Python Cheatsheet

Contents

To run a cell, press **Shift+Enter** or click **Run** at the top of the page.

1. Syntax and whitespace

Python uses indented space to indicate the level of statements. The following cell is an example where '**if**' and '**else**' are in same level, while '**print**' is separated by space to a different level. Spacing should be the same for items that are on the same level.

```
student_number = input("Enter your student number:")
if student_number != 0:
    print("Welcome student {}".format(student_number))
else:
    print("Try again!")
```

```
Enter your student number: 1
Welcome student 1
```

2. Comments

In Python, comments start with hash '#' and extend to the end of the line. '#' can be at the begining of the line or after code.

```
# This is code to print hello world!

print("Hello world!") # Print statement for hello world
print("# is not a comment in this case")
```

```
Hello world!
# is not a comment in this case
```

3. Numbers and operations

Like with other programming languages, there are four types of numbers:

- Integers (e.g., 1, 20, 45, 1000) indicated by *int*
- Floating point numbers (e.g., 1.25, 20.35, 1000.00) indicated by *float*
- Long integers
- Complex numbers (e.g., x+2y where x is known)

Operation	Result
x + y	Sum of x and y
x - y	Difference of x and y
x * y	Product of x and y
x / y	Quotient of x and y

Operation	Result
x // y	Quotient of x and y (floored)
x % y	Remainder of x / y
abs(x)	Absolute value of x
int(x)	x converted to integer
long(x)	x converted to long integer
float(x)	x converted to floating point
pow(x, y)	x to the power y
x ** y	x to the power y

```
# Number examples
a = 5 + 8
print("Sum of int numbers: {} and number format is {}".format(a, type(a)))

b = 5 + 2.3
print ("Sum of int and {} and number format is {}".format(b, type(b)))
```

```
Sum of int numbers: 13 and number format is <class 'int'>
Sum of int and 7.3 and number format is <class 'float'>
```

4. String manipulation

Python has rich features like other programming languages for string manipulation.

```
# Store strings in a variable
test_word = "hello world to everyone"

# Print the test_word value
print(test_word)

# Use [] to access the character of the string. The first character is indicated by '0'.
print(test_word[0])

# Use the len() function to find the length of the string
print(len(test_word))

# Some examples of finding in strings
print(test_word.count('l')) # Count number of times l repeats in the string
print(test_word.find("o")) # Find letter 'o' in the string. Returns the position of first match.
print(test_word.count(' ')) # Count number of spaces in the string
print(test_word.upper()) # Change the string to uppercase
print(test_word.lower()) # Change the string to lowercase
print(test_word.replace("everyone","you")) # Replace word "everyone" with "you"
print(test_word.title()) # Change string to title format
print(test_word + "!!!") # Concatenate strings
print(":".join(test_word)) # Add ":" between each character
print("".join(reversed(test_word))) # Reverse the string
```

```
hello world to everyone
h
23
3
4
3
HELLO WORLD TO EVERYONE
hello world to everyone
hello world to you
Hello World To Everyone
hello world to everyone!!!
h:e:l:l:o: :w:o:r:l:d: :t:o: :e:v:e:r:y:o:n:e
enoyreve ot dlrow olleh
```

5. Lists, tuples, and dictionaries

Python supports data types lists, tuples, dictionaries, and arrays.

Lists

A list is created by placing all the items (elements) inside square brackets [ ] separated by commas. A list can have any number of items, and they may be of different types (integer, float, strings, etc.).

```
# A Python list is similar to an array. You can create an empty list too.

my_list = []

first_list = [3, 5, 7, 10]
second_list = [1, 'python', 3]
```

```
# Nest multiple lists
nested_list = [first_list, second_list]
nested_list
```

```
    [[3, 5, 7, 10], [1, 'python', 3]]
```

```
# Combine multiple lists
combined_list = first_list + second_list
combined_list
```

```
    [3, 5, 7, 10, 1, 'python', 3]
```

```
# You can slice a list, just like strings
combined_list[0:3]
```

```
    [3, 5, 7]
```

```
# Append a new entry to the list
combined_list.append(600)
combined_list
```

```
    [3, 5, 7, 10, 1, 'python', 3, 600]
```

```
# Remove the last entry from the list
combined_list.pop()
```

```
    600
```

```
# Iterate the list
for item in combined_list:
    print(item)
```

```
    3
    5
    7
    10
    1
    python
    3
```

