PM           113,423 AggregateFunctions2.jpg
11/28/2021  12:55 PM           186,060 ArrayOperations.jpg
11/28/2021  12:33 PM           203,467 BooleanFunctions.jpg
11/28/2021  11:34 AM           217,278 ElementWiseFunction.jpg
11/28/2021  11:40 AM           323,830 ElementWiseFunction2.jpg
11/27/2021  03:12 PM           124,166 ElementWiseOperators.jpg
11/25/2021  01:00 PM               163 fib.py
08/30/2021  02:10 PM             4,164 Head_in.ipynb
08/30/2021  02:10 PM            32,425 Head_in.pdf
11/26/2021  02:48 PM           373,103 Indexing.jpg
11/30/2021  04:44 PM           982,612 JupyterIntro.html
11/30/2021  04:45 PM           430,044 JupyterIntro.ipynb
11/30/2021  02:51 PM             5,890 KroneckerProduct1.png
11/30/2021  02:51 PM            36,505 KroneckerProduct2.png
11/28/2021  02:51 PM           252,960 MatrixOperations.jpg
11/25/2021  05:54 PM         1,090,260 Numpy.html
11/30/2021  04:43 PM           325,724 Numpy.ipynb
11/25/2021  08:05 PM            58,769 OrderOfArraydataInMemory.png
11/30/2021  02:42 PM             4,855 OutterProduct1.png
11/30/2021  02:42 PM             9,417 OutterProduct2.png
11/30/2021  02:45 PM             2,060 OutterProduct3.png
11/30/2021  02:45 PM            12,456 OutterProduct4.png
11/28/2021  01:19 PM            92,056 PulseFunc.png
11/28/2021  12:54 PM           184,590 SetOperations.jpg
09/24/2021  11:02 PM            16,944 test.ipynb
11/27/2021  01:53 PM           144,424 Vectorizing.jpg
              27 File(s)      5,444,143 bytes
               3 Dir(s)  28,669,599,744 bytes free
```

In [ ]:
```
files = !dir
```

In [ ]:
```
len(files)
```

Out[ ]:
```
37
```

In [ ]:
```
files
```

Out[ ]:
```
[' Volume in drive C has no label.',
 ' Volume Serial Number is 1E5E-844D',
 '',
 ' Directory of c:\\Users\\vision\\Documents\\MEGAsync\\Cloud Drive\\Python Codes\\Jupyt
er Notebook',
 '',
 '11/30/2021  04:44 PM    <DIR>          .',
 '11/30/2021  04:44 PM    <DIR>          ..',
 '11/25/2021  05:51 PM    <DIR>          .ipynb_checkpoints',
 '11/28/2021  12:22 PM           216,498 AggregateFunctions.jpg',
 '11/28/2021  12:29 PM           113,423 AggregateFunctions2.jpg',
 '11/28/2021  12:55 PM           186,060 ArrayOperations.jpg',
 '11/28/2021  12:33 PM           203,467 BooleanFunctions.jpg',
 '11/28/2021  11:34 AM           217,278 ElementWiseFunction.jpg',
 '11/28/2021  11:40 AM           323,830 ElementWiseFunction2.jpg',
 '11/27/2021  03:12 PM           124,166 ElementWiseOperators.jpg',
 '11/25/2021  01:00 PM               163 fib.py',
 '08/30/2021  02:10 PM             4,164 Head_in.ipynb',
 '08/30/2021  02:10 PM            32,425 Head_in.pdf',
 '11/26/2021  02:48 PM           373,103 Indexing.jpg',
 '11/30/2021  04:44 PM           982,612 JupyterIntro.html',
 '11/30/2021  04:45 PM           430,044 JupyterIntro.ipynb',
 '11/30/2021  02:51 PM             5,890 KroneckerProduct1.png',
 '11/30/2021  02:51 PM            36,505 KroneckerProduct2.png',
 '11/28/2021  02:51 PM           252,960 MatrixOperations.jpg',
 '11/25/2021  05:54 PM         1,090,260 Numpy.html',
 '11/30/2021  04:43 PM           325,724 Numpy.ipynb',
 '11/25/2021  08:05 PM            58,769 OrderOfArraydataInMemory.png',
 '11/30/2021  02:42 PM             4,855 OutterProduct1.png',
 '11/30/2021  02:42 PM             9,417 OutterProduct2.png',
 '11/30/2021  02:45 PM             2,060 OutterProduct3.png',
 '11/30/2021  02:45 PM            12,456 OutterProduct4.png',
 '11/28/2021  01:19 PM            92,056 PulseFunc.png',
 '11/28/2021  12:54 PM           184,590 SetOperations.jpg',
 '09/24/2021  11:02 PM            16,944 test.ipynb',
 '11/27/2021  01:53 PM           144,424 Vectorizing.jpg',
 '              27 File(s)      5,444,143 bytes',
 '               3 Dir(s)  28,669,599,744 bytes free']
```

In [ ]:
```
file = 'Head_in.pdf'
```

In [ ]:
```
!dir $file
```

