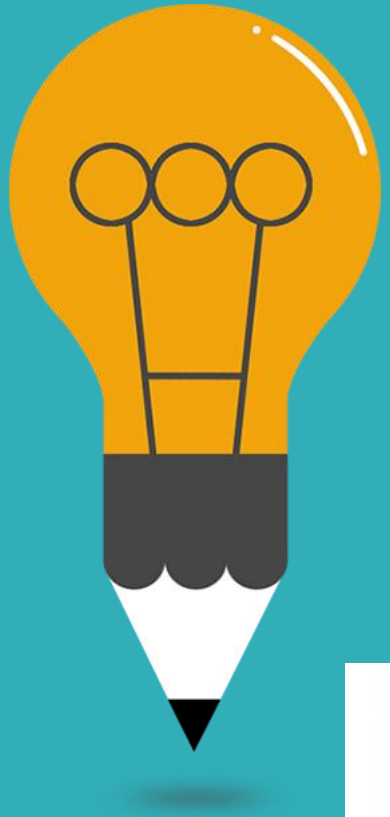
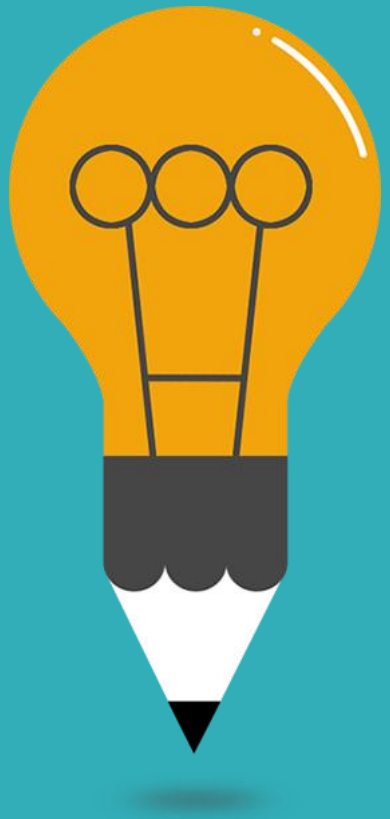


โครงการอบรม โปรแกรมคอมพิวเตอร์ Python เพื่อการทำงานวิจัยด้านวิทยาการข้อมูล

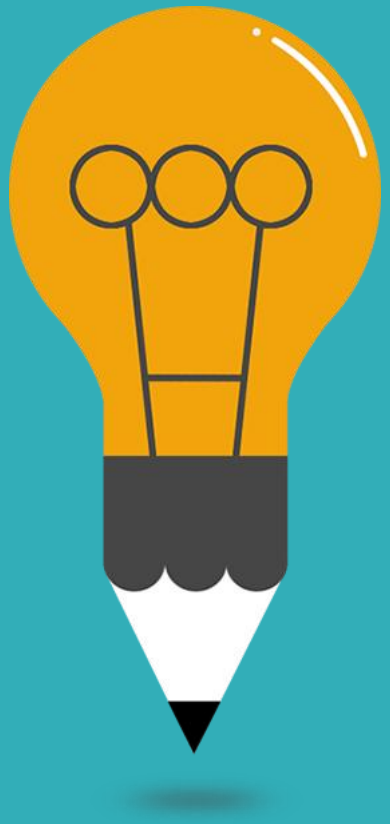
depa
สำนักงานส่งเสริมเศรษฐกิจดิจิทัล
Digital Economy Promotion Agency

บพค.
หน่วยบริหารและจัดการทุนด้านการพัฒนากำลังคน
และทุนด้านการพัฒนา สถาบันอุดมศึกษา
การวิจัยและการสร้างนวัตกรรม

สร้างคน
ข้ามพรมแดน



การเขียนโปรแกรมภาษาไพธอน (Python) เบื้องต้น



Python and Google’s colab

สร้างเว็บไซต์

จัดการข้อมูลที่เป็นตาราง
(เช่น ไฟล์ excel)
กรองข้อมูล (data filtering)

การประมวลผลภาพและวิดีโอ
(Image and Video Processing)