Tuples

A tuple is similar to a list, but you use them with parentheses ( ) instead of square brackets. The main difference is that a tuple is immutable, while a list is mutable.

```
my_tuple = (1, 2, 3, 4, 5)
my_tuple[1:4]
```

```
    (2, 3, 4)
```

Dictionaries

A dictionary is also known as an associative array. A dictionary consists of a collection of key-value pairs. Each key-value pair maps the key to its associated value.

```
desk_location = {'jack': 123, 'joe': 234, 'hary': 543}
desk_location['jack']
```

```
    123
```

6. JSON

JSON is text writen in JavaScript Object Notation. Python has a built-in package called `json` that can be used to work with JSON data.

```
import json

# Sample JSON data
x = '{"first_name":"Jane", "last_name":"Doe", "age":25, "city":"Chicago"}'

# Read JSON data
y = json.loads(x)

# Print the output, which is similar to a dictonary
print("Employee name is "+ y["first_name"] + " " + y["last_name"])
```

```
Employee name is Jane Doe
```

7. Loops

If, Else, Elif loop: Python supports conditional statements like any other programming language. Python relies on indentation (whitespace at the begining of the line) to define the scope of the code.

```
a = 22
b = 33
c = 100

# if ... else example
if a > b:
    print("a is greater than b")
else:
    print("b is greater than a")


# if .. else .. elif example

if a > b:
    print("a is greater than b")
elif b > c:
    print("b is greater than c")
else:
    print("b is greater than a and c is greater than b")
```

```
b is greater than a
b is greater than a and c is greater than b
```

While loop: Processes a set of statements as long as the condition is true

```
# Sample while example
i = 1
while i < 10:
    print("count is " + str(i))
    i += 1

print("="*10)

# Continue to next iteration if x is 2. Finally, print message once the condition is false.

x = 0
while x < 5:
    x += 1
    if x == 2:
        continue
    print(x)
else:
    print("x is no longer less than 5")
```

```
count is 1
count is 2
count is 3
count is 4
count is 5
count is 6
count is 7
count is 8
count is 9
==========
1
3
4
5
x is no longer less than 5
```

For loop: A `For` loop is more like an iterator in Python. A `For` loop is used for iterating over a sequence (list, tuple, dictionay, set, string, or range).

```
# Sample for loop examples
fruits = ["orange", "banana", "apple", "grape", "cherry"]
for fruit in fruits:
    print(fruit)

print("\n")
print("="*10)
print("\n")

# Iterating range
for x in range(1, 10, 2):
    print(x)
else:
    print("task complete")

print("\n")
print("="*10)
print("\n")

# Iterating multiple lists
traffic_lights = ["red", "yellow", "green"]
action = ["stop", "slow down", "go"]

for light in traffic_lights:
    for task in action:
        print(light, task)
```

```
orange
banana
apple
grape
cherry


==========


1
3
5
7
9
task complete


==========


red stop
red slow down
red go
yellow stop
yellow slow down
yellow go
green stop
green slow down
green go
```

8. File handling

The key function for working with files in Python is the `open()` function. The `open()` function takes two parameters: filename and mode.

There are four different methods (modes) for opening a file:

- "r" - Read
- "a" - Append
- "w" - Write
- "x" - Create

In addition, you can specify if the file should be handled in binary or text mode.