```
 Volume in drive C has no label.
 Volume Serial Number is 1E5E-844D

 Directory of c:\Users\vision\Documents\MEGAsync\Cloud Drive\Python Codes\Jupyter Notebo
ok
```

```
08/30/2021  02:10 PM            32,425 Head_in.pdf
               1 File(s)         32,425 bytes
               0 Dir(s)  28,669,521,920 bytes free
```

Magic methods

'%' uses for one line and '%%' uses on multiple lines

In [ ]:
```
%lsmagic
```

Out[ ]:
```
Available line magics:
%alias  %alias_magic  %autoawait  %autocall  %automagic  %autosave  %bookmark  %cd  %cle
ar  %cls  %colors  %conda  %config  %connect_info  %copy  %ddir  %debug  %dhist  %dirs
%doctest_mode  %echo  %ed  %edit  %env  %gui  %hist  %history  %killbgscripts  %ldir  %l
ess  %load  %load_ext  %loadpy  %logoff  %logon  %logstart  %logstate  %logstop  %ls  %l
smagic  %macro  %magic  %matplotlib  %mkdir  %more  %notebook  %page  %pastebin  %pdb  %
pdef  %pdoc  %pfile  %pinfo  %pinfo2  %pip  %popd  %pprint  %precision  %prun  %psearch
%psource  %pushd  %pwd  %pycat  %pylab  %qtconsole  %quickref  %recall  %rehashx  %reloa
d_ext  %ren  %rep  %rerun  %reset  %reset_selective  %rmdir  %run  %save  %sc  %set_env
%store  %sx  %system  %tb  %time  %timeit  %unalias  %unload_ext  %who  %who_ls  %whos
%xdel  %xmode

Available cell magics:
%%!  %%HTML  %%SVG  %%bash  %%capture  %%cmd  %%debug  %%file  %%html  %%javascript  %%j
s  %%latex  %%markdown  %%perl  %%prun  %%pypy  %%python  %%python2  %%python3  %%ruby
%%script  %%sh  %%svg  %%sx  %%system  %%time  %%timeit  %%writefile

Automagic is ON, % prefix IS NOT needed for line magics.
```

In [ ]:
```
%dirs?
```

```
Docstring: Return the current directory stack.
File:      c:\miniconda3\lib\site-packages\ipython\core\magics\osm.py
```

In [ ]:
```
%%timeit?
```

```
Docstring:
Time execution of a Python statement or expression

Usage, in line mode:
  %timeit [-n<N> -r<R> [-t|-c] -q -p<P> -o] statement
or in cell mode:
  %%timeit [-n<N> -r<R> [-t|-c] -q -p<P> -o] setup_code
  code
  code...

Time execution of a Python statement or expression using the timeit
module.  This function can be used both as a line and cell magic:

- In line mode you can time a single-line statement (though multiple
  ones can be chained with using semicolons).

- In cell mode, the statement in the first line is used as setup code
  (executed but not timed) and the body of the cell is timed.  The cell
```

```
  body has access to any variables created in the setup code.

Options:
-n<N>: execute the given statement <N> times in a loop. If <N> is not
provided, <N> is determined so as to get sufficient accuracy.

-r<R>: number of repeats <R>, each consisting of <N> loops, and take the
best result.
Default: 7

-t: use time.time to measure the time, which is the default on Unix.
This function measures wall time.