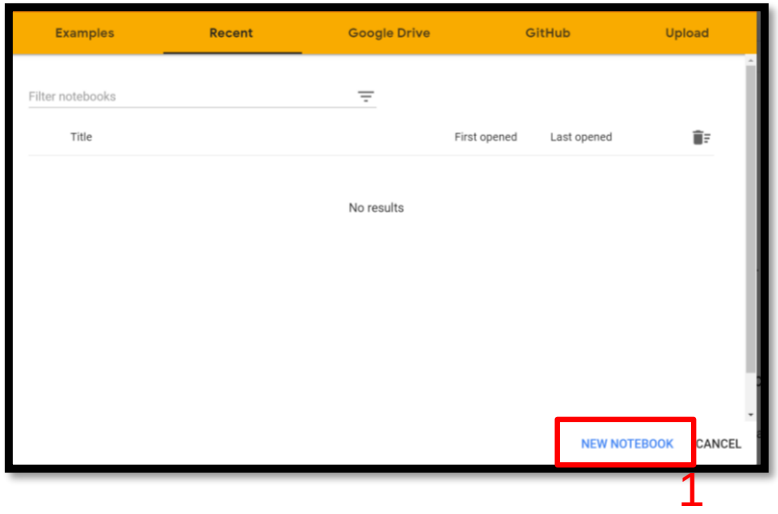
Deep Learning

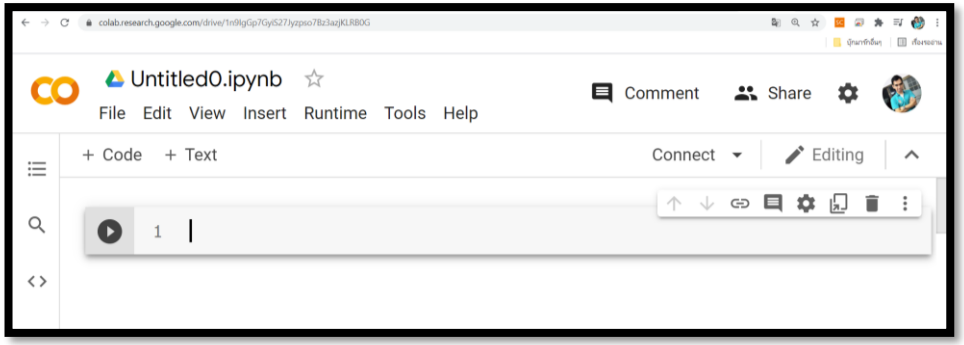
การคำนวณทาง
คณิตศาสตร์, matrix

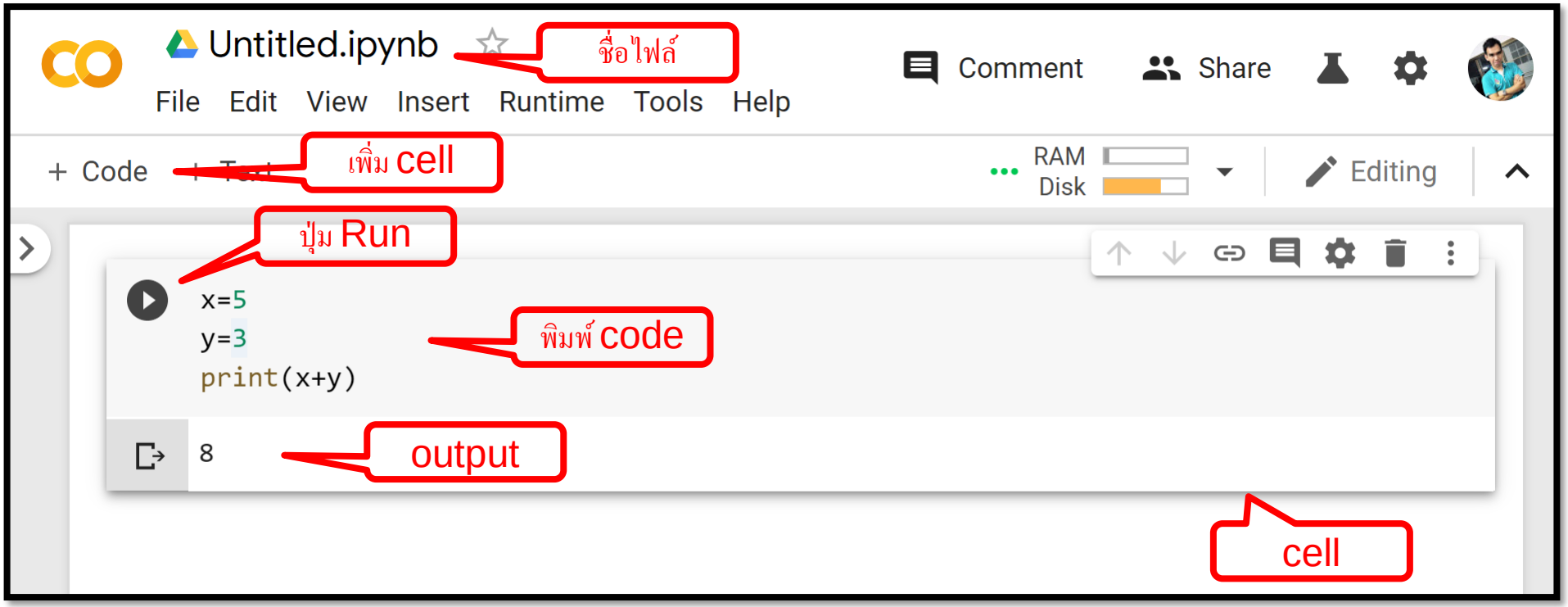
Machine Learning

Google’s colab

https://colab.research.google.com (ต้อง login Google Account)



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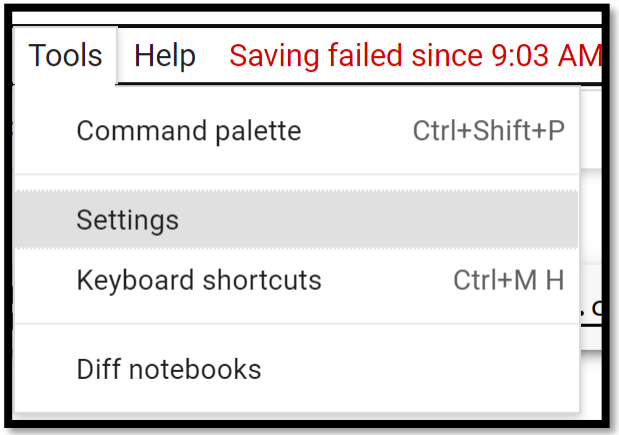
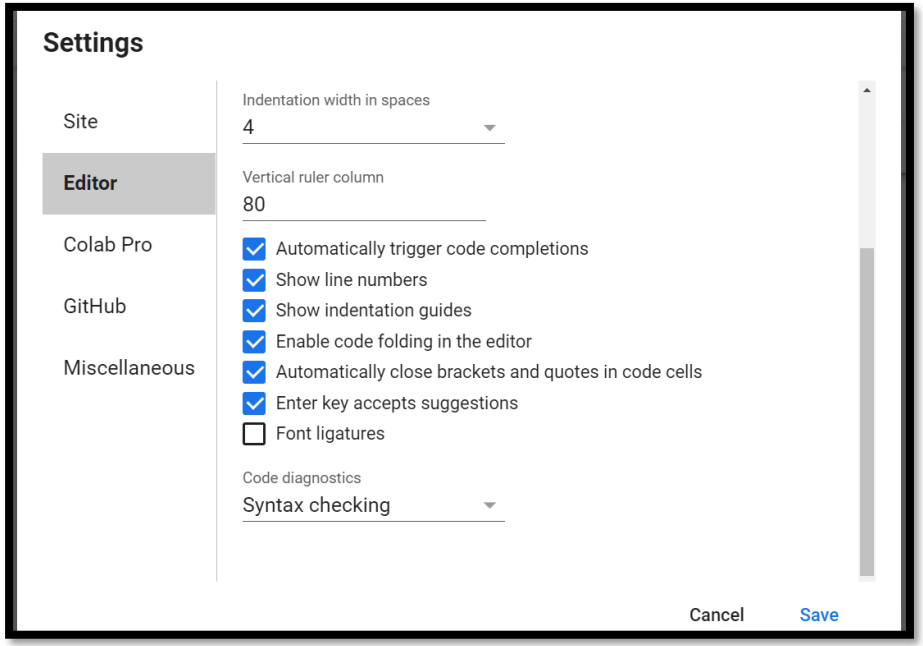
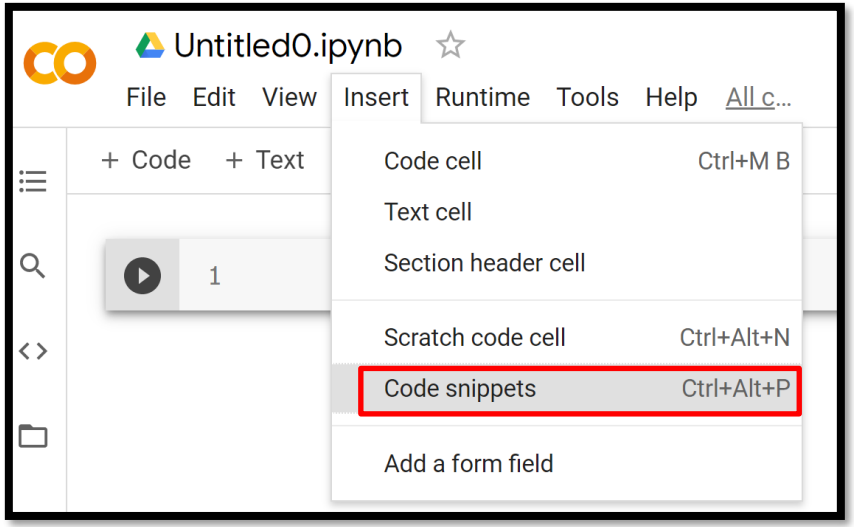
ชื่อไฟล์
File Edit View Insert Runtime Tools Help
Comment
Share
+ Code
+ Text
เพิ่ม cell
RAM
Disk
Editing
ปุ่ม Run
x=5
y=3
print(x+y)
พิมพ์ code
8
output
cell