- "t" - Text
- "b" - Binary

```
# Let's create a test text file
!echo "This is a test file with text in it. This is the first line." > test.txt
```

```
!echo "This is the second line." >> test.txt
!echo "This is the third line." >> test.txt


# Read file
file = open('test.txt', 'r')
print(file.read())
file.close()

print("\n")
print("="*10)
print("\n")

# Read first 10 characters of the file
file = open('test.txt', 'r')
print(file.read(10))
file.close()

print("\n")
print("="*10)
print("\n")

# Read line from the file

file = open('test.txt', 'r')
print(file.readline())
file.close()
```

```
    This is a test file with text in it. This is the first line.
    This is the second line.
    This is the third line.



    ==========


    This is a


    ==========


    This is a test file with text in it. This is the first line.
```

```
# Create new file

file = open('test2.txt', 'w')
file.write("This is content in the new test2 file.")
file.close()

# Read the content of the new file
file = open('test2.txt', 'r')
print(file.read())
file.close()
```

```
    This is content in the new test2 file.
```

```
# Update file
file = open('test2.txt', 'a')
file.write("\nThis is additional content in the new file.")
file.close()

# Read the content of the new file
file = open('test2.txt', 'r')
print(file.read())
file.close()
```

```
    This is content in the new test2 file.
    This is additional content in the new file.
```

```
# Delete file
import os
file_names = ["test.txt", "test2.txt"]
for item in file_names:
    if os.path.exists(item):
        os.remove(item)
        print(f"File {item} removed successfully!")
    else:
        print(f"{item} file does not exist.")
```

```
File test.txt removed successfully!
File test2.txt removed successfully!
```

9. Functions

A function is a block of code that runs when it is called. You can pass data, or *parameters*, into the function. In Python, a function is defined by `def`.

```
# Defining a function
def new_funct():
    print("A simple function")

# Calling the function
new_funct()
```

```
A simple function
```

```
# Sample fuction with parameters

def param_funct(first_name):
    print(f"Employee name is {first_name}.")

param_funct("Harry")
param_funct("Larry")
param_funct("Shally")
```

```
Employee name is Harry.
Employee name is Larry.
Employee name is Shally.
```

Anonymous functions (lambda): A lambda is a small anonymous function. A lambda function can take any number of arguments but only one expression.

```
# Sample lambda example
x = lambda y: y + 100
print(x(15))

print("\n")
print("="*10)
print("\n")

x = lambda a, b: a*b/100
print(x(2,4))
```

```
115


==========


0.08
```

10. Working with datetime

A `datetime` module in Python can be used to work with date objects.

```
import datetime

x = datetime.datetime.now()

print(x)
print(x.year)
print(x.strftime("%A"))
print(x.strftime("%B"))
print(x.strftime("%d"))
print(x.strftime("%H:%M:%S %p"))
```

```
2023-11-30 19:51:49.727931
2023
Thursday
November
30
19:51:49 PM
```

11. NumPy

NumPy is the fundamental package for scientific computing with Python. Among other things, it contains:

- Powerful N-dimensional array object
- Sophisticated (broadcasting) functions
- Tools for integrating C/C++ and Fortran code
- Useful linear algebra, Fourier transform, and random number capabilities

```
# Install NumPy using pip
!pip install numpy
```

```
Requirement already satisfied: numpy in /home/ec2-user/anaconda3/envs/python3/lib/python3.10/site-packages (1.22.4)
```

```
# Import NumPy module
import numpy as np
```

Inspecting your array

```
# Create array
a = np.arange(15).reshape(3, 5) # Create array with range 0-14 in 3 by 5 dimension
b = np.zeros((3,5)) # Create array with zeroes
c = np.ones( (2,3,4), dtype=np.int16 ) # Createarray with ones and defining data types
d = np.ones((3,5))
```

```
a.shape # Array dimension
```

```
(3, 5)
```

```
len(b)# Length of array
```

```
3
```

```
c.ndim # Number of array dimensions
```

```
3
```

```
a.size # Number of array elements
```

```
15
```

```
b.dtype # Data type of array elements
```

```
dtype('float64')
```

```
c.dtype.name # Name of data type
```

```
'int16'
```

```
c.astype(float) # Convert an array type to a different type
```

```
array([[[1., 1., 1., 1.],
        [1., 1., 1., 1.],
        [1., 1., 1., 1.]],

       [[1., 1., 1., 1.],
        [1., 1., 1., 1.],
        [1., 1., 1., 1.]]])
```

