Review Python Language

(Click MI > convert to Markdown)

```
my_name = "Grace"
my_age = 32
```

```
print(my_name)
print(my_age)
```

```
Grace
32
```

```
print(1 + 1)
print(2 * 2)
print(5 / 2)
print(8 - 5)
```

```
2
4
2.5
3
```

```
# string & fstring in Python
my_name = "Grace"
my_university = 'Silpakorn University'

my_long_string = """This is a very long
    This is a second line
    This is a thrid line
"""
```

```
print(my name, my university, my long string)
```

```
Grace Silpakorn University This is a very long
    This is a second line
    This is a thrid line
```

```
# fstring template
my_name = "Grace"
my_age = 32

text = f"my name is {my_name}, and I am {my_age} years old."
print(text)
```

```
my name is Grace, and I am 32 years old.
```

```
# function desinged for string (string methods)
text = "a duck walks into a bar"
```

```
a = text.upper()
b = "HELLO WORLD".lower()
print(a)
print(b)
```

```
A DUCK WALKS INTO A BAR
hello world
```

```
text.count("a")
```

```
4
```

```
text2 = text.replace('duck','lion')
print(text)
```

```
print(text2)
```

```
a duck walks into a bar
a lion walks into a bar
```

```
# list
shopping_list = ['egg', 'milk', 'bread']
print(shopping_list)
```

```
['egg', 'milk', 'bread']
```

```
print(shopping_list[0])
print(shopping_list[1])
print(shopping_list[2])
print(shopping_list[0:2]) # pull index 1, 2 but not 3
```

```
egg
milk
bread
['egg', 'milk']
```

```
# list method = .append เพิ่ม element ใน list
shopping_list.append('orange juice')
print(shopping_list)
```

```
['egg', 'milk', 'bread', 'orange juice']
```

```
shopping_list.append('water bottle')
print(shopping_list)
```

```
['egg', 'milk', 'bread', 'orange juice', 'water bottle']
```

```
# list method = .pop ลบ element ตัวสุดท้ายออกจาก list
shopping_list.pop()
```

```
'water bottle'
```

```
shopping_list
```

```
['egg', 'milk', 'bread', 'orange juice']
```

```
len(shopping_list)
```

```
4
```

```
# dictionary key-value pair

student = {
    "id": 1,
    "name": "Marry",
    "age": 22,
    "movies": ["Spider Man", "Thor", "Iron Man 3"]
}
```

```
student
```

```
{'id': 1,
 'name': 'Marry',
 'age': 22,
 'movies': ['Spider Man', 'Thor', 'Iron Man 3']}
```

```
type(student)
```

```
dict
```

```
student['movies'][1]
```

```
'Thor'
```

```
student['city'] = 'London'
student
```

```
{'id': 1,
 'name': 'Marry',
 'age': 22,
 'movies': ['Spider Man', 'Thor', 'Iron Man 3'],
 'city': 'London'}
```

```
student['city'] = 'Manchester'
student
```

```
{'id': 1,
 'name': 'Marry',
 'age': 22,
 'movies': ['Spider Man', 'Thor', 'Iron Man 3'],
 'city': 'Manchester'}
```

```
# remove key-value
del student['city']
student
```

```
{'id': 1,
 'name': 'Marry',
 'age': 22,
 'movies': ['Spider Man', 'Thor', 'Iron Man 3']}
```

```
# user-defined function

def hello(username):
    print("Hello! " + username)
```

```
hello("Grace")
```

```
Hello! Grace
```

```
def my_sum(val1, val2):
    print(val1 + val2)

my_sum(5, 15)
```

```
20
```

```
def my_sum2(val3, val4):
    return val3 + val4

result = my_sum2(10, 20)
```

```
print(result)
```

```
30
```

OOP

Object Oriented Programming

```
class Dog():
    name = "Grace"
```

```
    age = 5
    color = "Brown"
    breed = "French Bulldog"

    # function (Dog method)
    def sitting(self):
        print("I am sitting now!")

    def hungry(self):
        print("I am hungry, I need food!")

    def hungry2(self, food_name):
        print(f"I am hungry, I need {food_name}!")
```

```
my_dog = Dog()
type(my_dog)
```

```
__main__.Dog
```

```
my_dog.name
```

```
'Grace'
```

```
my_dog.sitting()
```

```
I am sitting now!
```

```
my_dog.hungry()
```

```
I am hungry, I need food!
```

```
my_dog.hungry2("Pizza")
```

```
I am hungry, I need Pizza!
```

Basic Pandas

```
import pandas as pd
```

```
# create dataframe from scratch

raw_data = {
    "name": ["Toy", "Joe", "Marry", "John", "Anna"],
    "age": [33, 25, 20, 22, 31],
    "gender": ["M", "M", "F", "M", "F"]
}

df = pd.DataFrame(raw_data) # ตั้งชื่อ dataframe ไว้เรียกใช้งาน

df
```

	name	age	gender
0	Toy	33	M
1	Joe	25	M
2	Marry	20	F
3	John	22	M
4	Anna	31	F

```
# การสร้าง column ใหม่

df['city'] = ['London', 'London', 'London', 'Manchester', 'Liverpool']
```

```
df
```

	name	age	gender	city
0	Toy	33	M	London
1	Joe	25	M	London
2	Marry	20	F	London
3	John	22	M	Manchester
4	Anna	31	F	Liverpool

```
df.shape
```

```
(5, 4)
```

```
# drop column
df = df.drop('city', axis=1)
```

```
df
```

	name	age	gender
0	Toy	33	M
1	Joe	25	M
2	Marry	20	F
3	John	22	M
4	Anna	31	F

```
# remove index = 2
df = df.drop(2, axis=0)
```

```
df
```