-c: use time.clock to measure the time, which is the default on
Windows and measures wall time. On Unix, resource.getrusage is used
instead and returns the CPU user time.

-p<P>: use a precision of <P> digits to display the timing result.
Default: 3

-q: Quiet, do not print result.

-o: return a TimeitResult that can be stored in a variable to inspect
    the result in more details.

.. versionchanged:: 7.3
    User variables are no longer expanded,
    the magic line is always left unmodified.

Examples
--------
::

  In [1]: %timeit pass
  8.26 ns ± 0.12 ns per loop (mean ± std. dev. of 7 runs, 100000000 loops each)

  In [2]: u = None

  In [3]: %timeit u is None
  29.9 ns ± 0.643 ns per loop (mean ± std. dev. of 7 runs, 10000000 loops each)

  In [4]: %timeit -r 4 u == None

  In [5]: import time

  In [6]: %timeit -n1 time.sleep(2)


The times reported by %timeit will be slightly higher than those
reported by the timeit.py script when variables are accessed. This is
due to the fact that %timeit executes the statement in the namespace
of the shell, compared with timeit.py, which uses a single setup
statement to import function or create variables. Generally, the bias
does not matter as long as results from timeit.py are not mixed with
those from %timeit.
File:      c:\miniconda3\lib\site-packages\ipython\core\magics\execution.py
```

In [ ]:

```
!ls
```

```
AggregateFunctions.jpg
AggregateFunctions2.jpg
ArrayOperations.jpg
BooleanFunctions.jpg
ElementWiseFunction.jpg
ElementWiseFunction2.jpg
ElementWiseOperators.jpg
Head_in.ipynb
Head_in.pdf
Indexing.jpg
JupyterIntro.html
JupyterIntro.ipynb
KroneckerProduct1.png
KroneckerProduct2.png
MatrixOperations.jpg
Numpy.html
Numpy.ipynb
OrderOfArraydataInMemory.png
OutterProduct1.png
OutterProduct2.png
OutterProduct3.png
OutterProduct4.png
PulseFunc.png
SetOperations.jpg
Vectorizing.jpg
fib.py
test.ipynb
```

In [ ]:

```
%ls
```

```
 Volume in drive C has no label.
 Volume Serial Number is 1E5E-844D

 Directory of c:\Users\vision\Documents\MEGAsync\Cloud Drive\Python Codes\Jupyter Notebo
ok

11/30/2021  04:44 PM    <DIR>          .
11/30/2021  04:44 PM    <DIR>          ..
11/25/2021  05:51 PM    <DIR>          .ipynb_checkpoints
11/28/2021  12:22 PM           216,498 AggregateFunctions.jpg
11/28/2021  12:29 PM           113,423 AggregateFunctions2.jpg
11/28/2021  12:55 PM           186,060 ArrayOperations.jpg
11/28/2021  12:33 PM           203,467 BooleanFunctions.jpg
11/28/2021  11:34 AM           217,278 ElementWiseFunction.jpg
11/28/2021  11:40 AM           323,830 ElementWiseFunction2.jpg
11/27/2021  03:12 PM           124,166 ElementWiseOperators.jpg
11/25/2021  01:00 PM               163 fib.py
08/30/2021  02:10 PM             4,164 Head_in.ipynb
08/30/2021  02:10 PM            32,425 Head_in.pdf
11/26/2021  02:48 PM           373,103 Indexing.jpg
11/30/2021  04:44 PM           982,612 JupyterIntro.html
11/30/2021  04:45 PM           433,050 JupyterIntro.ipynb
11/30/2021  02:51 PM             5,890 KroneckerProduct1.png
11/30/2021  02:51 PM            36,505 KroneckerProduct2.png
11/28/2021  02:51 PM           252,960 MatrixOperations.jpg
11/25/2021  05:54 PM         1,090,260 Numpy.html
11/30/2021  04:43 PM           325,724 Numpy.ipynb
11/25/2021  08:05 PM            58,769 OrderOfArraydataInMemory.png
11/30/2021  02:42 PM             4,855 OutterProduct1.png
```