Basic math operations

```
# Create array
a = np.arange(15).reshape(3, 5) # Create array with range 0-14 in 3 by 5 dimension
b = np.zeros((3,5)) # Create array with zeroes
c = np.ones( (2,3,4), dtype=np.int16 ) # Createarray with ones and defining data types
d = np.ones((3,5))
```

```
np.add(a,b) # Addition
```

```
    array([[ 0.,  1.,  2.,  3.,  4.],
           [ 5.,  6.,  7.,  8.,  9.],
           [10., 11., 12., 13., 14.]])
```

```
np.subtract(a,b) # Substraction
```

```
    array([[ 0.,  1.,  2.,  3.,  4.],
           [ 5.,  6.,  7.,  8.,  9.],
           [10., 11., 12., 13., 14.]])
```

```
np.divide(a,d) # Division
```

```
    array([[ 0.,  1.,  2.,  3.,  4.],
           [ 5.,  6.,  7.,  8.,  9.],
           [10., 11., 12., 13., 14.]])
```

```
np.multiply(a,d) # Multiplication
```

```
    array([[ 0.,  1.,  2.,  3.,  4.],
           [ 5.,  6.,  7.,  8.,  9.],
           [10., 11., 12., 13., 14.]])
```

```
np.array_equal(a,b) # Comparison - arraywise
```

```
    False
```

Aggregate functions

```
# Create array
a = np.arange(15).reshape(3, 5) # Create array with range 0-14 in 3 by 5 dimension
b = np.zeros((3,5)) # Create array with zeroes
c = np.ones( (2,3,4), dtype=np.int16 ) # Createarray with ones and defining data types
d = np.ones((3,5))
```

```
a.sum() # Array-wise sum
```

```
    105
```

```
a.min() # Array-wise min value
```

```
    0
```

```
a.mean() # Array-wise mean
```

```
    7.0
```

```
a.max(axis=0) # Max value of array row
```

```
    array([10, 11, 12, 13, 14])
```

```
np.std(a) # Standard deviation
```

```
    4.320493798938574
```

Subsetting, slicing, and indexing

```
# Create array
a = np.arange(15).reshape(3, 5) # Create array with range 0-14 in 3 by 5 dimension
b = np.zeros((3,5)) # Create array with zeroes
c = np.ones( (2,3,4), dtype=np.int16 ) # Createarray with ones and defining data types
d = np.ones((3,5))
```

```
a[1,2] # Select element of row 1 and column 2
```

```
    7
```

```
a[0:2] # Select items on index 0 and 1
```

```
    array([[0, 1, 2, 3, 4],
           [5, 6, 7, 8, 9]])
```

```
a[:1] # Select all items at row 0
```

```
    array([[0, 1, 2, 3, 4]])
```

```
a[-1:] # Select all items from last row
```

```
    array([[10, 11, 12, 13, 14]])
```

```
a[a<2] # Select elements from 'a' that are less than 2
```

```
    array([0, 1])
```