	name	age	gender
0	Toy	33	M
1	Joe	25	M
3	John	22	M
4	Anna	31	F

```
# reset index
df = df.reset_index(drop = True)
df
```

	name	age	gender
0	Toy	33	M
1	Joe	25	M
2	John	22	M
3	Anna	31	F

```
# column names
# ถ้าเรียก df.columns ใช้ดู index ในหัวข้อว่ามีชื่อ column อะไรบ้าง และ type เป็นอะไร

list(df.columns)
```

```
['name', 'age', 'gender']
```

```
# rename columns
df.columns = ['nickname', 'age', 'sex']
df
```

	nickname	age	sex
0	Toy	33	M
1	Joe	25	M
2	John	22	M
3	Anna	31	F

```
type(df['nickname'])
```

```
pandas.core.series.Series
```

```
type(df)
```

```
pandas.core.frame.DataFrame
```

```
# create a new series
s1 = pd.Series(['Marry', 20, 'F'], index=['nickname', 'age', 'sex'])
print(s1)
print(type(s1))
```

```
nickname    Marry
age            20
sex             F
dtype: object
<class 'pandas.core.series.Series'>
```

```
df
```

	nickname	age	sex
0	Toy	33	M
1	Joe	25	M
2	John	22	M
3	Anna	31	F

```
# append เอา serie เข้าไปใส่ต่อจาก index สุดท้าย
df = df.append(s1, ignore_index=True)
df
```

	nickname	age	sex
0	Toy	33	M
1	Joe	25	M
2	John	22	M
3	Anna	31	F
4	Marry	20	F

```
s2 = pd.Series(['London', 'London', 'London', 'Manchester', 'Liverpool']) # ระบุข้อ
df['city'] = s2 # ระบุชื่อ column เป็น city แล้วเอาข้อมูล s2 ไปใส่ใน column city
df
```

	nickname	age	sex	city
0	Toy	33	M	London
1	Joe	25	M	London
2	John	22	M	London
3	Anna	31	F	Manchester
4	Marry	20	F	Liverpool

```
# write csv file เอาข้อมูลที่เขียนใน Pandas ไป save เป็น csv เพื่อใช้งานต่อ
df.to_csv('mydata.csv')
```

```
# import csv file
df2 = pd.read_csv('data/data.csv') # ชื่อfolder/ชื่อfile.สกุลfile
```

```
df2
```

	id	name	city
0	1	John	London
1	2	Joe	Liverpool
2	3	Mary	Manchester
3	4	Anna	Swansea
4	5	David	London

```
# import excel file / ต้อง install openpyxl ก่อน
import pandas as pd
df3 = pd.read_excel('data/data.xlsx')
```

```
df3
```

	id	name	city
0	1	John	London
1	2	Joe	Liverpool
2	3	Mary	Manchester
3	4	Anna	Swansea
4	5	David	London

```
# import json
df4 = pd.read_json('data/data.json')
df4
```

	ebook	language	amazonRating	myFavorite
0	Getting started with Python	python	4.89	True
1	Introduction to R	r	4.88	False
2	SQL for Beginners	sql	4.75	True

```
df4['myFavorite'].dtype
```

```
dtype('bool')
```

Intermediate Pandas

```
import pandas as pd
```

```
penguins = pd.read_csv("penguins.csv")
```

```
# preview first 5 rows / head function จะแสดง 5 row แรกสุด
penguins.head()
```

	species	island	bill_length_mm	bill_depth_mm	flipper_length_mm	body_mass_g	sex
0	Adelie	Torgersen	39.1	18.7	181.0	3750.0	MALE
1	Adelie	Torgersen	39.5	17.4	186.0	3800.0	FEMALE
2	Adelie	Torgersen	40.3	18.0	195.0	3250.0	FEMALE
3	Adelie	Torgersen	NaN	NaN	NaN	NaN	NaN
4	Adelie	Torgersen	36.7	19.3	193.0	3450.0	FEMALE

```
# preview last 5 rows / last function จะแสดง 5 row ล่างสุด
penguins.tail()
```

	species	island	bill_length_mm	bill_depth_mm	flipper_length_mm	body_mass_g	sex
339	Gentoo	Biscoe	NaN	NaN	NaN	NaN	NaN
340	Gentoo	Biscoe	46.8	14.3	215.0	4850.0	FEMALE

```
# shape of dataframe / shape เป็น attribute ไม่ใช่ method ไม่ต้องมี ()
penguins.shape
```

```
(344, 7)
```

```
# information of dataframe
penguins.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 344 entries, 0 to 343
Data columns (total 7 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   species            344 non-null    object 
 1   island             344 non-null    object 
 2   bill_length_mm     342 non-null    float64
 3   bill_depth_mm      342 non-null    float64
 4   flipper_length_mm  342 non-null    float64
 5   body_mass_g        342 non-null    float64
 6   sex                333 non-null    object 
dtypes: float64(4), object(3)
memory usage: 18.9+ KB
```

```
# select columns / จะใช้เป็น penguins['species'] หรือ penguins.species เพื่อดึงทั้ง column
# แต่ถ้าจะดู row บนหรือล่างใช้ function head, tail โดยระบุตัวเลขใน () ได้
penguins[ ['species', 'island', 'sex'] ].tail(8)
```

	species	island	sex
336	Gentoo	Biscoe	NaN
337	Gentoo	Biscoe	MALE

```
# integer location based indexing (iloc) / ดึงตาม index ของ row ที่ระบุ / iloc[ [0,1,2
mini_penguins = penguins.iloc[ 0:5, 0:3 ]
mini_penguins
```

