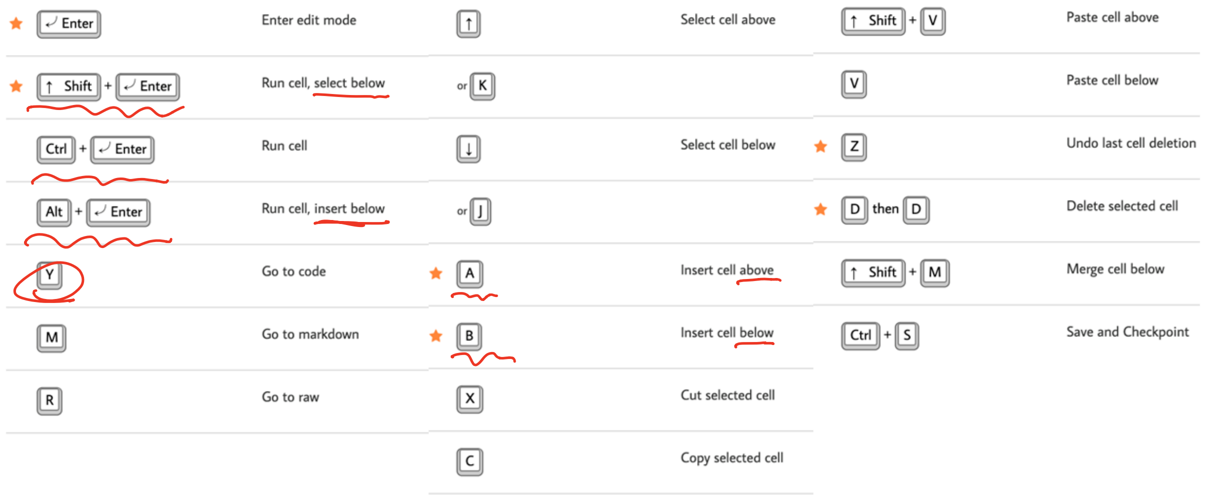
Jupyter notebook common shortcuts

- Esc: exit edit mode, enable command mode



★ ↵ Enter	Enter edit mode	↑	Select cell above	↑ Shift + V	Paste cell above
★ ↑ Shift + ↵ Enter	Run cell, select below	or K		V	Paste cell below
Ctrl + ↵ Enter	Run cell	↓	Select cell below	★ Z	Undo last cell deletion
Alt + ↵ Enter	Run cell, insert below	or J		★ D then D	Delete selected cell
Y	Go to code	★ A	Insert cell above	↑ Shift + M	Merge cell below
M	Go to markdown	★ B	Insert cell below	Ctrl + S	Save and Checkpoint
R	Go to raw	X	Cut selected cell		
		C	Copy selected cell		

- https://shortcutworld.com/Jupyter-Notebook/win/Jupyter-

Basic data types in Python

- 6 basic data types in Python 3:
  - Number
  - String
  - List
  - Tuple
  - Set
  - Dictionary
- **Fixed** data types: number, string, tuple;
- **Flexible** data types: list, dictionary, set.
- **Numeric** types in Python 3: int, float, bool, complex （复数）

Variables

- Python does not require variables to be defined before use.
- It also does not require specifying the data type of a variable.
- One variable can be assigned with different type of values repeatedly.
  - This is part of the reason why Python is called a dynamic language.
- Python also allows to assign different types of values at the same time to multiple variables.

Operators & expressions

- Python supports standard operators

操作符	描述
+, -, *, /, %, //, **	算术运算：加、减、乘、除、取模、整除、幂
<,<=,>,>=,!=,==	关系运算符
and, or, not,	逻辑运算符

String

- In Python, string values are quoted with single quote ('), double quote (") or triple quote ('''), these quotes must match.
- Escape symbol: \

back slach

转义序列	说明
\n	换行
\\	反斜杠
\”	双引号
\t	制表符

- We can use slice ([] or [:]) to select substrings.
- Python index starts with 0. Backward indexing starts with -1 as the last character and minus 1.