```
11/30/2021  02:42 PM             9,417 OutterProduct2.png
11/30/2021  02:45 PM             2,060 OutterProduct3.png
11/30/2021  02:45 PM            12,456 OutterProduct4.png
11/28/2021  01:19 PM            92,056 PulseFunc.png
11/28/2021  12:54 PM           184,590 SetOperations.jpg
09/24/2021  11:02 PM            16,944 test.ipynb
11/27/2021  01:53 PM           144,424 Vectorizing.jpg
              27 File(s)      5,447,149 bytes
               3 Dir(s)  28,669,300,736 bytes free
```

In [ ]:

```
!dir
```

```
 Volume in drive C has no label.
 Volume Serial Number is 1E5E-844D

 Directory of c:\Users\vision\Documents\MEGAsync\Cloud Drive\Python Codes\Jupyter Notebo
ok

11/30/2021  04:44 PM    <DIR>          .
11/30/2021  04:44 PM    <DIR>          ..
11/25/2021  05:51 PM    <DIR>          .ipynb_checkpoints
11/28/2021  12:22 PM           216,498 AggregateFunctions.jpg
11/28/2021  12:29 PM           113,423 AggregateFunctions2.jpg
11/28/2021  12:55 PM           186,060 ArrayOperations.jpg
11/28/2021  12:33 PM           203,467 BooleanFunctions.jpg
11/28/2021  11:34 AM           217,278 ElementWiseFunction.jpg
11/28/2021  11:40 AM           323,830 ElementWiseFunction2.jpg
11/27/2021  03:12 PM           124,166 ElementWiseOperators.jpg
11/25/2021  01:00 PM               163 fib.py
08/30/2021  02:10 PM             4,164 Head_in.ipynb
08/30/2021  02:10 PM            32,425 Head_in.pdf
11/26/2021  02:48 PM           373,103 Indexing.jpg
11/30/2021  04:44 PM           982,612 JupyterIntro.html
11/30/2021  04:45 PM           433,050 JupyterIntro.ipynb
11/30/2021  02:51 PM             5,890 KroneckerProduct1.png
11/30/2021  02:51 PM            36,505 KroneckerProduct2.png
11/28/2021  02:51 PM           252,960 MatrixOperations.jpg
11/25/2021  05:54 PM         1,090,260 Numpy.html
11/30/2021  04:43 PM           325,724 Numpy.ipynb
11/25/2021  08:05 PM            58,769 OrderOfArraydataInMemory.png
11/30/2021  02:42 PM             4,855 OutterProduct1.png
11/30/2021  02:42 PM             9,417 OutterProduct2.png
11/30/2021  02:45 PM             2,060 OutterProduct3.png
11/30/2021  02:45 PM            12,456 OutterProduct4.png
11/28/2021  01:19 PM            92,056 PulseFunc.png
11/28/2021  12:54 PM           184,590 SetOperations.jpg
09/24/2021  11:02 PM            16,944 test.ipynb
11/27/2021  01:53 PM           144,424 Vectorizing.jpg
              27 File(s)      5,447,149 bytes
               3 Dir(s)  28,669,169,664 bytes free
```

In [ ]:

```
%dir
```

```
UsageError: Line magic function `%dir` not found.
```

In [ ]:

```
%pwd
```

```
'c:\\Users\\vision\\Documents\\MEGAsync\\Cloud Drive\\Python Codes\\Jupyter Notebook'
```

Out[ ]:

In [ ]:
```
!pwd
```

```
/c/Users/vision/Documents/MEGAsync/Cloud Drive/Python Codes/Jupyter Notebook
```

In [ ]:
```
%ls
```

```
 Volume in drive C has no label.
 Volume Serial Number is 1E5E-844D

 Directory of c:\Users\vision\Documents\MEGAsync\Cloud Drive\Python Codes\Jupyter Notebo
ok