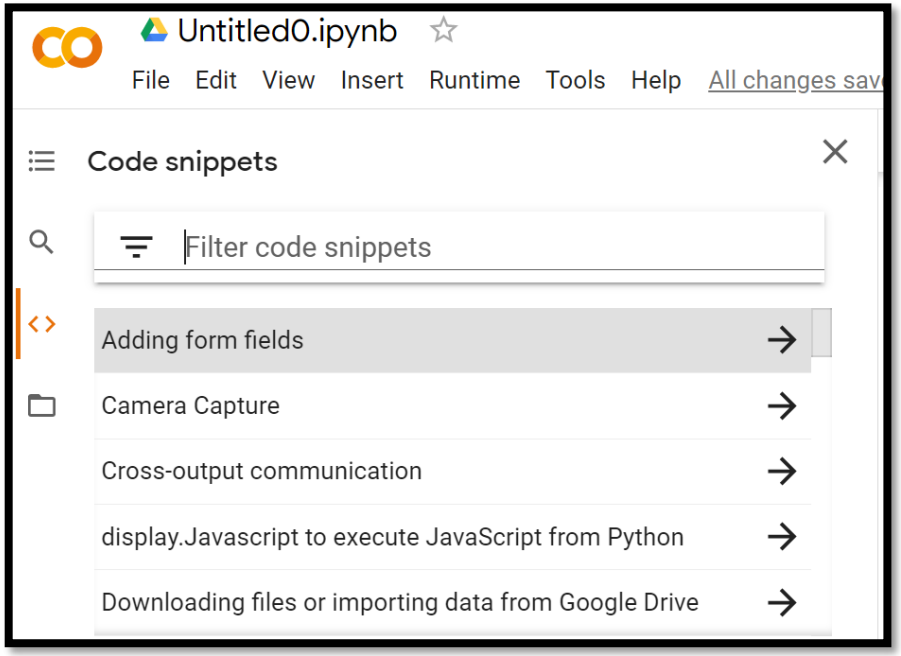
Setting

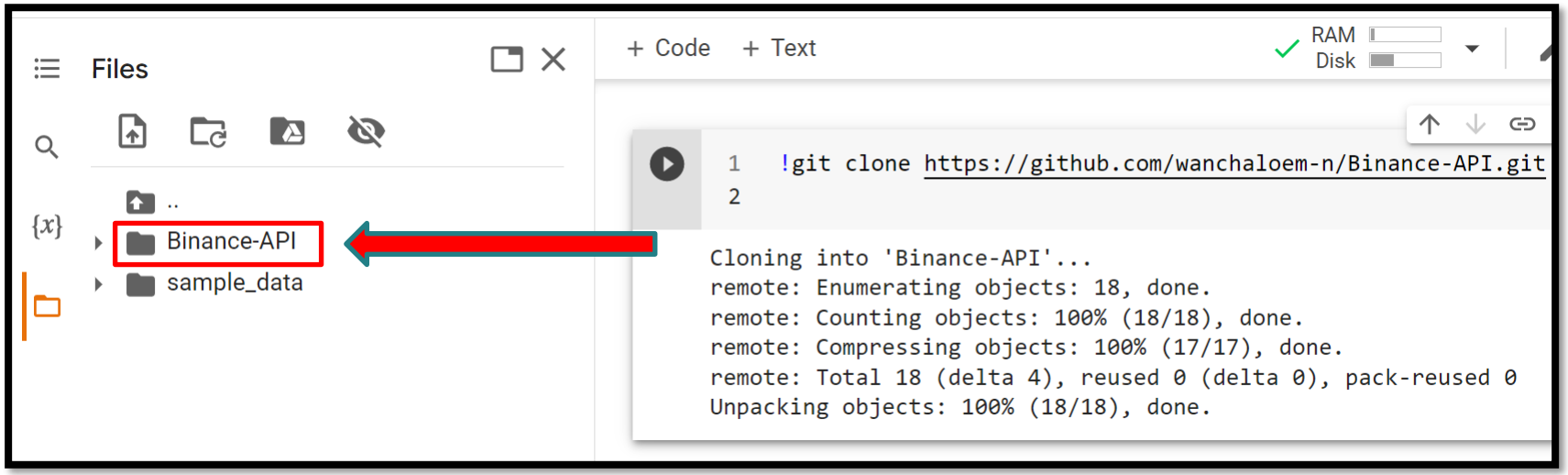

Tools
Help
Saving failed since 9:03 AM
Command palette
Ctrl+Shift+P
Settings
Keyboard shortcuts
Ctrl+M H
Diff notebooks


Settings
Site
Editor
Colab Pro
GitHub
Miscellaneous
Indentation width in spaces
4
Vertical ruler column
80
Automatically trigger code completions
Show line numbers
Show indentation guides
Enable code folding in the editor
Automatically close brackets and quotes in code cells
Enter key accepts suggestions
Font ligatures
Code diagnostics
Syntax checking
Cancel
Save

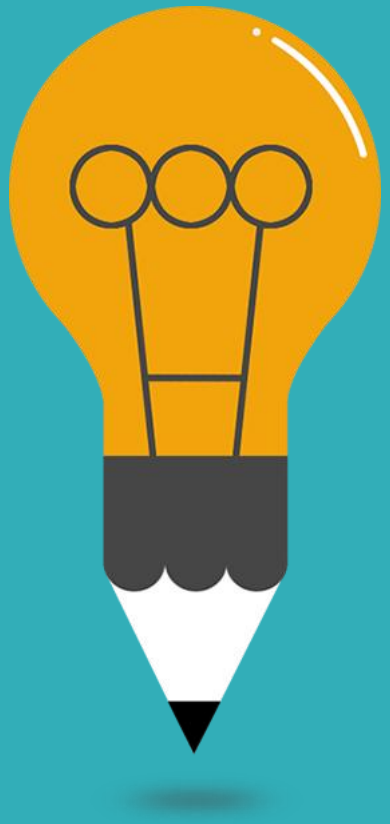
ตัวอย่าง code ใน Google's colab








```
!git clone https://github.com/wanchaloem-n/Binance-API.git
```



Python - Basic Syntax

ตัวแปร (Variables)

```
a = 3.21
A = 1.23
num_1 = 5
```

```
# python code
a=3.21
A=1.23
Num=5
print(a)
print(A)
print(a+A)
```