	species	island	bill_length_mm
0	Adelie	Torgersen	39.1
1	Adelie	Torgersen	39.5
2	Adelie	Torgersen	40.3
3	Adelie	Torgersen	NaN
4	Adelie	Torgersen	36.7

```
# filter rows by a condition # เรียกข้อมูลจาก penguins ที่มีเงื่อนไขคือ island = Torgersen
penguins[ penguins['island'] == 'Torgersen' ]
```

	species	island	bill_length_mm	bill_depth_mm	flipper_length_mm	body_mass_g	sex
0	Adelie	Torgersen	39.1	18.7	181.0	3750.0	MALE
1	Adelie	Torgersen	39.5	17.4	186.0	3800.0	FEMALE
2	Adelie	Torgersen	40.3	18.0	195.0	3250.0	FEMALE
3	Adelie	Torgersen	NaN	NaN	NaN	NaN	NaN
4	Adelie	Torgersen	36.7	19.3	193.0	3450.0	FEMALE
5	Adelie	Torgersen	39.3	20.6	190.0	3650.0	MALE
6	Adelie	Torgersen	38.9	17.8	181.0	3625.0	FEMALE
7	Adelie	Torgersen	39.2	19.6	195.0	4675.0	MALE
8	Adelie	Torgersen	34.1	18.1	193.0	3475.0	NaN
9	Adelie	Torgersen	42.0	20.2	190.0	4250.0	NaN
10	Adelie	Torgersen	37.8	17.1	186.0	3300.0	NaN
11	Adelie	Torgersen	37.8	17.3	180.0	3700.0	NaN
12	Adelie	Torgersen	41.1	17.6	182.0	3200.0	FEMALE
13	Adelie	Torgersen	38.6	21.2	191.0	3800.0	MALE
14	Adelie	Torgersen	34.6	21.1	198.0	4400.0	MALE
15	Adelie	Torgersen	36.6	17.8	185.0	3700.0	FEMALE
16	Adelie	Torgersen	38.7	19.0	195.0	3450.0	FEMALE
17	Adelie	Torgersen	42.5	20.7	197.0	4500.0	MALE
18	Adelie	Torgersen	34.4	18.4	184.0	3325.0	FEMALE
19	Adelie	Torgersen	46.0	21.5	194.0	4200.0	MALE
68	Adelie	Torgersen	35.9	16.6	190.0	3050.0	FEMALE
69	Adelie	Torgersen	41.8	19.4	198.0	4450.0	MALE
70	Adelie	Torgersen	33.5	19.0	190.0	3600.0	FEMALE
71	Adelie	Torgersen	39.7	18.4	190.0	3900.0	MALE
72	Adelie	Torgersen	39.6	17.2	196.0	3550.0	FEMALE
73	Adelie	Torgersen	45.8	18.9	197.0	4150.0	MALE
74	Adelie	Torgersen	35.5	17.5	190.0	3700.0	FEMALE
75	Adelie	Torgersen	42.8	18.5	195.0	4250.0	MALE
76	Adelie	Torgersen	40.9	16.8	191.0	3700.0	FEMALE
77	Adelie	Torgersen	37.2	19.4	184.0	3900.0	MALE
78	Adelie	Torgersen	36.2	16.1	187.0	3550.0	FEMALE
79	Adelie	Torgersen	42.1	19.1	195.0	4000.0	MALE
80	Adelie	Torgersen	34.6	17.2	189.0	3200.0	FEMALE
81	Adelie	Torgersen	42.9	17.6	196.0	4700.0	MALE

82	Adelie	Torgersen	36.7	18.8	187.0	3800.0	FEMALE
83	Adelie	Torgersen	35.1	19.4	193.0	4200.0	MALE
116	Adelie	Torgersen	38.6	17.0	188.0	2900.0	FEMALE
117	Adelie	Torgersen	37.3	20.5	199.0	3775.0	MALE
118	Adelie	Torgersen	35.7	17.0	189.0	3350.0	FEMALE
119	Adelie	Torgersen	41.1	18.6	189.0	3325.0	MALE
120	Adelie	Torgersen	36.2	17.2	187.0	3150.0	FEMALE
121	Adelie	Torgersen	37.7	19.8	198.0	3500.0	MALE
122	Adelie	Torgersen	40.2	17.0	176.0	3450.0	FEMALE
123	Adelie	Torgersen	41.4	18.5	202.0	3875.0	MALE
124	Adelie	Torgersen	35.2	15.9	186.0	3050.0	FEMALE
125	Adelie	Torgersen	40.6	19.0	199.0	4000.0	MALE
126	Adelie	Torgersen	38.8	17.6	191.0	3275.0	FEMALE
127	Adelie	Torgersen	41.5	18.3	195.0	4300.0	MALE
128	Adelie	Torgersen	39.0	17.1	191.0	3050.0	FEMALE
129	Adelie	Torgersen	44.1	18.0	210.0	4000.0	MALE
130	Adelie	Torgersen	38.5	17.9	190.0	3325.0	FEMALE
131	Adelie	Torgersen	43.1	19.2	197.0	3500.0	MALE

```
penguins[ penguins['bill_length_mm'] > 34 ]
```

	species	island	bill_length_mm	bill_depth_mm	flipper_length_mm	body_mass_g	sex
0	Adelie	Torgersen	39.1	18.7	181.0	3750.0	MALE
1	Adelie	Torgersen	39.5	17.4	186.0	3800.0	FEMALE
2	Adelie	Torgersen	40.3	18.0	195.0	3250.0	FEMALE
4	Adelie	Torgersen	36.7	19.3	193.0	3450.0	FEMALE
5	Adelie	Torgersen	39.3	20.6	190.0	3650.0	MALE
...	...	...	...	...	...	...	...
338	Gentoo	Biscoe	47.2	13.7	214.0	4925.0	FEMALE
340	Gentoo	Biscoe	46.8	14.3	215.0	4850.0	FEMALE
341	Gentoo	Biscoe	50.4	15.7	222.0	5750.0	MALE
342	Gentoo	Biscoe	45.2	14.8	212.0	5200.0	FEMALE
343	Gentoo	Biscoe	49.9	16.1	213.0	5400.0	MALE