Array manipulation

```
# Create array
a = np.arange(15).reshape(3, 5) # Create array with range 0-14 in 3 by 5 dimension
b = np.zeros((3,5)) # Create array with zeroes
c = np.ones( (2,3,4), dtype=np.int16 ) # Createarray with ones and defining data types
d = np.ones((3,5))
```

```
np.transpose(a) # Transpose array 'a'
```

```
    array([[ 0,  5, 10],
           [ 1,  6, 11],
           [ 2,  7, 12],
           [ 3,  8, 13],
           [ 4,  9, 14]])
```

```
a.ravel() # Flatten the array
```

```
    array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14])
```

```
a.reshape(5,-2) # Reshape but don't change the data
```

```
    array([[ 0,  1,  2],
           [ 3,  4,  5],
           [ 6,  7,  8],
           [ 9, 10, 11],
           [12, 13, 14]])
```

```
np.append(a,b) # Append items to the array
```

```
    array([ 0.,  1.,  2.,  3.,  4.,  5.,  6.,  7.,  8.,  9., 10., 11., 12.,
           13., 14.,  0.,  0.,  0.,  0.,  0.,  0.,  0.,  0.,  0.,  0.,  0.,
            0.,  0.,  0.,  0.])
```

```
np.concatenate((a,d), axis=0) # Concatenate arrays
```

```
    array([[ 0.,  1.,  2.,  3.,  4.],
           [ 5.,  6.,  7.,  8.,  9.],
           [10., 11., 12., 13., 14.],
           [ 1.,  1.,  1.,  1.,  1.],
           [ 1.,  1.,  1.,  1.,  1.],
           [ 1.,  1.,  1.,  1.,  1.]])
```

```
np.vsplit(a,3) # Split array vertically at 3rd index
```

```
    [array([[0, 1, 2, 3, 4]]),
     array([[5, 6, 7, 8, 9]]),
     array([[10, 11, 12, 13, 14]])]
```

```
np.hsplit(a,5) # Split array horizontally at 5th index
```

```
    [array([[ 0],
            [ 5],
            [10]]),
     array([[ 1],
            [ 6],
            [11]]),
     array([[ 2],
            [ 7],
            [12]]),
     array([[ 3],
            [ 8],
            [13]]),
     array([[ 4],
            [ 9],
            [14]])]
```

Pandas

Pandas is an open source, BSD-licensed library providing high-performance, easy-to-use data structures and data analysis tools for the Python programming language.

Pandas DataFrames are the most widely used in-memory representation of complex data collections within Python.

```
# Install pandas, xlrd, and openpyxl using pip
!pip install pandas
!pip install xlrd openpyxl
```

```
Requirement already satisfied: pandas in /home/ec2-user/anaconda3/envs/python3/lib/python3.10/site-packages (2.1.1)
Requirement already satisfied: numpy>=1.22.4 in /home/ec2-user/anaconda3/envs/python3/lib/python3.10/site-packages (from
Requirement already satisfied: python-dateutil>=2.8.2 in /home/ec2-user/anaconda3/envs/python3/lib/python3.10/site-packag
Requirement already satisfied: pytz>=2020.1 in /home/ec2-user/anaconda3/envs/python3/lib/python3.10/site-packages (from p
Requirement already satisfied: tzdata>=2022.1 in /home/ec2-user/anaconda3/envs/python3/lib/python3.10/site-packages (fro
Requirement already satisfied: six>=1.5 in /home/ec2-user/anaconda3/envs/python3/lib/python3.10/site-packages (from pyth
Collecting xlrd
  Downloading xlrd-2.0.1-py2.py3-none-any.whl (96 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 96.5/96.5 kB 9.2 MB/s eta 0:00:00
Requirement already satisfied: openpyxl in /home/ec2-user/anaconda3/envs/python3/lib/python3.10/site-packages (3.1.2)
Requirement already satisfied: et-xmlfile in /home/ec2-user/anaconda3/envs/python3/lib/python3.10/site-packages (from op
Installing collected packages: xlrd
Successfully installed xlrd-2.0.1
```

```
# Import NumPy and Pandas modules
import numpy as np
import pandas as pd
```

```
/home/ec2-user/anaconda3/envs/python3/lib/python3.10/site-packages/pandas/core/computation/expressions.py:21: UserWarnin
  from pandas.core.computation.check import NUMEXPR_INSTALLED
```

```
# Sample dataframe df
df = pd.DataFrame({'num_legs': [2, 4, np.nan, 0],
                   'num_wings': [2, 0, 0, 0],
                   'num_specimen_seen': [10, np.nan, 1, 8]},
                   index=['falcon', 'dog', 'spider', 'fish'])
df # Display dataframe df
```

	num_legs	num_wings	num_specimen_seen
falcon	2.0	2	10.0
dog	4.0	0	NaN
spider	NaN	0	1.0
fish	0.0	0	8.0

```
# Another sample dataframe df1 - using NumPy array with datetime index and labeled column
df1 = pd.date_range('20130101', periods=6)
df1 = pd.DataFrame(np.random.randn(6, 4), index=df1, columns=list('ABCD'))
df1 # Display dataframe df1
```