Reserved keywords

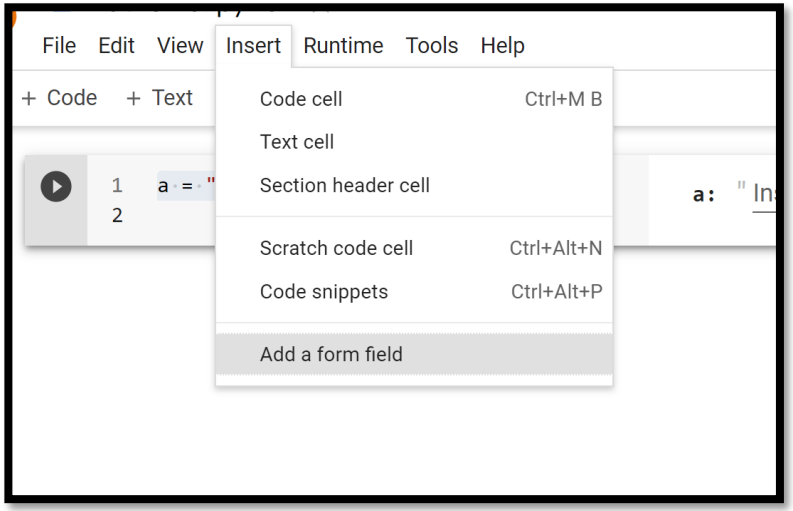
False	None	True	and
as	assert	break	class
continue	def	del	elif
else	except	finally	for
from	global	if	import
in	is	lambda	nonlocal
not	or	pass	raise
return	try	while	with
yield			

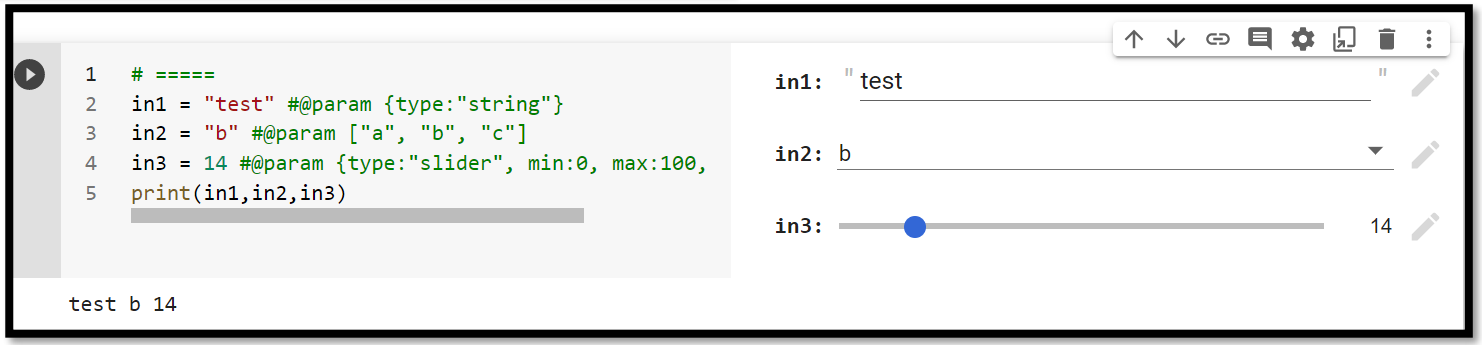
Variable Types

Type	Example
integer	age = 12
float	height = 103.5
complex	C = 5+2j
string	gender = “male”
boolean	single = False

```
# python code
age=12
height=103.5
C=5+2j
gender='male'
single=True
single=False
print(age,type(age))
```

Form Field


File Edit View Insert Runtime Tools Help
+ Code + Text
Code cell Ctrl+M B
Text cell
Section header cell
Scratch code cell Ctrl+Alt+N
Code snippets Ctrl+Alt+P
Add a form field
1 a = "
2
a: "


1 # =====
2 in1 = "test" #@param {type:"string"}
3 in2 = "b" #@param ["a", "b", "c"]
4 in3 = 14 #@param {type:"slider", min:0, max:100,
5 print(in1,in2,in3)
in1: " test "
in2: b
in3: 14
test b 14

ตัวดำเนินการพื้นฐานทางคณิตศาสตร์

+ , - , * , /	บวก ลบ คูณ หาร
a ** b หรือ pow(a, b)	a^b
pow(a, b, m)	$a^b \bmod m$
//	หารตัดเศษ
%	เศษจากการหาร

การเปรียบเทียบ

==	เท่ากับ
>	มากกว่า
<	น้อยกว่า
>=	มากกว่าหรือเท่ากับ
<=	น้อยกว่าหรือเท่ากับ
!=	ไม่เท่ากับ

สัญลักษณ์ทางตรรกศาสตร์

Logical operation	Bitwise operation
and	&
or	|
not	~

0.1 + 0.2 = __?

```
1    0.1+0.2
2
```

0.30000000000000004

```
1    (0.1+0.2)==0.3
```

False

$$10^3\ 10^2\ 10^1\ 10^0.\ 10^{-1}\ 10^{-2}\ 10^{-3}\ 10^{-4}$$

$$2\ \ 2\ \ 0\ .\ 5$$

(128) (64) (32) (16) (8) (4) (2) (1) (0.5) (0.25)

$$2^7\ 2^6\ 2^5\ 2^4\ 2^3\ 2^2\ 2^1\ 2^0.\ 2^{-1}\ 2^{-2}$$

$$1\ 1\ 0\ 1\ 1\ 1\ 0\ 0.\ 1\ 0$$

$128 + 64 + 16 + 8 + 4 + 0.5 = 220.5$

$$0.1_{10} = 0.000\dot{1}100\dot{}_2$$
$$0.2_{10} = 0.00\dot{1}100\dot{}_2$$

Ref: https://stackpython.medium.com/0-1-0-2-%E0%B8%88%E0%B8%B6%E0%B8%87%E0%B9%84%E0%B8%A1%E0%B9%88%E0%B9%80%E0%B8%97%E0%B9%88%E0%B8%B2%E0%B8%81%E0%B8%B1%E0%B8%9A-0-3-%E0%B9%81%E0%B8%A5%E0%B8%B0-ieee-754-4908787e1d1c

การลบตัวแปร

del var1, var2, var3

การติดตั้ง packages

!pip install (ชื่อ package)

```
# python code
!pip install pythainlp
```

การ import packages

```
# python code
import math
from math import *
form math import sqrt
import math.sqrt as sqt
```

การใช้ help และ dir ใน python

?function name

ตัวอย่าง


```
# python code
print(abs(-5))
?abs
```

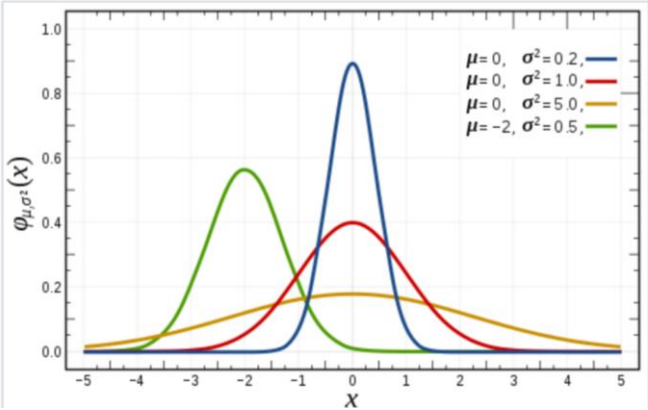
```
# python code
dir(math)
```

การใช้ฟังก์ชันทางคณิตศาสตร์

abs(a)	$\|a\|$
math.sin(a)	$\sin(a)$
math.floor(a)	$\lfloor a \rfloor$
math.ceil(a)	$\lceil a \rceil$
round(a)	$[a]$
math.exp(a)	e^a
math.e	e
math.pi	π
math.sqrt(a)	$\sqrt{a}$
math.log(a)	$\ln(a)$
math.log(a,b)	$\log_b(a)$