338 rows × 7 columns

```
# filter more than one condition / & = and, | = or
filtered_penguins = penguins[ (penguins['island'] == 'Torgersen') & (penguins['bi
```

```
# filter with .query()
penguins.query('island == "Torgersen" | bill_length_mm < 35') # "island == 'Torge
```

	species	island	bill_length_mm	bill_depth_mm	flipper_length_mm	body_mass_g	sex
0	Adelie	Torgersen	39.1	18.7	181.0	3750.0	MALE
1	Adelie	Torgersen	39.5	17.4	186.0	3800.0	FEMALE
2	Adelie	Torgersen	40.3	18.0	195.0	3250.0	FEMALE
3	Adelie	Torgersen	NaN	NaN	NaN	NaN	NaN
4	Adelie	Torgersen	36.7	19.3	193.0	3450.0	FEMALE
5	Adelie	Torgersen	39.3	20.6	190.0	3650.0	MALE
6	Adelie	Torgersen	38.9	17.8	181.0	3625.0	FEMALE
7	Adelie	Torgersen	39.2	19.6	195.0	4675.0	MALE
8	Adelie	Torgersen	34.1	18.1	193.0	3475.0	NaN
9	Adelie	Torgersen	42.0	20.2	190.0	4250.0	NaN
10	Adelie	Torgersen	37.8	17.1	186.0	3300.0	NaN
11	Adelie	Torgersen	37.8	17.3	180.0	3700.0	NaN
12	Adelie	Torgersen	41.1	17.6	182.0	3200.0	FEMALE
13	Adelie	Torgersen	38.6	21.2	191.0	3800.0	MALE
14	Adelie	Torgersen	34.6	21.1	198.0	4400.0	MALE
15	Adelie	Torgersen	36.6	17.8	185.0	3700.0	FEMALE
16	Adelie	Torgersen	38.7	19.0	195.0	3450.0	FEMALE
17	Adelie	Torgersen	42.5	20.7	197.0	4500.0	MALE
18	Adelie	Torgersen	34.4	18.4	184.0	3325.0	FEMALE
19	Adelie	Torgersen	46.0	21.5	194.0	4200.0	MALE
54	Adelie	Biscoe	34.5	18.1	187.0	2900.0	FEMALE
68	Adelie	Torgersen	35.9	16.6	190.0	3050.0	FEMALE
69	Adelie	Torgersen	41.8	19.4	198.0	4450.0	MALE
70	Adelie	Torgersen	33.5	19.0	190.0	3600.0	FEMALE
71	Adelie	Torgersen	39.7	18.4	190.0	3900.0	MALE
72	Adelie	Torgersen	39.6	17.2	196.0	3550.0	FEMALE
73	Adelie	Torgersen	45.8	18.9	197.0	4150.0	MALE
74	Adelie	Torgersen	35.5	17.5	190.0	3700.0	FEMALE
75	Adelie	Torgersen	42.8	18.5	195.0	4250.0	MALE
76	Adelie	Torgersen	40.9	16.8	191.0	3700.0	FEMALE
77	Adelie	Torgersen	37.2	19.4	184.0	3900.0	MALE
78	Adelie	Torgersen	36.2	16.1	187.0	3550.0	FEMALE
79	Adelie	Torgersen	42.1	19.1	195.0	4000.0	MALE
80	Adelie	Torgersen	34.6	17.2	189.0	3200.0	FEMALE

81	Adelie	Torgersen	42.9	17.6	196.0	4700.0	MALE
82	Adelie	Torgersen	36.7	18.8	187.0	3800.0	FEMALE
83	Adelie	Torgersen	35.1	19.4	193.0	4200.0	MALE
92	Adelie	Dream	34.0	17.1	185.0	3400.0	FEMALE
98	Adelie	Dream	33.1	16.1	178.0	2900.0	FEMALE
116	Adelie	Torgersen	38.6	17.0	188.0	2900.0	FEMALE
117	Adelie	Torgersen	37.3	20.5	199.0	3775.0	MALE
118	Adelie	Torgersen	35.7	17.0	189.0	3350.0	FEMALE
119	Adelie	Torgersen	41.1	18.6	189.0	3325.0	MALE
120	Adelie	Torgersen	36.2	17.2	187.0	3150.0	FEMALE
121	Adelie	Torgersen	37.7	19.8	198.0	3500.0	MALE
122	Adelie	Torgersen	40.2	17.0	176.0	3450.0	FEMALE
123	Adelie	Torgersen	41.4	18.5	202.0	3875.0	MALE
124	Adelie	Torgersen	35.2	15.9	186.0	3050.0	FEMALE
125	Adelie	Torgersen	40.6	19.0	199.0	4000.0	MALE
126	Adelie	Torgersen	38.8	17.6	191.0	3275.0	FEMALE
127	Adelie	Torgersen	41.5	18.3	195.0	4300.0	MALE
128	Adelie	Torgersen	39.0	17.1	191.0	3050.0	FEMALE
129	Adelie	Torgersen	44.1	18.0	210.0	4000.0	MALE
130	Adelie	Torgersen	38.5	17.9	190.0	3325.0	FEMALE
131	Adelie	Torgersen	43.1	19.2	197.0	3500.0	MALE
142	Adelie	Dream	32.1	15.5	188.0	3050.0	FEMALE

```
# check missing in each column
penguins.isna().sum()
```

```
# filter missing values in column sex or bill_length_mm = penguins[ penguins['sex
penguins[ penguins['bill_length_mm'].isna() ]
```