11/30/2021  04:44 PM    <DIR>          .
11/30/2021  04:44 PM    <DIR>          ..
11/25/2021  05:51 PM    <DIR>          .ipynb_checkpoints
11/28/2021  12:22 PM           216,498 AggregateFunctions.jpg
11/28/2021  12:29 PM           113,423 AggregateFunctions2.jpg
11/28/2021  12:55 PM           186,060 ArrayOperations.jpg
11/28/2021  12:33 PM           203,467 BooleanFunctions.jpg
11/28/2021  11:34 AM           217,278 ElementWiseFunction.jpg
11/28/2021  11:40 AM           323,830 ElementWiseFunction2.jpg
11/27/2021  03:12 PM           124,166 ElementWiseOperators.jpg
11/25/2021  01:00 PM               163 fib.py
08/30/2021  02:10 PM             4,164 Head_in.ipynb
08/30/2021  02:10 PM            32,425 Head_in.pdf
11/26/2021  02:48 PM           373,103 Indexing.jpg
11/30/2021  04:44 PM           982,612 JupyterIntro.html
11/30/2021  04:45 PM           436,517 JupyterIntro.ipynb
11/30/2021  02:51 PM             5,890 KroneckerProduct1.png
11/30/2021  02:51 PM            36,505 KroneckerProduct2.png
11/28/2021  02:51 PM           252,960 MatrixOperations.jpg
11/25/2021  05:54 PM         1,090,260 Numpy.html
11/30/2021  04:43 PM           325,724 Numpy.ipynb
11/25/2021  08:05 PM            58,769 OrderOfArraydataInMemory.png
11/30/2021  02:42 PM             4,855 OutterProduct1.png
11/30/2021  02:42 PM             9,417 OutterProduct2.png
11/30/2021  02:45 PM             2,060 OutterProduct3.png
11/30/2021  02:45 PM            12,456 OutterProduct4.png
11/28/2021  01:19 PM            92,056 PulseFunc.png
11/28/2021  12:54 PM           184,590 SetOperations.jpg
09/24/2021  11:02 PM            16,944 test.ipynb
11/27/2021  01:53 PM           144,424 Vectorizing.jpg
              27 File(s)      5,450,616 bytes
               3 Dir(s)  28,668,911,616 bytes free
```

In [ ]:
```
%run fib.py
```

```
[1, 1, 2, 3, 5, 8, 13, 21, 34, 55]
```

In [ ]:
```
%who
```

```
a        fib     file    files   math    os      sys     x       y
```

In [ ]:

```
fib
```

Out[ ]:
```
<function __main__.fib(n)>
```

In [ ]:
```
fib(5)
```

Out[ ]:
```
[1, 1, 2, 3, 5]
```

In [ ]:
```
fib(20)
```

Out[ ]:
```
[1,
 1,
 2,
 3,
 5,
 8,
 13,
 21,
 34,
 55,
 89,
 144,
 233,
 377,
 610,
 987,
 1597,
 2584,
 4181,
 6765]
```

In [ ]:
```
%whos
```

```
Variable   Type        Data/Info
--------------------------------
a          list        n=11
fib        function    <function fib at 0x00000156DDC63D30>
file       str         Head_in.pdf
files      SList       [' Volume in drive C has <...>,669,599,744 bytes free']
math       module      <module 'math' (built-in)>
os         module      <module 'os' from 'C:\\Miniconda3\\lib\\os.py'>
sys        module      <module 'sys' (built-in)>
x          int         5
y          NoneType    None
```

In [ ]:
```
%time %run fib.py
```

```
[1, 1, 2, 3, 5, 8, 13, 21, 34, 55]
Wall time: 1.99 ms
```

In [ ]:
```
fib(2.0)
```

```
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
~\AppData\Local\Temp/ipykernel_8448/1960624670.py in <module>
```

```
----> 1 fib(2.0)

c:\Users\vision\Documents\MEGAsync\Cloud Drive\Python Codes\Jupyter Notebook\fib.py in f
ib(n)
      2
      3     f0, f1 = 0, 1
----> 4     f = [1] * n
      5     for i in range(1, n):
      6         f[i] = f0 + f1

TypeError: can't multiply sequence by non-int of type 'float'
```

In [ ]:

```
%debug
```

```
> c:\users\vision\documents\megasync\cloud drive\python codes\jupyter notebook\fib.py(4)
fib()
      2
      3     f0, f1 = 0, 1
----> 4     f = [1] * n
      5     for i in range(1, n):
      6         f[i] = f0 + f1