Viewing data

	A	B	C	D
2013-01-02	1.431951	0.793861	0.940300	-0.567993

```
df1 = pd.date_range('20130101', periods=6)
df1 = pd.DataFrame(np.random.randn(6, 4), index=df1, columns=list('ABCD'))
```

```
df1.head(2) # View top data
```

	A	B	C	D
2013-01-01	1.391132	-1.593587	1.801365	0.004086
2013-01-02	-0.431011	2.605599	0.384398	-0.417979

```
df1.tail(2) # View bottom data
```

	A	B	C	D
2013-01-05	-1.074617	-0.854460	-0.017001	-0.761798
2013-01-06	0.199736	-0.022141	-2.377702	0.245258

```
df1.index # Display index column
```

```
DatetimeIndex(['2013-01-01', '2013-01-02', '2013-01-03', '2013-01-04',
               '2013-01-05', '2013-01-06'],
              dtype='datetime64[ns]', freq='D')
```

```
df1.dtypes # Inspect datatypes
```

```
A    float64
B    float64
C    float64
D    float64
dtype: object
```

```
df1.describe() # Display quick statistics summary of data
```

Subsetting, slicing, and indexing

```
df1 = pd.date_range('20130101', periods=6)
df1 = pd.DataFrame(np.random.randn(6, 4), index=df1, columns=list('ABCD'))
```

```
      mean   0.575569   0.045096   0.031565   0.125568
```

```
df1.T # Transpose data
```

	2013-01-01	2013-01-02	2013-01-03	2013-01-04	2013-01-05	2013-01-06
A	0.027030	0.976364	-0.479214	-1.732572	-0.847890	-1.241276
B	0.975635	-1.082700	-0.118557	0.245337	-0.230890	-0.372955
C	-1.287683	-0.097347	0.879278	0.694448	-0.977119	0.417494
D	0.522557	0.342539	-0.339455	0.999107	0.655293	0.081941

```
df1.sort_index(axis=1, ascending=False) # Sort by an axis
```

	D	C	B	A
2013-01-01	0.522557	-1.287683	0.975635	0.027030
2013-01-02	0.342539	-0.097347	-1.082700	0.976364
2013-01-03	-0.339455	0.879278	-0.118557	-0.479214
2013-01-04	0.999107	0.694448	0.245337	-1.732572
2013-01-05	0.655293	-0.977119	-0.230890	-0.847890
2013-01-06	0.081941	0.417494	-0.372955	-1.241276

```
df1.sort_values(by='B') # Sort by values
```

	A	B	C	D
2013-01-02	0.976364	-1.082700	-0.097347	0.342539
2013-01-06	-1.241276	-0.372955	0.417494	0.081941
2013-01-05	-0.847890	-0.230890	-0.977119	0.655293
2013-01-03	-0.479214	-0.118557	0.879278	-0.339455
2013-01-04	-1.732572	0.245337	0.694448	0.999107
2013-01-01	0.027030	0.975635	-1.287683	0.522557

```
df1['A'] # Select column A
```

```
2013-01-01    0.027030
2013-01-02    0.976364
2013-01-03   -0.479214
2013-01-04   -1.732572
2013-01-05   -0.847890
2013-01-06   -1.241276
Freq: D, Name: A, dtype: float64
```

```
df1[0:3] # Select index 0 to 2
```

	A	B	C	D
2013-01-01	0.027030	0.975635	-1.287683	0.522557
2013-01-02	0.976364	-1.082700	-0.097347	0.342539
2013-01-03	-0.479214	-0.118557	0.879278	-0.339455

```
df1['20130102':'20130104'] # Select from index matching the values
```