แบบฝึกหัด จงเขียน code เพื่อหาค่า Y

$$Y = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$




```
# python code
x=1
mu=0.5
sigma=1.5
…
y=___?
```

List, Tuple, Set, และ Dictionary

List

X = ["red" , "blue" , "red“]
Y= [1,3,2,5]

code	output
Z=X+Y	["red" , "blue" , "red“,1,3,2,5]
Y.append(1)	[1,3,2,5,1]
len(X)	3
X.insert(2,'a')	["red" , "blue" , “a”,"red“]
Y.sort()	[1,2,3,5]
Y.reverse()	[5,2,3,1]

List

Index of elements

X = [1, 'red', 'blue', 'red', 'r', 'b']

code	output
X[2]	'blue'
X[-2]	'r'
X[1:4]	['red', 'blue', 'red’]
X[4:]	['r', 'b']
X[:3]	[1, 'red', 'blue’]

Nested List

X = [1,[2,3],[4,5,6],[[7,8]]]

code	output
X[1]	[2,3]
X[1][0]	2
X[3][0][1]	8

Set

X = {"red" , "blue" , "red“}
Y= {"red" , “green"}

code	output
X == {"red" , "blue“}	True
"red“ in X	True
len(X)	3
X.union(Y)	{"red" , “green“,”blue”}
X.intersection(Y)	{"red“}
X-Y	{”blue”}

Tuple

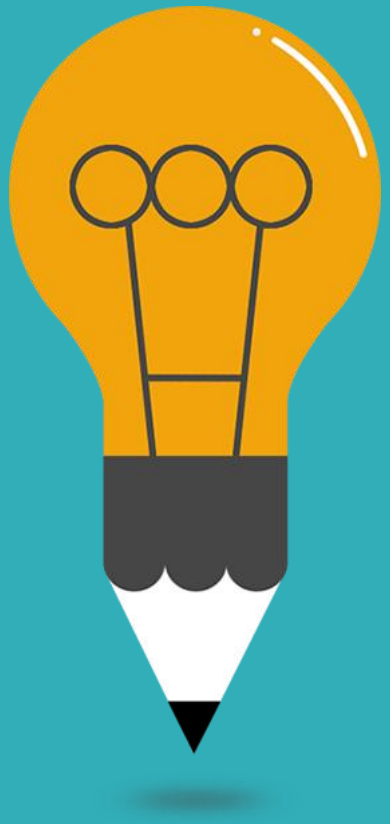
X = (30, 20000, "male")
Y= (25, 16000, "male")

code	output
Z=X+Y	(30, 20000, ‘male’, 25, 16000, ‘male’)
Z=(X,Y)	((30, 20000, ‘male’), (25, 16000, ‘male’))
Z=X*2	(30, 20000, ‘male’, 30, 20000, ‘male’)
len(X)	3
tuple(‘male’)	(‘m’, ‘a’, ‘l’, ‘e’)

Dictionary

X = {'Name': ‘A', 'Income': 12000, 'Gender': 'Male’}

code	output
X[“name”]	'A'
X.keys()	{‘Name’, ‘Income’, ‘Gender’}

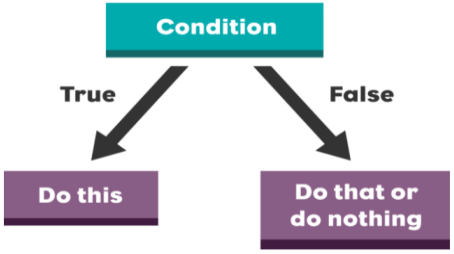


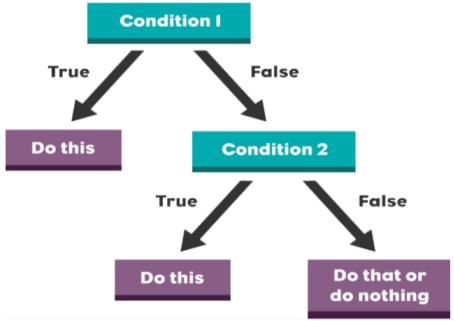
Condition and Loop

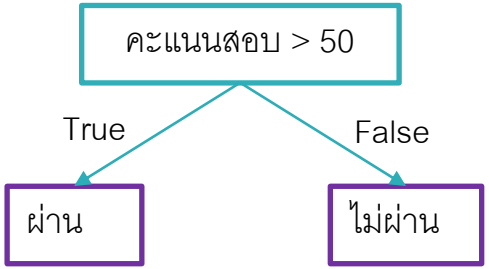
if, else, for, while

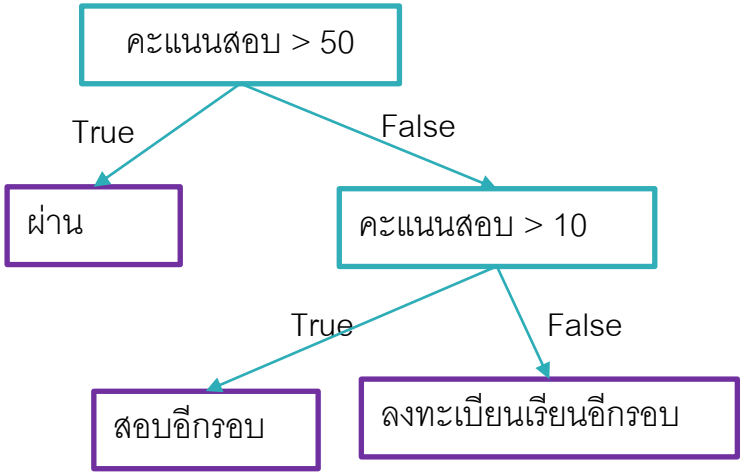
Condition and loop

Condition (if … else …)









```python
# python code
score=47
if score>50:
    print("ผ่าน")
else:
    print("ไม่ผ่าน")
```

```python
# python code
score=2
if score>50:
    print("ผ่าน")
elif score>10:
    print("สอบอีกรอบ")
else:
    print("ไม่ผ่าน")
```

Condition and loop

Loop (while loop)

```
while condition:
    do something
```

```
while True:
    do something
    if condition:
        break
```

```
# python code
scores=[2,47,0,52]
i=0
while scores[i]>0:
    print(scores[i])
    i=i+1
```

```
# python code
scores=[2,47,0,52]
i=0
while True:
    print(scores[i])
    i=i+1
    if scores[i]<=0:
        break
```

Condition and loop

Loop (For loop)

```
for i in [1,2,4]:
    do something
```

```
for i in range(2,5):
    do something
```

```
# python code
for score in [2,47,50,52]:
    if score>50:
        print("ผ่าน")
    else:
        print("ไม่ผ่าน")
```

```
# python code
scores=[2,47,50,52]
for i in range(len(scores)):
    if scores[i]>50:
        print(i,"ผ่าน")
    else:
        print(i,"ไม่ผ่าน")
```