Common methods of Strings

Method	Operations
str.capitalize()	返回字符串的副本，其首字符大写，其余字符小写
str.count(sub [,start [,end]])	返回[start，end]范围内sub的非重叠出现次数，start和end可选
str.endswith(sub[,start[,end]])	返回布尔值，表示字符串是否以指定的sub结束，同类方法str.startswith()
str.find(sub [,start [,end]]) indexof( ).	返回字符串中首次出现子串sub的索引位置，start和end可选，若未找到sub，返回-1
str.split(sep =None)	使用sep作为分隔符拆分字符串，返回字符串中单词的列表，分隔空字符串
str.strip([chars])	删除字符串前端和尾部chars指定的字符集，如果省略或None，则删除空白字符

Output in Python: String formatting

1. **Use %**

```
>>> name = "Eric"
>>> age = 74
>>> "Hello, %s. You are %s." % (name, age)
'Hello Eric. You are 74.'
```

- Verbose and error prone for longer strings and many variables 容易错

2. **Use str.format()**

- Simple syntax

```
>>> "Hello, {1}. You are {0}.".format(age, name)
'Hello, Eric. You are 74.'
```

- Access values from dictionaries

```
person = {'name': 'Eric', 'age': 74}
print("Hello, {name}. You are {age}.".format(name=person['name'], age=person['age']))
```

```
Hello, Eric. You are 74.
```

```
>>> person = {'name': 'Eric', 'age': 74}
>>> "Hello, {name}. You are {age}.".format(**person)
'Hello, Eric. You are 74.'
```

Output in Python: String formatting

1. **Use f-strings:** Also called "formatted string literals," f-strings are string literals that have an f at the beginning and curly braces containing expressions that will be replaced with their values.

```
name = "Eric"
age = 74
f"Hello, {name}. You are {age}."
```

```
'Hello, Eric. You are 74.'
```

2. Because f-strings are evaluated at runtime, you can put any and all valid Python expressions in them.

```
>>> f"{2 * 37}"
'74'
```

```
>>> f"{name.lower()} is funny."
'eric idle is funny.'
```

```
def to_lowercase(input):
    return input.lower()

name = "Eric Idle"
f"{to_lowercase(name)} is funny."
```

range( ) 左闭右开.

Built-in data structures

- When dealing with data records, the commonly used data structures are the four built-in data structures in Python
  - **List** ordered, sequence of items, mutable,
  - **Tuple**
  - **Dictionary**
  - **Set**

```
>>> print([1, 2, 3])                       # <class 'list'>
[1, 2, 3]
>>> print((1, 2, 3))                       # <class 'tuple'>
(1, 2, 3)
>>> print({'red', 'green', 'blue'})        # <class 'set'>
{'red', 'green', 'blue'}
>>> print({'name': 'Alice', 'age': 42})  # <class 'dict'>
{'name': 'Alice', 'age': 42}
```

List

- Features of list:
  - Flexible
  - Ordered
  - Members can have different types
  - Varied length
  - Allows nested lists
  - Allows in-place modification
- Definition of a list:

  list = [2, 4, 6, 8, 10]

  list = [‘a’, ‘b’, ‘c’, ‘d’, ‘e’]
- **print the lists; print the length of the lists.**

List

- Common methods:

1）L.append(v)： 把v添加到列表L的结尾

2）L.insert(i, v)：将值v插入到列表L的索引i处

3）L.index(v)：返回列表中第一个值为v的元素的索引

4）L.remove(v)：从列表L中移除第一次找到的值v

5）L.pop(i)：从列表的指定位置删除元素，并将其返回。如果没有指定索引，a.pop()返回最后一个元素。

6）L.reverse()：倒排列表中的元素

7）L.count(v)：返回v在列表中出现的次数

8）L.sort(key=None, reverse=False)：对链表中的元素进行适当的排序。

List

- Iterate over the elements of a list

syntax	`[ <expr1> for k in L if <expr2> ]`

meaning	`returnList=[]`
	`for k in L:`
	`    if <expr2>:`
	`        returnList.append(<expr1>)`
	`return  returnList;`

- **Examples:**
  - For each element of a list, print its product with 3
  - For each element of a list, if it’s greater than 6, print its product with 3
  - Given two lists, if the product of each element at the same position is greater than 0, print the product

Tuple

- Features:
  - Immutable: fixed once defined
  - Does not support item assignment
  - Use parenthesis () instead of square brackets

Dictionary

- Consists of key-value pairs.