2.0
2.0
2.0
```

In [ ]:
```
%who
```

```
Interactive namespace is empty.
```

In [ ]:
```
%whos
```

```
Interactive namespace is empty.
```

In [ ]:
```
a
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
~\AppData\Local\Temp/ipykernel_8448/2167009006.py in <module>
----> 1 a

NameError: name 'a' is not defined
```

In [ ]:
```
%timeit %run fib.py
```

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[1, 1, 2, 3, 5, 8, 13, 21, 34, 55]
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233,
377,
610,
987,
1597,
2584,
4181,
6765,
10946,
17711,
28657,
46368,
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121393,
196418,
317811,
514229,
832040,
1346269,
2178309,
3524578,
5702887,
9227465,
14930352,
24157817,
39088169,
63245986,
102334155,
165580141,
267914296,
433494437,
701408733,
1134903170,
1836311903,
2971215073,
4807526976,
7778742049,
12586269025,
20365011074,
32951280099,
53316291173,
86267571272,
139583862445,
225851433717,
365435296162,
591286729879,
956722026041,
1548008755920,
2504730781961,
4052739537881,
6557470319842,
10610209857723,
17167680177565,
27777890035288,
44945570212853,
72723460248141,
117669030460994,
190392490709135,
308061521170129,
498454011879264,
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 806515533049393,
 1304969544928657,
 2111485077978050,
 3416454622906707,
 5527939700884757,
 8944394323791464,
 14472334024676221,
 23416728348467685,
 37889062373143906,
 61305790721611591,
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 1779979416004714189,
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 51680708854858323072,
 83621143489848422977,
 135301852344706746049,
 218922995834555169026,
 354224848179261915075]
```

In [ ]:

```
%run -p fib.py #for outter script profiling
```

```
[1, 1, 2, 3, 5, 8, 13, 21, 34, 55]
         102 function calls (101 primitive calls) in 0.001 seconds

   Ordered by: internal time

   ncalls  tottime  percall  cumtime  percall filename:lineno(function)
        2    0.000    0.000    0.000    0.000 {method '__exit__' of '_io._IOBase' object
s}
        1    0.000    0.000    0.000    0.000 {built-in method builtins.compile}
        2    0.000    0.000    0.000    0.000 {built-in method io.open}
      2/1    0.000    0.000    0.001    0.001 {built-in method builtins.exec}
        1    0.000    0.000    0.000    0.000 {method 'read' of '_io.BufferedReader' obj
ects}
        3    0.000    0.000    0.000    0.000 socket.py:480(send)
        1    0.000    0.000    0.001    0.001 interactiveshell.py:2720(safe_execfile)
        1    0.000    0.000    0.000    0.000 ntpath.py:450(normpath)
        3    0.000    0.000    0.000    0.000 iostream.py:206(schedule)
        2    0.000    0.000    0.000    0.000 iostream.py:500(write)
        1    0.000    0.000    0.001    0.001 py3compat.py:164(execfile)
        1    0.000    0.000    0.000    0.000 {built-in method builtins.print}
        2    0.000    0.000    0.000    0.000 ntpath.py:124(splitdrive)
        1    0.000    0.000    0.000    0.000 ntpath.py:289(expanduser)
        3    0.000    0.000    0.000    0.000 threading.py:1093(is_alive)
        1    0.000    0.000    0.000    0.000 ntpath.py:180(split)
        1    0.000    0.000    0.000    0.000 fib.py:1(<module>)
        3    0.000    0.000    0.000    0.000 threading.py:1039(_wait_for_tstate_lock)
        1    0.000    0.000    0.000    0.000 fib.py:1(fib)
        2    0.000    0.000    0.000    0.000 iostream.py:418(_is_master_process)
```

```
        1    0.000    0.000    0.000    0.000 {built-in method _locale._getdefaultlocal
e}
        1    0.000    0.000    0.000    0.000 ntpath.py:524(abspath)
        1    0.000    0.000    0.000    0.000 {built-in method nt._getfullpathname}
        3    0.000    0.000    0.000    0.000 {method 'acquire' of '_thread.lock' object
s}
        1    0.000    0.000    0.000    0.000 _bootlocale.py:11(getpreferredencoding)
        1    0.000    0.000    0.001    0.001 <string>:1(<module>)
        3    0.000    0.000    0.000    0.000 iostream.py:96(_event_pipe)
        2    0.000    0.000    0.000    0.000 iostream.py:437(_schedule_flush)
        1    0.000    0.000    0.000    0.000 {method 'split' of 'str' objects}
       14    0.000    0.000    0.000    0.000 {built-in method builtins.len}
        1    0.000    0.000    0.000    0.000 traitlets.py:535(get)
        1    0.000    0.000    0.000    0.000 builtin_trap.py:46(__exit__)
        3    0.000    0.000    0.000    0.000 {method 'startswith' of 'str' objects}
        7    0.000    0.000    0.000    0.000 {built-in method builtins.isinstance}
        1    0.000    0.000    0.000    0.000 syspathcontext.py:48(__enter__)
        1    0.000    0.000    0.000    0.000 builtin_trap.py:39(__enter__)
        1    0.000    0.000    0.000    0.000 traitlets.py:566(__get__)
        1    0.000    0.000    0.000    0.000 syspathcontext.py:45(__init__)
        1    0.000    0.000    0.000    0.000 {method 'lstrip' of 'str' objects}
        1    0.000    0.000    0.000    0.000 ntpath.py:221(dirname)
        2    0.000    0.000    0.000    0.000 {built-in method nt.getpid}
        5    0.000    0.000    0.000    0.000 {built-in method nt.fspath}
        1    0.000    0.000    0.000    0.000 codecs.py:260(__init__)
        3    0.000    0.000    0.000    0.000 threading.py:529(is_set)
        3    0.000    0.000    0.000    0.000 {method 'replace' of 'str' objects}
        1    0.000    0.000    0.000    0.000 syspathcontext.py:55(__exit__)
        3    0.000    0.000    0.000    0.000 {method 'append' of 'collections.deque' ob
jects}
        1    0.000    0.000    0.000    0.000 {method 'join' of 'str' objects}
        1    0.000    0.000    0.000    0.000 ntpath.py:34(_get_bothseps)
        1    0.000    0.000    0.000    0.000 {method 'rstrip' of 'str' objects}
        1    0.000    0.000    0.000    0.000 {method 'disable' of '_lsprof.Profiler' ob
jects}
```