	species	island	bill_length_mm	bill_depth_mm	flipper_length_mm	body_mass_g	sex
3	Adelie	Torgersen	NaN	NaN	NaN	NaN	NaN
339	Gentoo	Biscoe	NaN	NaN	NaN	NaN	NaN

```
# drop na
clean_penguins = penguins.dropna()
clean_penguins.head(10)
```

	species	island	bill_length_mm	bill_depth_mm	flipper_length_mm	body_mass_g	sex
0	Adelie	Torgersen	39.1	18.7	181.0	3750.0	MALE
1	Adelie	Torgersen	39.5	17.4	186.0	3800.0	FEMALE
2	Adelie	Torgersen	40.3	18.0	195.0	3250.0	FEMALE
4	Adelie	Torgersen	36.7	19.3	193.0	3450.0	FEMALE
5	Adelie	Torgersen	39.3	20.6	190.0	3650.0	MALE
6	Adelie	Torgersen	38.9	17.8	181.0	3625.0	FEMALE
7	Adelie	Torgersen	39.2	19.6	195.0	4675.0	MALE
12	Adelie	Torgersen	41.1	17.6	182.0	3200.0	FEMALE
13	Adelie	Torgersen	38.6	21.2	191.0	3800.0	MALE
14	Adelie	Torgersen	34.6	21.1	198.0	4400.0	MALE

```
# fill missing value
# Mean Imputation คือการ Replace nan with column mean หรือแทนที่ด้วยค่า mean ของ column
top5_penguins = penguins.head(5)
```

```
avg_value = top5_penguins['bill_length_mm'].mean()
print(avg_value)
```

```
38.9
```

```
top5_penguins = top5_penguins['bill_length_mm'].fillna(value=avg_value)
top5_penguins
```

```
# sort bill_length_mm low to high, high to low / penguins.sort_values('bill_lengt
penguins.dropna().sort_values('bill_length_mm', ascending=False).head(10)
```

	species	island	bill_length_mm	bill_depth_mm	flipper_length_mm	body_mass_g	sex
253	Gentoo	Biscoe	59.6	17.0	230.0	6050.0	MALE
169	Chinstrap	Dream	58.0	17.8	181.0	3700.0	FEMALE
321	Gentoo	Biscoe	55.9	17.0	228.0	5600.0	MALE
215	Chinstrap	Dream	55.8	19.8	207.0	4000.0	MALE
335	Gentoo	Biscoe	55.1	16.0	230.0	5850.0	MALE
283	Gentoo	Biscoe	54.3	15.7	231.0	5650.0	MALE
183	Chinstrap	Dream	54.2	20.8	201.0	4300.0	MALE
191	Chinstrap	Dream	53.5	19.9	205.0	4500.0	MALE
327	Gentoo	Biscoe	53.4	15.8	219.0	5500.0	MALE
181	Chinstrap	Dream	52.8	20.0	205.0	4550.0	MALE

```
# sort multiple columns
penguins.dropna().sort_values(['island', 'bill_length_mm'])
```

	species	island	bill_length_mm	bill_depth_mm	flipper_length_mm	body_mass_g	sex
54	Adelie	Biscoe	34.5	18.1	187.0	2900.0	FEMALE
52	Adelie	Biscoe	35.0	17.9	190.0	3450.0	FEMALE
100	Adelie	Biscoe	35.0	17.9	192.0	3725.0	FEMALE
25	Adelie	Biscoe	35.3	18.9	187.0	3800.0	FEMALE
66	Adelie	Biscoe	35.5	16.2	195.0	3350.0	FEMALE
...	...	...	...	...	...	...	...
81	Adelie	Torgersen	42.9	17.6	196.0	4700.0	MALE
131	Adelie	Torgersen	43.1	19.2	197.0	3500.0	MALE
129	Adelie	Torgersen	44.1	18.0	210.0	4000.0	MALE
73	Adelie	Torgersen	45.8	18.9	197.0	4150.0	MALE
19	Adelie	Torgersen	46.0	21.5	194.0	4200.0	MALE

333 rows × 7 columns

```
# unique values
penguins['species'].unique()
```

```
# count values
penguins['species'].value_counts()
```

```
# count more than one columns
penguins[ ['island', 'species'] ].value_counts().reset_index()
```

	island	species	0
0	Biscoe	Gentoo	124
1	Dream	Chinstrap	68
2	Dream	Adelie	56
3	Torgersen	Adelie	52
4	Biscoe	Adelie	44

```
result = penguins[ ['island', 'species'] ].value_counts().reset_index()

result.columns = ['island', 'species', 'count'] # edit column name from 0 to coun

result
```

	island	species	count
0	Biscoe	Gentoo	124
1	Dream	Chinstrap	68
2	Dream	Adelie	56
3	Torgersen	Adelie	52
4	Biscoe	Adelie	44

```
# summarise dataframe
penguins.describe()
```

	bill_length_mm	bill_depth_mm	flipper_length_mm	body_mass_g
count	342.000000	342.000000	342.000000	342.000000

```
penguins.describe(include='all') # ดึงมาทุก column
```