แบบฝึกหัด

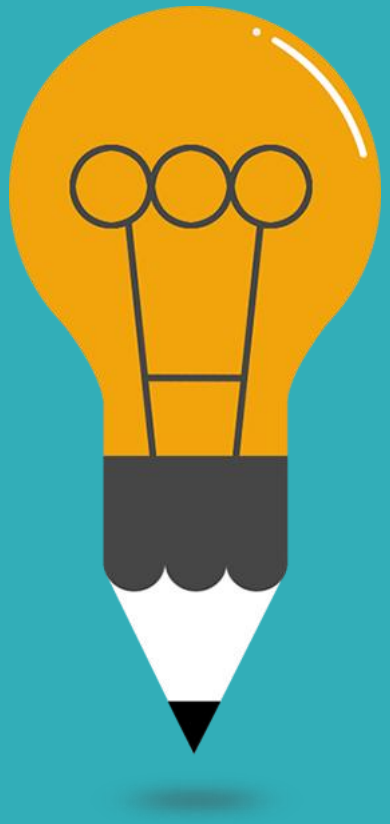
จงเขียน code เพื่อหาตัวประกอบเฉพาะทั้งหมด

ของ N1, N2

เมื่อกำหนด

N1=2475115831,

N2=166153499473114472511703242428645381



การสร้าง

custom function

custom function

คณิตศาสตร์

$$z = f(x, y)$$

python

```
def function_name(x, y):
    do something
    return z
```

```
function_name = lambda x, y : z
```

$$f(x) = 2x^2 + 1$$

```
# python code
def f1(x):
    return 2*x**2+1
def f2(x):
    y=2*x**2+1
    return y
f3 = lambda x: 2*x**2+1
print(f1(2))
print(f2(2))
print(f3(2))
```

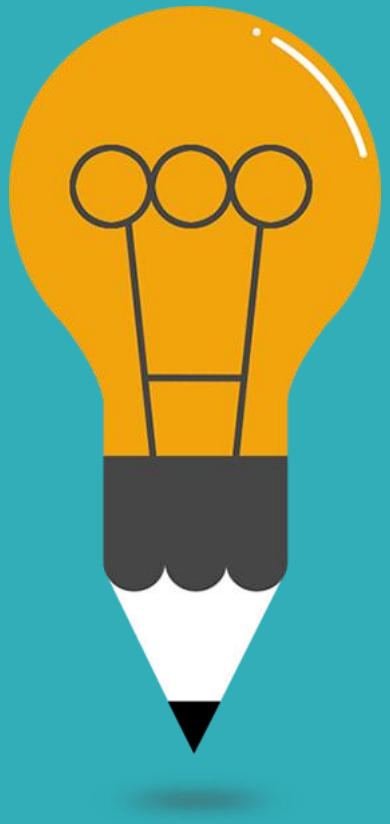
$$\text{gaussian}(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

```
# python code
import math
def gaussian(x,mu,sigma):
    coef=1/(math.sqrt(2*math.pi*(s
igma**2)))
    expo=-((x-mu)**2)/(2*sigma**2)
    return coef*math.exp(expo)

print(gaussian(1,0,1))
```

Numpy array

import numpy as np

code	
V=np.array([1,2,3,5])	สร้าง vector
M=np.array([[1,2],[3,5]])	สร้าง matrix



Numpy array

ตัวดำเนินการพื้นฐาน

```
M1=np.array([[1,2],[3,5]])
M2=np.array([[5,-4],[3,5]])
```

M1*M2	การคูณทีละสมาชิก
np.dot(M1,M2)	การคูณเมทริกซ์
M1+M2	
M1-M2	
np.log(M1)	
np.diag([1,2,3])	สร้าง diagonal matrix
np.diag(M1)	diagonal matrix ของ M1
np.eye(4)	
np.random.rand(4,5)	random matrix
np.zeros((2,3))	
np.ones((2,3))	
M1.transpose()	
M1.shape	dimension ของ M1

Numpy.linalg

from numpy import linalg as LA

Matrix eigenvalues

`linalg.eig`(a)	Compute the eigenvalues and right eigenvectors of a square array.
`linalg.eigh`(a[, UPLO])	Return the eigenvalues and eigenvectors of a complex Hermitian (conjugate symmetric) or a real symmetric matrix.
`linalg.eigvals`(a)	Compute the eigenvalues of a general matrix.
`linalg.eigvalsh`(a[, UPLO])	Compute the eigenvalues of a complex Hermitian or real symmetric matrix.

Norms and other numbers

`linalg.norm`(x[, ord, axis, keepdims])	Matrix or vector norm.
`linalg.cond`(x[, p])	Compute the condition number of a matrix.
`linalg.det`(a)	Compute the determinant of an array.
`linalg.matrix_rank`(M[, tol, hermitian])	Return matrix rank of array using SVD method
`linalg.slogdet`(a)	Compute the sign and (natural) logarithm of the

Solving equations and inverting matrices

`linalg.solve`(a, b)	Solve a linear matrix equation, or system of linear scalar equations.
`linalg.tensorsolve`(a, b[, axes])	Solve the tensor equation `a x = b` for x.
`linalg.lstsq`(a, b[, rcond])	Return the least-squares solution to a linear matrix equation.
`linalg.inv`(a)	Compute the (multiplicative) inverse of a matrix.
`linalg.pinv`(a[, rcond, hermitian])	Compute the (Moore-Penrose) pseudo-inverse of a matrix.
`linalg.tensorinv`(a[, ind])	Compute the 'inverse' of an N-dimensional array.

Exceptions ¶

`linalg.LinAlgError`	Generic Python-exception-derived object raised by linalg functions.

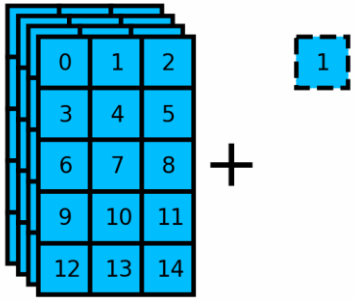
https://numpy.org/doc/stable/reference/routines.linalg.html

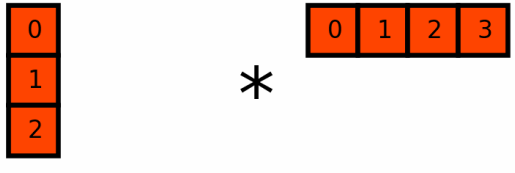
Example code

```
# python code
import numpy as np
import numpy.linalg as LA

V=np.array([1,2])
print("2-norm: ",LA.norm(V,ord=2))

M=np.array([[1,2],[3,4]])
print("inv: ",LA.inv(M))
print("eig values & vectors: ",LA.eig(M))
print("det: ",LA.det(M))
```

Numpy array: broadcasting

$$\begin{bmatrix}0\\1\\2\end{bmatrix} + [0 \quad 1 \quad 2 \quad 3] = \_\_?$$





แบบฝึกหัด จงเขียน python code เพื่อหา A^+

Moore–Penrose inverse (ref: https://en.wikipedia.org/wiki/Moore%E2%80%93Penrose_inverse)

$$AX = B \rightarrow X \approx A^+ B$$
$$A^+ = (A^T A)^{-1} A^T$$

```
# python code
import numpy as np
A=np.array([[1,2],[3,4],[5,6]])
B=np.array([[1],[2],[3]])
…
X=__?
```