- Features:
  - Uses brackets in definition.
  - Key has to be unique.
  - Only use immutable data type (e.g. string) as key.
  - Unordered.
  - Mutable: allow item assignment.

- Definition of a dictionary:

  dict = {key1:value1, key2:value2}

- Common methods:

方法	描述
get(key,default=None)	返回指定键的值，若值不在字典中则返回default值，default的系统缺省值是None
items()	以列表返回可遍历的(键, 值) 元组数组
keys()	以列表返回一个字典所有的键
values()	以列表返回字典中的所有值
update(dict)	更新，加入字典dict中的元素
clear()	清空字典

Set

- Features:
  - Unordered
  - Unique elements
- Definition of a set:

  a = {1, 1, 2, 3, 4}

  a = set([1, 1, 2, 3, 4]) 去重.
- Note:
  - set() method takes a list and turns it into a set.
  - Must use the set() method to create an empty set.
  - {} creates an empty dictionary.

Set

- Common methods:

set_a.issubset(set_b)	Whether the input set set_b is a subset of the current set set_a
set_a.union(set_b)	Computes the union of two sets
set_a.difference(set_b)	Computes set_b-set_a
set_a.intersection(set_b)	Computes the intersection of set_a and set_b

In:

```
set1 = set([0,1,2,3,4])
set2 = set([1,3,5,7,9])
print(set1.issubset(set2))
print(set1.union(set2))
print(set2.difference(set1))
print(set2.intersection(set1))
```

Out:

```
False
{0, 1, 2, 3, 4, 5, 7, 9}
{9, 5, 7}
```

lambda function

- Python使用lambda来创建匿名函数(anonymous function)
- 准确地说，lambda只是一个表达式，函数体比def定义的函数简单的多
- 在lambda表达式中只能封装有限的逻辑。
- lambda函数不能访问自有参数列表之外或全局命名空间里的参数。
- Syntax:

  func_name=lambda [v1, v2,…]: expression

  func_name([v1, v2,…])

lambda function

- Example:

Write a lambda function to calculate 1+2x+y^2+zy

```
polynominal = lambda x,y,z: 1+2*x+y**2+z*y
polynominal(1,2,3)
```

Or the function can be anonymous:

```
lambda x,y,z: 1+2*x+y**2+z*y
_(1,2,3)
```

The underscore references to the last evaluated expression.

Note: this only works in the interactive interpreter, and you could not write similar code in a Python module.

Create. insert.... select. grant.

File manipulation DDL DML DQL DCL

- Common process:
  1. Open file: open();
  2. Read/write file: read(), readline(), readlines(), write();
  3. Process data from file;
  4. Close file: close()

- Documentation:

  https://docs.python.org/3/tutorial/inputoutput.html#reading-and-

Open a file

- First step is to open a file using the open() function. This will return a file object:

```
file_object = open(file_name [, access_mode = "r",
                buffering= -1])
```

- Note:
  - Files opened with the open() function must be closed with the close() function when finish reading, so as to release the file.
- Alternatively, we can use `with open() as f`, which will automatically close the file when finish reading.

```
with open("student.txt", "r") as f:
    processes…
```

- We can use f.closed afterwards to check whether file is closed automatically.

CSV files

- CSV (Comma Separated Values) is a very common file type of datasets in data mining.
- CSV is a plain text format：
  - Pure text, using certain character set, e.g. ASCII, Unicode or GB2312
  - Each line is a record.
  - Each record is separated into fields, the separator is usually comma or tab.
  - Field order is the same for each record.
- Python has a built-in csv module, which can be used to read and process csv files.
  - Load the module: import csv
  - Documentation: https://docs.python.org/3/library/csv.html