	species	island	bill_length_mm	bill_depth_mm	flipper_length_mm	body_mass_g	sex
count	344	344	342.000000	342.000000	342.000000	342.000000	333
unique	3	3	NaN	NaN	NaN	NaN	2
top	Adelie	Biscoe	NaN	NaN	NaN	NaN	MALE
freq	152	168	NaN	NaN	NaN	NaN	168
mean	NaN	NaN	43.921930	17.151170	200.915205	4201.754386	NaN
std	NaN	NaN	5.459584	1.974793	14.061714	801.954536	NaN
min	NaN	NaN	32.100000	13.100000	172.000000	2700.000000	NaN
25%	NaN	NaN	39.225000	15.600000	190.000000	3550.000000	NaN
50%	NaN	NaN	44.450000	17.300000	197.000000	4050.000000	NaN
75%	NaN	NaN	48.500000	18.700000	213.000000	4750.000000	NaN
max	NaN	NaN	59.600000	21.500000	231.000000	6300.000000	NaN

```
# average, mean
penguins['bill_length_mm'].median()
```

```
44.45
```

```
# group by + sum/ mean
# penguins[penguins['species'] == 'Adelie']['bill_length_mm'].mean()
# groupby method ใช้ (), หาค่าเฉลี่ยของคอลัม bill_length_mm

penguins.groupby('species')['bill_length_mm'].mean()
```

```
# จับกลุ่มหลายค่าสถิติมาตรฐาน
penguins.groupby('species')['bill_length_mm'].agg(['min', 'mean', 'median', 'std'
```

	min	mean	median	std	max
species					
Adelie	32.1	38.791391	38.80	2.663405	46.0
Chinstrap	40.9	48.833824	49.55	3.339256	58.0
Gentoo	40.9	47.504878	47.30	3.081857	59.6

```
# group by more than one columns
penguins.groupby(['island', 'species'])['bill_length_mm'].agg(['min', 'mean', 'ma
```

	island	species	min	mean	max
0	Biscoe	Adelie	34.5	38.975000	45.6
1	Biscoe	Gentoo	40.9	47.504878	59.6
2	Dream	Adelie	32.1	38.501786	44.1
3	Dream	Chinstrap	40.9	48.833824	58.0
4	Torgersen	Adelie	33.5	38.950980	46.0

```
result = penguins.groupby(['island', 'species'])['bill_length_mm'].agg(['min', 'm

result.to_csv('result.csv')
```

```
# if your code is long, use backslash '\'
penguins.groupby('species')['bill_length_mm']\
    .agg(['min', 'mean', 'median', 'std', 'max'])\
        .reset_index()
```

	species	min	mean	median	std	max
0	Adelie	32.1	38.791391	38.80	2.663405	46.0

```
# map values MALE: m, FEMALE: f
# penguins['sex'].head()
# filter ค่า nan เป็น other

penguins['sex'].map( {'MALE': 'm', 'FEMALE': 'f'} ).head(10).fillna('other')
```

```
# add new column โดยใส่ค่าที่แทนที่ แล้วเรียกดูตัวอย่าง
penguins['sex_nex'] = penguins['sex'].map( {'MALE': 'm', 'FEMALE': 'f'} ).fillna(
penguins.head()
```

	species	island	bill_length_mm	bill_depth_mm	flipper_length_mm	body_mass_g	sex	sex_nex
0	Adelie	Torgersen	39.1	18.7	181.0	3750.0	MALE	m
1	Adelie	Torgersen	39.5	17.4	186.0	3800.0	FEMALE	f
2	Adelie	Torgersen	40.3	18.0	195.0	3250.0	FEMALE	f
3	Adelie	Torgersen	NaN	NaN	NaN	NaN	NaN	other
4	Adelie	Torgersen	36.7	19.3	193.0	3450.0	FEMALE	f

Numpy

(Numerical Python)

```
penguins.head()
```

	species	island	bill_length_mm	bill_depth_mm	flipper_length_mm	body_mass_g	sex	sex_nex
0	Adelie	Torgersen	39.1	18.7	181.0	3750.0	MALE	m
1	Adelie	Torgersen	39.5	17.4	186.0	3800.0	FEMALE	f

```
# pandas stype หาค่าเฉลี่ย แบบ pandas
penguins['bill_length_mm'].mean()
```

```
43.9219298245614
```

```
# numpy หาค่าเฉลี่ยแบบ numpy
import numpy as np
np.mean(penguins['bill_length_mm'])
```

```
43.9219298245614
```

```
# other functions of numpy
print(np.sum(penguins['bill_depth_mm']))
print(np.std(penguins['body_mass_g']))
```

```
5865.700000000001
800.7812292384522
```

```
score = pd.Series([80, 55, 62,95,20])
```

```
np.where(score >= 80, "passed", "failed")
print(score)
```

```
0    80
1    55
2    62
3    95
4    20
dtype: int64
```

```
np.where(score >= 80, "passed", "failed")
grade = np.where(score >= 80, "passed", "failed")
print(grade)
```

```
['passed' 'failed' 'failed' 'passed' 'failed']
```

```
penguins.head()
```

	species	island	bill_length_mm	bill_depth_mm	flipper_length_mm	body_mass_g	sex	sex_nex
0	Adelie	Torgersen	39.1	18.7	181.0	3750.0	MALE	m
1	Adelie	Torgersen	39.5	17.4	186.0	3800.0	FEMALE	f
2	Adelie	Torgersen	40.3	18.0	195.0	3250.0	FEMALE	f
3	Adelie	Torgersen	NaN	NaN	NaN	NaN	NaN	other
4	Adelie	Torgersen	36.7	19.3	193.0	3450.0	FEMALE	f

```
# เอาเฉพาะค่าที่ species = Adelie และดึงมาเฉพาะ col species, island, bill_length_mm และ
df = penguins.query("species == 'Adelie'")[['species', 'island', 'bill_length_mm'
```

```
# สร้าง new_column โดยใช้ where เป็นเงื่อนไข
df['new_column'] = np.where(df['bill_length_mm'] > 40, True, False) # boolean
```

```
df.head(5)
```

	species	island	bill_length_mm	new_column
0	Adelie	Torgersen	39.1	False
1	Adelie	Torgersen	39.5	False