	A	B	C	D
2013-01-02	0.976364	-1.082700	-0.097347	0.342539
2013-01-03	-0.479214	-0.118557	0.879278	-0.339455
2013-01-04	-1.732572	0.245337	0.694448	0.999107

```
df1.loc[:, ['A', 'B']] # Select on a multi-axis by label
```

	A	B
2013-01-01	0.027030	0.975635
2013-01-02	0.976364	-1.082700
2013-01-03	-0.479214	-0.118557
2013-01-04	-1.732572	0.245337
2013-01-05	-0.847890	-0.230890
2013-01-06	-1.241276	-0.372955

```
df1.iloc[3] # Select via the position of the passed integers
```

```
A   -1.732572
B    0.245337
C    0.694448
D    0.999107
Name: 2013-01-04 00:00:00, dtype: float64
```

```
df1[df1 > 0] # Select values from a DataFrame where a boolean condition is met
```

	A	B	C	D
2013-01-01	0.027030	0.975635	NaN	0.522557
2013-01-02	0.976364	NaN	NaN	0.342539
2013-01-03	NaN	NaN	0.879278	NaN
2013-01-04	NaN	0.245337	0.694448	0.999107

```
df2 = df1.copy() # Copy the df1 dataset to df2
df2['E'] = ['one', 'one', 'two', 'three', 'four', 'three'] # Add column E with value
df2[df2['E'].isin(['two', 'four'])] # Use isin method for filtering
```

	A	B	C	D	E
2013-01-03	-0.479214	-0.118557	0.879278	-0.339455	two
2013-01-05	-0.847890	-0.230890	-0.977119	0.655293	four

Missing data

Pandas primarily uses the value `np.nan` to represent missing data. It is not included in computations by default.

```
df = pd.DataFrame({'num_legs': [2, 4, np.nan, 0],
                   'num_wings': [2, 0, 0, 0],
                   'num_specimen_seen': [10, np.nan, 1, 8]},
                   index=['falcon', 'dog', 'spider', 'fish'])
```

```
df.dropna(how='any') # Drop any rows that have missing data
```

	num_legs	num_wings	num_specimen_seen
falcon	2.0	2	10.0
fish	0.0	0	8.0

```
df.dropna(how='any', axis=1) # Drop any columns that have missing data
df.fillna(value=5) # Fill missing data with value 5
```

	num_legs	num_wings	num_specimen_seen
falcon	2.0	2	10.0
dog	4.0	0	5.0
spider	5.0	0	1.0
fish	0.0	0	8.0

```
pd.isna(df) # To get boolean mask where data is missing
```

	num_legs	num_wings	num_specimen_seen
falcon	False	False	False
dog	False	False	True
spider	True	False	False
fish	False	False	False

File handling

```
df = pd.DataFrame({'num_legs': [2, 4, np.nan, 0],
                   'num_wings': [2, 0, 0, 0],
                   'num_specimen_seen': [10, np.nan, 1, 8]},
                   index=['falcon', 'dog', 'spider', 'fish'])
```

```
df.to_csv('foo.csv') # Write to CSV file
```

```
pd.read_csv('foo.csv') # Read from CSV file
```

	Unnamed: 0	num_legs	num_wings	num_specimen_seen
0	falcon	2.0	2	10.0
1	dog	4.0	0	NaN
2	spider	NaN	0	1.0
3	fish	0.0	0	8.0

```
df.to_excel('foo.xlsx', sheet_name='Sheet1') # Write to Microsoft Excel file
```

```
pd.read_excel('foo.xlsx', 'Sheet1', index_col=None, na_values=['NA']) # Read from Microsoft Excel file
```

	Unnamed: 0	num_legs	num_wings	num_specimen_seen
0	falcon	2.0	2	10.0
1	dog	4.0	0	NaN