Slicing and Filtering

```
# python code
import numpy as np
M1=np.array([[1,2],[3,4],[5
,6],[7,8]])
M2=np.array([[1,2,3,4]])

print("1st: ",M1)
print("2nd: ",M1[1:,:])
print("3rd: ",M1[1:3,:])
print("4th: ",M1[:3,:])
print("5th: ",M1[2,1])
print("6th: ",M1[[1,3],:])
print("7th: ",M1[0:4:2,:])
```

```
# python code
import numpy as np
M1=np.array([[1,2],[3,4],[5,6
],[7,8]])
M2=np.array([[1,2,3,4]])
M3=np.array([[1,2,3],[3,4,5],
[5,6,7],[7,8,9]])

print("1st: ",M1[M1[:,1]>5])
print("2nd: ",M2[M2>=3])
print("3rd: ",M3[M1[:,1]>5])
```

Scipy stats

T-test, F-test,
p-value

PANDAS

ใช้สำหรับจัดการข้อมูลในตาราง

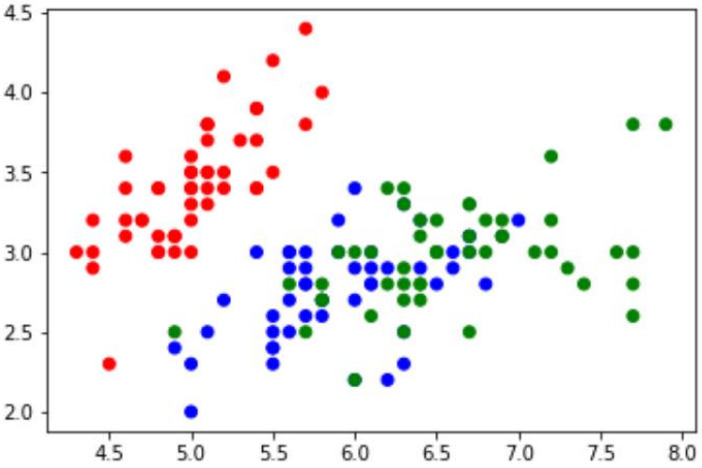
import pandas as pd

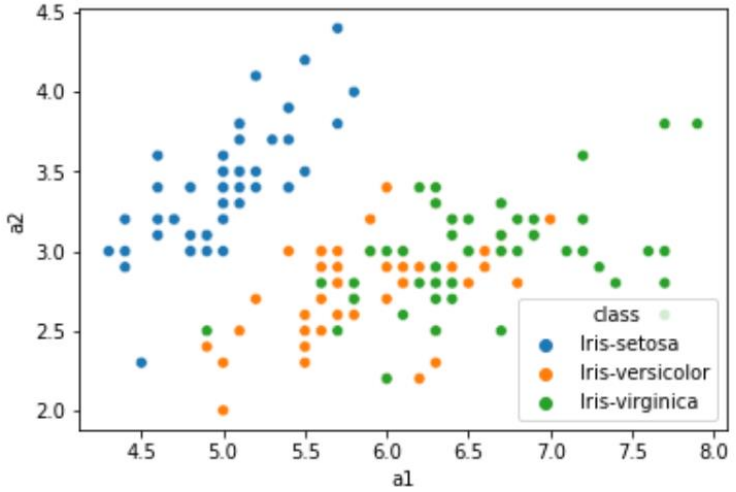
```
import pandas as pd
df=pd.DataFrame({
"ID":[6,7,8,9],
"AGE":[14,16,18,20],
"GENDER":["M","F","F","M"]
})
```

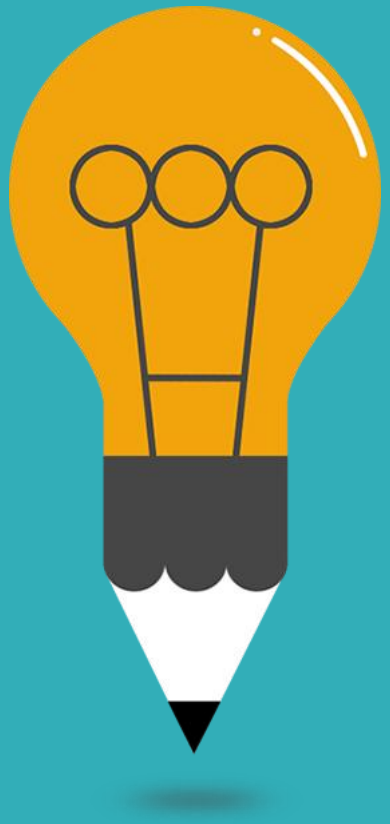
	ID	AGE	GENDER
0	6	14	M
1	7	16	F
2	8	18	F
3	9	20	M