Merge DataFrames

ตัวอย่าง result = pd.merge(left, right, on="key")

```
# create 2 tables เพื่อใช้ merge

left = {
    'key': [1, 2, 3, 4],
    'name': ['toy', 'joe', 'jane', 'anna'],
    'age': [25, 28, 30, 22]
}

right = {
    'key': [1, 2, 3, 4],
    'city': ['Bangkok', 'London', 'Seoul', 'Tokyo'],
    'zip': [1001, 2504, 2094, 9802]
}

df_left = pd.DataFrame(left)
df_right = pd.DataFrame(right)
```

```
# preview ดู table ที่ create ไว้
df_left
```

	key	name	age
0	1	toy	25
1	2	joe	28
2	3	jane	30
3	4	anna	22

```
# merge dataframe
```

```
import pandas as pd
pd.merge(df_left, df_right, on='key')
df_result = pd.merge(df_left, df_right, on='key')
df_result
```

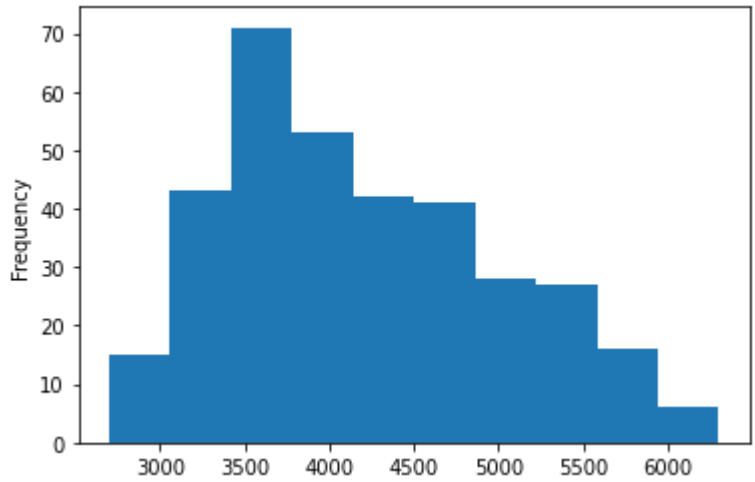
	key	name	age	city	zip
0	1	toy	25	Bangkok	1001
1	2	joe	28	London	2504
2	3	jane	30	Seoul	2094
3	4	anna	22	Tokyo	9802

Pandas Plots

```
# histogram one column
penguins['body_mass_g'].plot(kind='hist')
```

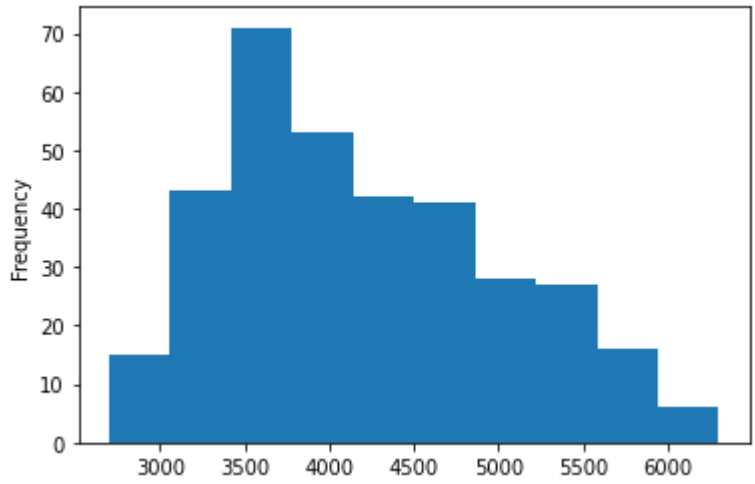
```
<AxesSubplot:ylabel='Frequency'>
```

Download




```
# histogram one column - ซ่อนข้อความ '<AxesSubplot:ylabel='Frequency'>' ได้โดยการใส่ ;
penguins['body_mass_g'].plot(kind='hist');
```

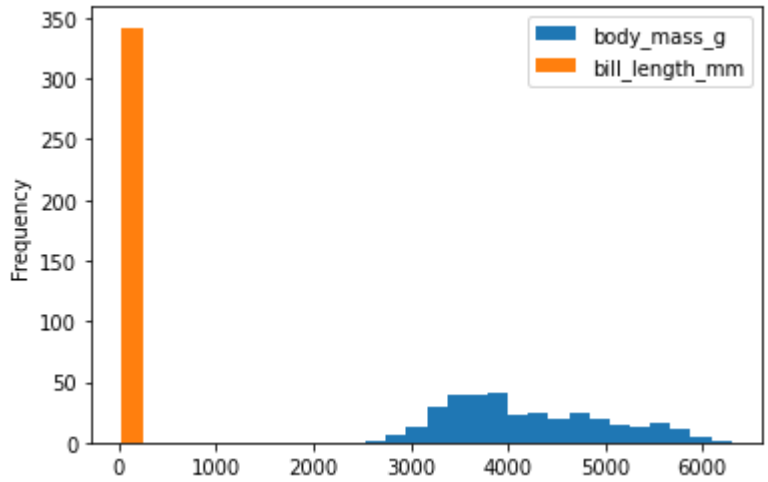
Download




```
# histogram two columns
penguins[['body_mass_g', 'bill_length_mm']].plot(kind='hist', bins=30)
```

```
<AxesSubplot:ylabel='Frequency'>
```