Plotting

```
# Install Matplotlib using pip
!pip install matplotlib
```

```
Requirement already satisfied: matplotlib in /home/ec2-user/anaconda3/envs/python3/lib/python3.10/site-packages (3.8.0)
Requirement already satisfied: contourpy>=1.0.1 in /home/ec2-user/anaconda3/envs/python3/lib/python3.10/site-packages (f
Requirement already satisfied: cycler>=0.10 in /home/ec2-user/anaconda3/envs/python3/lib/python3.10/site-packages (from
Requirement already satisfied: fonttools>=4.22.0 in /home/ec2-user/anaconda3/envs/python3/lib/python3.10/site-packages (
Requirement already satisfied: kiwisolver>=1.0.1 in /home/ec2-user/anaconda3/envs/python3/lib/python3.10/site-packages (
Requirement already satisfied: numpy<2,>=1.21 in /home/ec2-user/anaconda3/envs/python3/lib/python3.10/site-packages (fro
Requirement already satisfied: packaging>=20.0 in /home/ec2-user/anaconda3/envs/python3/lib/python3.10/site-packages (fr
Requirement already satisfied: pillow>=6.2.0 in /home/ec2-user/anaconda3/envs/python3/lib/python3.10/site-packages (from
Requirement already satisfied: pyparsing>=2.3.1 in /home/ec2-user/anaconda3/envs/python3/lib/python3.10/site-packages (f
Requirement already satisfied: python-dateutil>=2.7 in /home/ec2-user/anaconda3/envs/python3/lib/python3.10/site-package
Requirement already satisfied: six>=1.5 in /home/ec2-user/anaconda3/envs/python3/lib/python3.10/site-packages (from pyth
```

```
from matplotlib import pyplot as plt # Import Matplotlib module
```

```
Matplotlib is building the font cache; this may take a moment.
```

```
# Generate random time-series data
ts = pd.Series(np.random.randn(1000),index=pd.date_range('1/1/2000', periods=1000))
ts.head()
```

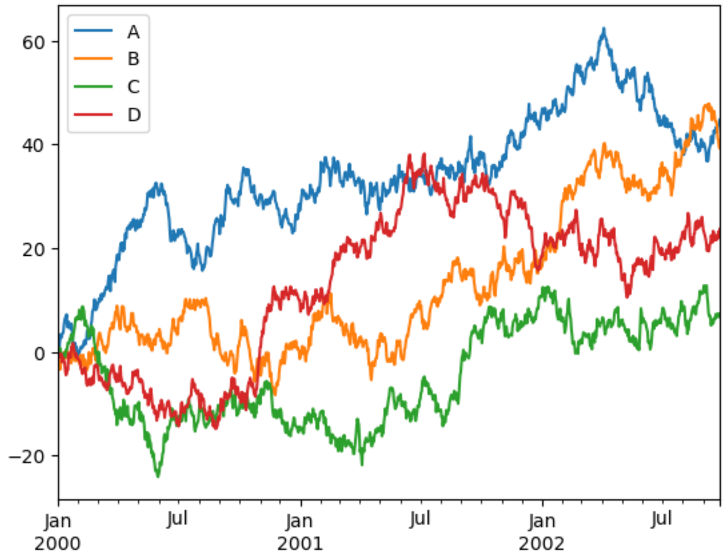
```
2000-01-01   -0.909929
2000-01-02   -0.713175
2000-01-03    0.256578
2000-01-04    1.887163
2000-01-05    0.156225
Freq: D, dtype: float64
```

```
ts = ts.cumsum()
ts.plot() # Plot graph
plt.show()
```

```
# On a DataFrame, the plot() method is convenient to plot all of the columns with labels
df4 = pd.DataFrame(np.random.randn(1000, 4), index=ts.index,columns=['A', 'B', 'C', 'D'])
df4 = df4.cumsum()
df4.head()
```

	A	B	C	D
2000-01-01	0.634267	-2.033250	-1.226215	0.106784
2000-01-02	1.393185	-2.893325	-0.923199	-0.318161
2000-01-03	0.873873	-1.817906	0.310210	-0.615651
2000-01-04	2.295118	-3.427966	0.772764	-0.585540
2000-01-05	3.343442	-2.535185	-0.591843	-1.069885

```
df4.plot()
plt.show()
```


A
B
C
D
Jan
Jul
Jan
Jul
Jan
Jul