Matplotlib and Seaborn

การพอร์ตกราฟ

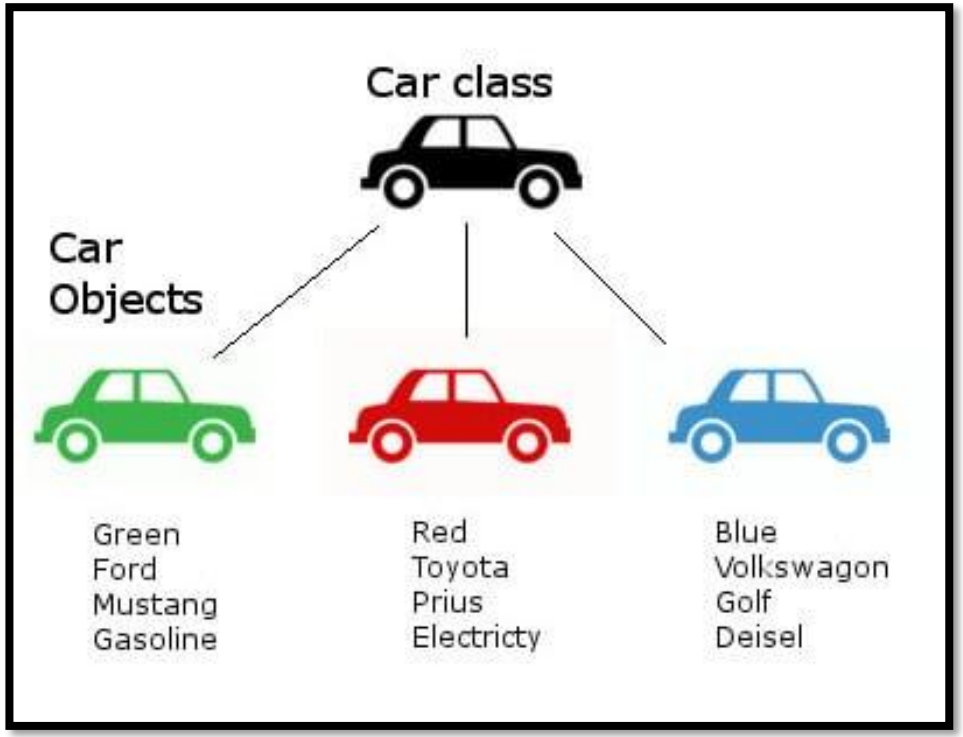


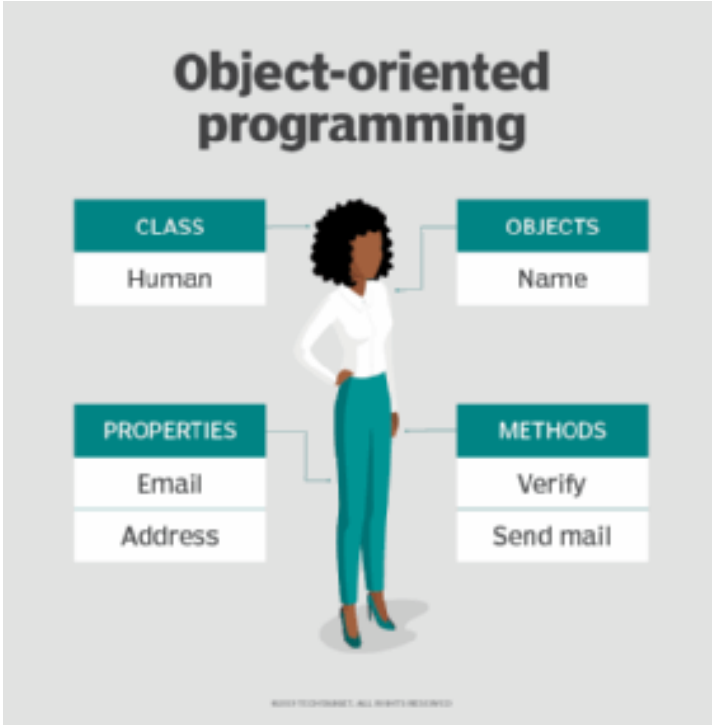




OOP
Object Oriented Programming

Object Oriented Programming (OOP)

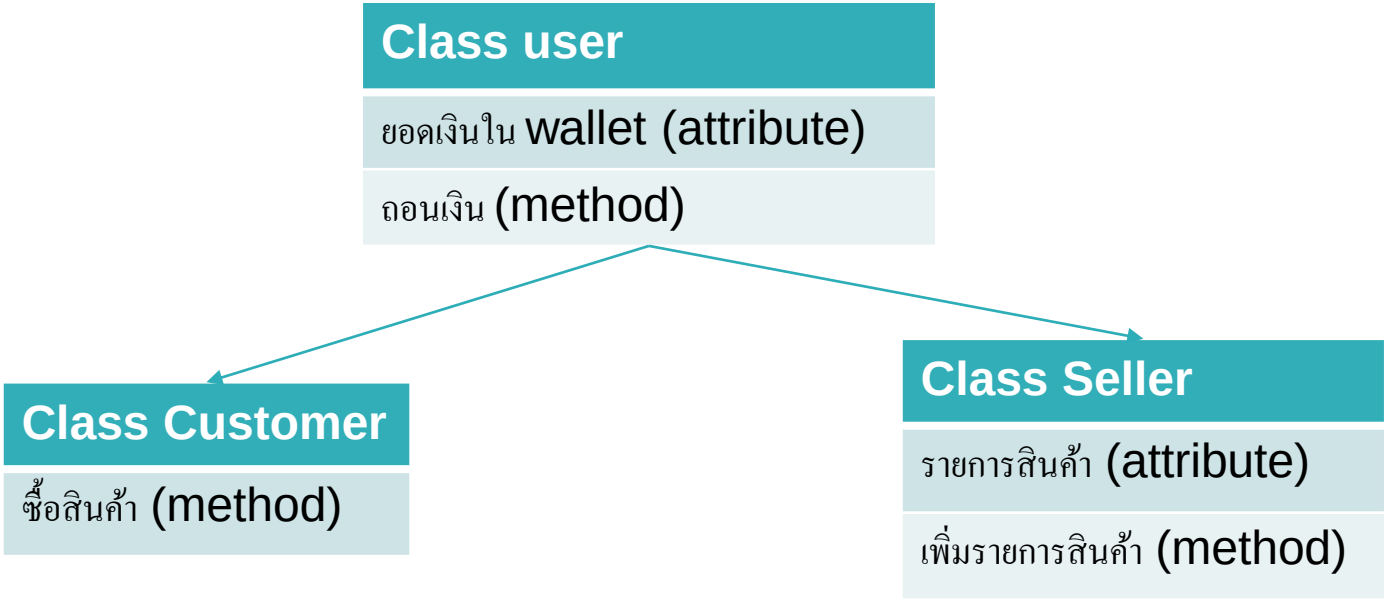




โครงสร้าง class

```
class ClassName:
    # Attributes
    var1=“some values”

    def __init__(self, var1):
        self.var1 = var1

    # Methods
    def function1(self,val2):
        self.var1 = var2
Obj1 = ClassName(val1)
```

Inheritance Class



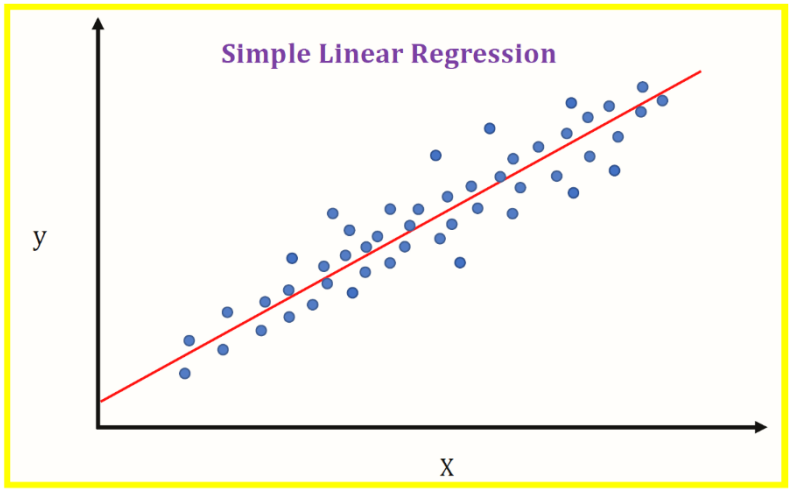
```python
# python code
class User:
    def __init__(self,wallet):
        self.wallet=wallet
    def withdraw(self,amount):
        self.wallet=self.wallet-amount

class Customer(User):
    def __init__(self,wallet):
        super().__init__(wallet)
        self.cart=[]
    def buy(self,product,price):
        self.cart.append(product)
        self.wallet=self.wallet-price
```

```python
U1=User(500)
print(U1.wallet)
U1.withdraw(30)
print(U1.wallet)
C1=Customer(5000)
print(C1.wallet)
C1.buy("cat",10)
C1.buy("dog",10)
print(C1.cart)
print(C1.wallet)
print("\n==== withdraw====")
C1.withdraw(100)
print(C1.cart)
print(C1.wallet)
```

Simple Linear Regression

ref: https://home.kku.ac.th/nikom/regsimp_nk2559.pdf

$$\hat{y}_i = a + bx_i$$



$$a = \bar{y} - b\bar{x}$$

$$b = \left[\frac{\sum x_i y_i - \frac{(\sum x_i)(\sum y_i)}{n}}{\sum x_i^2 - \frac{(\sum x_i)^2}{n}} \right]$$

Thank you