In [ ]:

```
import numpy as np
```

In [ ]:

```
def random_walker_max_distance(M,N):
    traj = [np.random.randn(M).cumsum() for _ in range(N)]
    return(np.max(np.abs(traj)))
```

In [ ]:

```
%prun random_walker_max_distance(400, 10000)
```

```
         20013 function calls in 0.289 seconds

   Ordered by: internal time

   ncalls  tottime  percall  cumtime  percall filename:lineno(function)
    10000    0.173    0.000    0.173    0.000 {method 'randn' of 'numpy.random.mtrand.Ra
ndomState' objects}
    10000    0.058    0.000    0.058    0.000 {method 'cumsum' of 'numpy.ndarray' object
s}
        1    0.033    0.033    0.279    0.279 811583599.py:1(random_walker_max_distance)
        1    0.013    0.013    0.244    0.244 811583599.py:2(<listcomp>)
        1    0.010    0.010    0.289    0.289 <string>:1(<module>)
```

```
        1    0.002    0.002    0.002    0.002 {method 'reduce' of 'numpy.ufunc' objects}
        1    0.000    0.000    0.289    0.289 {built-in method builtins.exec}
        1    0.000    0.000    0.002    0.002 fromnumeric.py:69(_wrapreduction)
        1    0.000    0.000    0.002    0.002 <__array_function__ internals>:2(amax)
        1    0.000    0.000    0.002    0.002 fromnumeric.py:2638(amax)
        1    0.000    0.000    0.002    0.002 {built-in method numpy.core._multiarray_um
ath.implement_array_function}
        1    0.000    0.000    0.000    0.000 fromnumeric.py:70(<dictcomp>)
        1    0.000    0.000    0.000    0.000 {method 'disable' of '_lsprof.Profiler' ob
jects}
        1    0.000    0.000    0.000    0.000 fromnumeric.py:2633(_amax_dispatcher)
        1    0.000    0.000    0.000    0.000 {method 'items' of 'dict' objects}
```

```
def func(x):
    return x**2
```