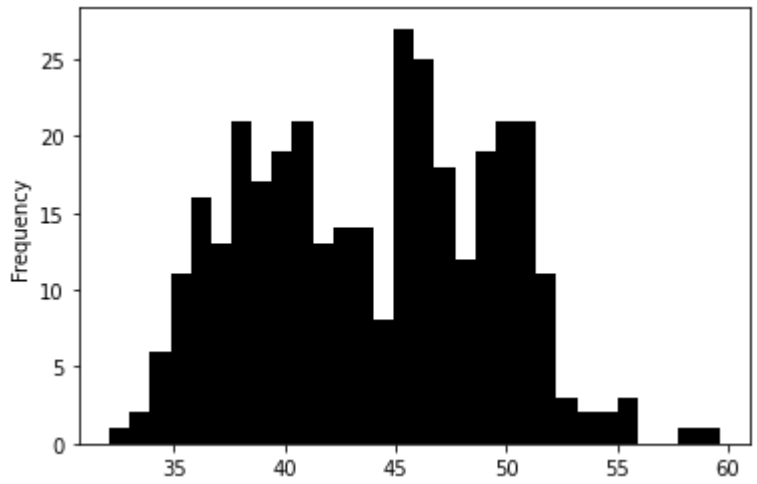
Download




```
penguins['bill_length_mm'].plot(kind='hist', bins=30, color='black')
```

```
<AxesSubplot:ylabel='Frequency'>
```

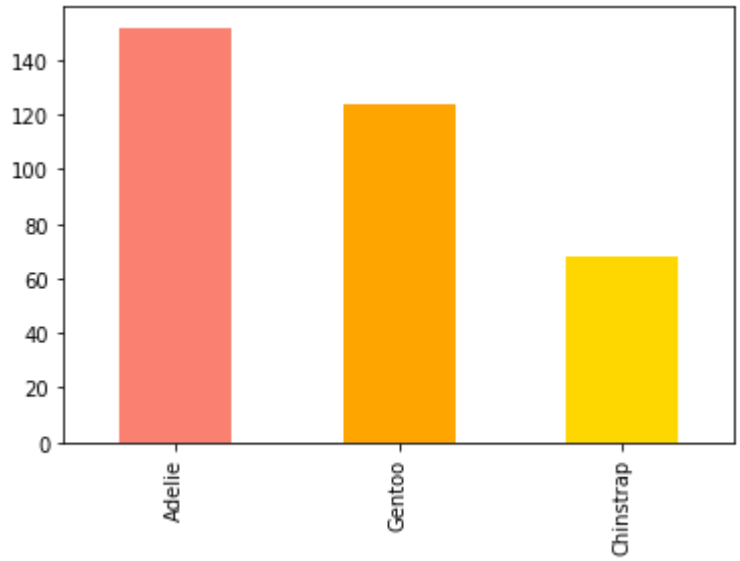
Download




```
# bar plot for species / ต้อง summarize ก่อนโดยการเลือก column species แล้ว sum ให้ได้ตัวเ
penguins['species'].value_counts().plot(kind='bar', color=['salmon','orange','gol
```

```
<AxesSubplot:>
```

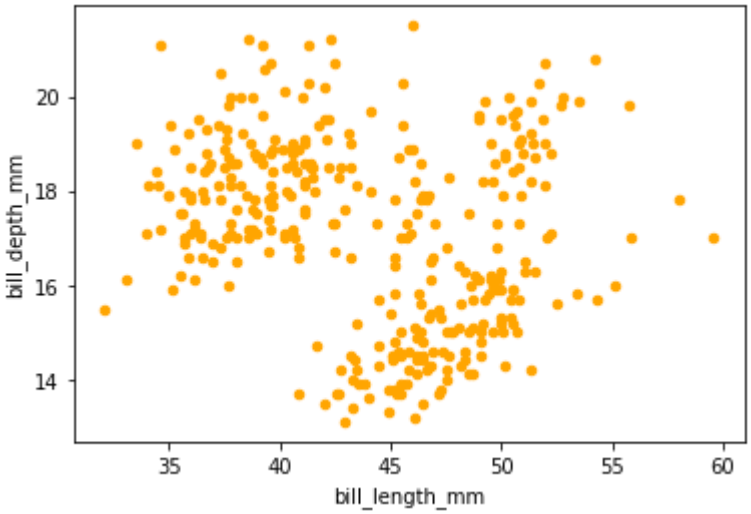
Download




```
#scatter plot
penguins[['bill_length_mm', 'bill_depth_mm']]\
    .plot(x='bill_length_mm', y='bill_depth_mm', kind="scatter", color='orange')
```

```
<AxesSubplot:xlabel='bill_length_mm', ylabel='bill_depth_mm'>
```

Download




```
penguins
```

	species	island	bill_length_mm	bill_depth_mm	flipper_length_mm	body_mass_g	sex
0	Adelie	Torgersen	39.1	18.7	181.0	3750.0	MALE
1	Adelie	Torgersen	39.5	17.4	186.0	3800.0	FEMALE
2	Adelie	Torgersen	40.3	18.0	195.0	3250.0	FEMALE
3	Adelie	Torgersen	NaN	NaN	NaN	NaN	NaN
4	Adelie	Torgersen	36.7	19.3	193.0	3450.0	FEMALE
...	...	...	...	...	...	...	...
339	Gentoo	Biscoe	NaN	NaN	NaN	NaN	NaN
340	Gentoo	Biscoe	46.8	14.3	215.0	4850.0	FEMALE
341	Gentoo	Biscoe	50.4	15.7	222.0	5750.0	MALE
342	Gentoo	Biscoe	45.2	14.8	212.0	5200.0	FEMALE
343	Gentoo	Biscoe	49.9	16.1	213.0	5400.0	MALE

344 rows × 7 columns