A	B	C
1	2	3
4	5	6

Text

> Text1
>
> > Text2

- a
- b
- c

1. a
2. b
3. c

$$-\frac{1}{N}\sum_{n=1}^{N} \tag{1}$$

In [ ]:
```
from IPython.display import display, Image, HTML, Math
```

In [ ]:
```
Image(url = 'PythonLogo.png')
```

Out[ ]:

In [ ]:
```
import scipy, numpy, matplotlib
```

In [ ]:
```
modules = [numpy, matplotlib, scipy]
row = "<tr> <td>%s</td> <td>%s</td> </tr>"
rows = '\n'.join([row % (module.__name__, module.__version__) for module in modules])
s = "<table> <tr> <th> Library </th> <th> Version </th> </tr> %s </table>" % (rows)
```

In [ ]:
```
s
```

Out[ ]:
```
'<table> <tr> <th> Library </th> <th> Version </th> </tr> <tr> <td>numpy</td> <td>1.21.4
</td> </tr>\n<tr> <td>matplotlib</td> <td>3.4.3</td> </tr>\n<tr> <td>scipy</td> <td>1.7.
1</td> </tr> </table>'
```

In [ ]:
```
HTML(s)
```

Out[ ]:

Library	Version
numpy	1.21.4
matplotlib	3.4.3
scipy	1.7.1

In [ ]:
```
class HTMLDisplayer():
    def __init__(self, code):
        self.code = code
    def _repr_html_(self):
        return self.code
```

In [ ]:
```
HTMLDisplayer(s)
```

Out[ ]:

Library	Version
numpy	1.21.4
matplotlib	3.4.3
scipy	1.7.1

In [ ]:
```
Math(r'\hat{H} = -\frac{1}{2}\epsilon \hat{\sigma}_z -\frac{1}{2}\delta \hat{\sigma}_x'
```

Out[ ]: $\hat{H} = -\frac{1}{2}\epsilon\hat{\sigma}_z - \frac{1}{2}\delta\hat{\sigma}_x$

In [ ]:
```
class QubitHamiltonian():
    def __init__(self, epsilon, delta):
        self.epsilon = epsilon
        self.delta = delta
    def _repr_latex_(self):
        return '$ \hat{H} = -%0.2f\hat{\sigma}_z - %0.2f\hat{\sigma}_x $' % (self.epsil
```

In [ ]:
```
QubitHamiltonian(0.6, 0.5)
```

Out[ ]: $\hat{H} = -0.30\hat{\sigma}_z - 0.25\hat{\sigma}_x$

In [ ]:
```
import matplotlib.pyplot as plt
import numpy as np
from scipy import stats

def f(mu):
    X = stats.norm(loc = mu, scale = np.sqrt(mu))
    N = stats.poisson(mu)
    x = np.linspace(0, X.ppf(0.999))
    n = np.arange(0, x[-1])
    fig, ax = plt.subplots()
    ax.plot(x, X.pdf(x), color = 'black', lw = 2, label = 'Normal($\mu = %d, \sigma^2 =
    ax.bar(n, N.pmf(n), align = 'edge', label = r'Poisson($\lambda = %d$)' % (mu))
    ax.set_ylim(0, X.pdf(x).max() * 1.3)
    ax.legend(loc = 2, ncol = 2)
    plt.close()
    return fig
```

In [ ]:
```
from ipywidgets import interact
import ipywidgets as widgets
```

In [ ]:
```
interact(f, mu = widgets.FloatSlider(min = 1.0, max = 20.0, step = 1.0));
```

In [ ]:
```
!jupyter nbconvert --to html JupyterIntro.ipynb
```

```
[NbConvertApp] Converting notebook JupyterIntro.ipynb to html
[NbConvertApp] ERROR | Notebook JSON is invalid: Additional properties are not allowed
('id' was unexpected)

Failed validating 'additionalProperties' in code_cell:

On instance['cells'][0]:
{'cell_type': 'code',
 'execution_count': 2,
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 'metadata': {},
 'outputs': ['...1 outputs...'],
 'source': '3*3'}
[NbConvertApp] Writing 965590 bytes to JupyterIntro.html
```

In [ ]: