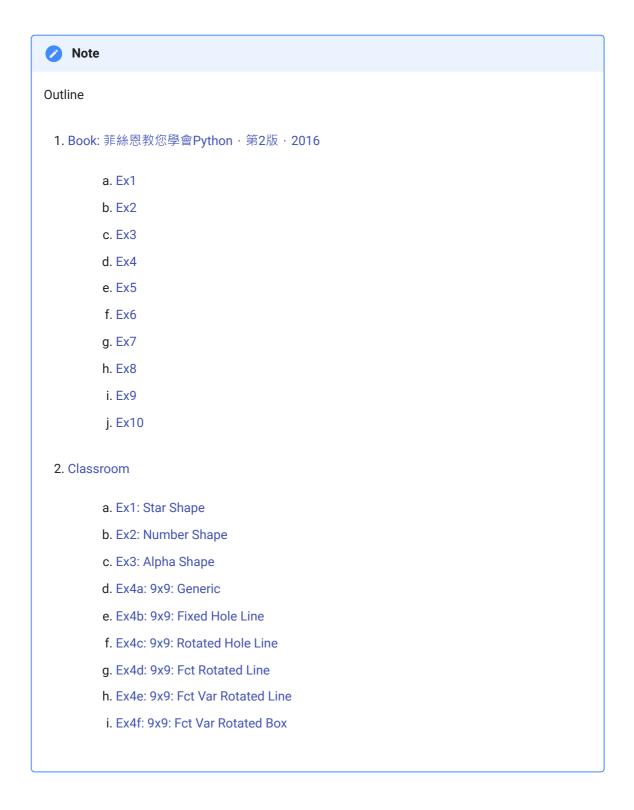
2.14.5. Exercise



Fig. 2.14.5.1 Photo by Fitsum Admasu on Unsplash



2.14.5.1. Book: 菲絲恩教您學會Python,第2版,2014

2.14.5.1.1. Ex1

1. Question+Code



金字塔是世界七大奇景之一· 請利用for迴圈寫出如下圖所示的4層金字塔圖形。 *
**
**

2.14.5.1.2. Ex2

1. Question+Code

Question Code

請寫一支程式能夠輸入兩個數字、然後輸出這兩個數字的最大公因數。

2.14.5.1.3. Ex3

##. Question+Code

 Question
 Code

 讓使用者輸入一個正整數n ·
 求出1! + 2! + 3! + ... + n!之值並輸出。

2.14.5.1.4. Ex4

1. Question+Code

Question Code

請撰寫程式輸出500以內的完全數。

其中,完全數代表一正整數,除其自身以外之所有因數的和恰好為該數。

例如·6為第一個完全數·6除自身以外的因數有 $1 \cdot 2 \cdot 3 \cdot$ 則6 = 1 + 2 + 3。

2.14.5.1.5. Ex5

1. Question+Code

Question Code 請撰寫程式讓使用者輸入一正整數n·然後輸出數列的前n項。

數列為0 1 1 2 3 5 8 13 21 34 55 ...。

例如,輸入5,輸出0 1 1 2 3 。

2.14.5.1.6. Ex6

1. Question+Code

Question: selected: Code

《孫子算經》裡有個「物不知其數」的問題:
「今有物・不知其數・三三數之賸三・五五數之賸三・七七數之賸三。
問物幾何?
(眼前有一堆物品・不知有多少個。
每次取3個・最後剩下2個;
每次取5個・最後剩下3個;
每次取7個・最後剩下2個。
問這堆物品到底有多少個?)」。
請利用for迴圈求出該問題的最小解。

2.14.5.1.7. Ex7

1. Question+Code



2.14.5.1.8. Ex8

1. Question+Code

Question Code

請撰寫一個程式,讓使用者輸入一正數N,再利用二分逼近法求N的平方根並輸出。

2.14.5.1.9. Ex9

1. Question+Code



預設一個List = [9, 8, 7, 6, 5, 4, 3, 2, 1, 0]· 利用氣泡排序法將其元素由小到大排列後輸出。 氣泡排序法:

- (1) 比較相鄰的兩個元素,若前面的元素較大就進行交換。
- (2) 重複進行(1)的動作直到最後面,最後一個元素將會是最大值。
- (3) 重複進行(1)、(2)的動作、每次比較到上一輪的前一個元素。
- (4) 重複進行以上動作直到沒有元素需要比較。

2.14.5.1.10, Ex10

1. Question+Code

Question Code

讓使用者輸入一串數字‧再倒序後輸出。例:輸入「123456」;輸出「654321」。

2.14.5.2. Classroom

2.14.5.2.1. Ex1: Star Shape

1. Question

讓使用者輸入一個正整數·並使用迴圈·一一畫出以下的星星圖形·共26種圖形。 迴圈的形式包括: 1-while, 1-for, 2-while, 2-for, while-for, for-while 請讓每一種圖形·使用一支小程式。 如果輸入 5·則會顯示以下的圖形。

- *
- *
- *

*						
*						

*				****		
**				****		
***	**		***	***		
****	***		**	**		
****	***	× ×	*	*		
*	***	L-L	*	*		
***			**	**		
****				***		
			**	**		
			*	*		
*		***	*****	*		*
***		**:	****	**		**
****	k	*:	****	***		***
*****	+ *	,	***	****	*	***
*****	***		*	****	**	***
				****	*	***
				***		***
				**		**
				*		*
*		* *	* * *	*		*
* *		* :	* * *	*		*
* * *	k	*	* *	* *		* *
* * *	*	,	* *	* *	*	*
* * * *	* *		*	* * *	*	* *
				* *	*	*
				* *		* *
				*		*
				*		*
*	*	***	*****	*****	***	******
**	**	***	*****	*****	***	*****
*** *	***	***	*****	****	***	*****
**** **	* **	***	*****	***	***	*****
*****	* **	***	*****	***	***	****
*****	***	***	* ****	***	***	*****
*****	***	***	***	****	***	*****
*****	***	**	**	*****	***	*****
*****	* **	*	*	*****	***	******
*				****		****
***				*****		*****
****	k			*****		*****
*****				******		*****
*****				******		*****
*****			****	******		*****
*****	***	*:	****	*****		*****

2. Code: 1-while loop

CPH 高一, 胡承恩, 鳳山高中, 20201129 高一, 余柏諺, 鳳山高中, 20201129.

高一, 王志弘, 鳳山高中, 20201130.

資訊科技二專7班, 王碩宏, 中正預校國中部理化科專任教師, 20210716.

資訊科技二專7班, 林琇瑾, 瑞祥國中童軍科專任教師, 20210716.

3. Code: 2-while loop

4. Code: 1-for loop

CPH 高一, 余柏諺, 鳳山高中, 20201219.

5. Code: 2-for loop

6. Code: while-for loop

7. Code: for-while loop

2.14.5.2.2. Ex2: Number Shape

1. Question

讓使用者輸入一個正整數,並使用迴圈,一一畫出以下的數字圖形, 包括升冪與降冪兩類,共52種圖形。 迴圈的形式包括: 1-while, 1-for, 2-while, 2-for, while-for, for-while 請讓每一種圖形,使用一支小程式。 如果輸入 5.則會顯示以下的圖形。

_ 1	5	111111111	55555555	1	5	1	
5 222	444	2222222	444444	12	54	21	
45 33333	33333	33333	33333	123	543	321	
345 444444	222222	222	222	1234	5432	4321	
2345 55555555	111111111	1	1	12345	54321	54321	
12345				1234	5432	4321	
2345				123	543	321	
345				12	54	21	
45				1	5	1	
5							
1	5	1 1 1 1 1	5 5 5 5 5	5	1	5	
2 2	4 4	2 2 2 2	4 4 4 4	4	2	4	
3 3 3 3 3	3 3 3	3 3 3	3 3 3	5 3	1 3	3 5	
	2 2 2 2	4 4	2 2	4 2	2 4	2 4	
	1 1 1 1 1	5	1	5 3 1	1 3 5	1 3 5	
4 2				4 2	2 4	2 4	
3 1				5 3	1 3	3 5	
				4	2	4	
2				5	1	5	
1							
1 1 555554321	5 5 111112345	55555555	111111111	123455		13211111	
22 22 55555432	44 44 11111234	55555555	111111111	23455	5555 4	13211111	
333 333 5555543	333 333 1111123	55555555	111111111	3455	5555	3211111	
4444 4444 555554	2222 2222 111112	55555555	111111111	455	5555	211111	
55555555 55555	111111111	55555555	111111111	55	5555	11111	
55555555 555554	111111111 111112	4444 4444	2222 2222	455	5555	211111	
55555555	1111111111	333 333	333 333	3455	5555	3211111	
5555543 55555555 55555432	1111123 111111111 11111234	22 22	44 44	23455	5555 4	13211111	

55555555 555554321	111111111 111112345	1 1	5 5	123455555	543211111
1	5	55555555	111111111	55555	11111
55555	11111				
222	444	55555555	111111111	555554	111112
455555	211111				
33333	33333	55555555	111111111	5555543	1111123
3455555	3211111				
444444	222222	55555555	111111111	55555432	11111234
23455555	43211111				
55555555	111111111	55555555	111111111	555554321	111112345
123455555	543211111				
55555555	111111111	444444	222222	55555432	11111234
23455555	43211111				
55555555	111111111	33333	33333	5555543	1111123
3455555	3211111				
55555555	111111111	222	444	555554	111112
455555	211111				
55555555	111111111	1	5	55555	11111
55555	11111				

2. Code: 1-while loop

3. Code: 2-while loop

4. Code: 1-for loop

5. Code: 2-for loop

6. Code: while-for loop

7. Code: for-while loop

2.14.5.2.3. Ex3: Alpha Shape

1. Question

讓使用者輸入一個正整數,並使用迴圈,一一畫出以下的字母圖形 包括升冪與降冪兩類,還有大寫與小寫,共104種圖形。 迴圈的形式包括: 1-while, 1-for, 2-while, 2-for, while-for, for-while 請讓每一種圖形,使用一支小程式。 如果輸入 5,則會顯示以下的圖形。 abcde edbca aBcDe eDcBa а е а е b b В D С С С С d D В е е а е а е aaaaa eeeee aaaaa eeeee bb dd dd bbbb dddd bbbb dddd

ccc dddd eeeee	ccc bbbb aaaaa	ccc dddd eeeee	ccc bbbb aaaaa	ccc dd e	ccc bb a	ccc bb a	ccc bb a		
a BB	e DD	a BB	e DD	aaaaa BBBB	DDDD D	aaaaa BBBB	DDDD		
ccc	ccc	ccc	ccc	ccc	ccc	ccc	ccc		
DDDD eeeee	BBBB aaaaa	DDDD eeeee	BBBB aaaaa	DD e	BB a	BB a	BB a		
a ccc	e ccc	aaaaa ccc	ccc	a ac	e ec	a ca	e ce		
eeeee	aaaaa	е	а	ace	ece	eca	ace		
				ac	ec	ca	ce		
				а	е	а	е		
а	е	aaaaa	eeeee	а	е	а	е		
CCC eeeee	CCC aaaaa	CCC e	CCC a	aC aCe	eC eCa	Ca eCa	Ce eCe		
Ceeee	uuuua	C	u	aCe	ec	Ca	Ce		
				а	е	а	е		
a e		е	aaaaaa	iaaa	eeeeeeee	а	е	а	
bbb de		ddd	bbbbb	bb	ddddddd	ab	ed	ba	
ccccc cde	(cccc	cccc	cc	ccccc	abc	edc	cba	
dddddd bcde	d bl	bbbbbb	bbb)	bbb	abcd	edcb	dcba	
eeeeeee abcde	ee aaa	aaaaaaa	а		а	abcde	edcba	edcba	
bcde						abcd	edcb	dcba	
cde						edc	cba	cde	
de						ab	ed	ba	
						а	е	а	
е									
a e		е	aaaaaa	aaa	eeeeeeee	а	е	а	
BBB De		DDD	BBBBB	BBB	DDDDDDD	аВ	eD	Ва	
ccccc	(cccc	cccc	С	ccccc	аВс	eDc	сВа	
DDDDDD BcDe	D BI	BBBBBB	BBE	3	BBB	aBcD	eDcB	DcBa	
eeeeeee aBcDe	ee aaa	aaaaaaa	а		а	aBcDe	eDcBa	eDcBa	
BcDe						aBcD	eDcB	DcBa	
_ 52 5						eDc	eDc	cDe	

cDe				o.P.	٥٦	Po	
De				aB	eD	Ва	
е				а	е	а	
а	е	aaaaa	e e e e e	е	а	е	
a b b	d d	b b b b	d d d d	d	b	d	
b ссс	ссс	ссс	ссс	ес	ас	се	
	b b b b	d d	b b	d b	b d	b d	d
b e e e e e	aaaaa	е	а	еса	асе	асе	е
c a				d b	b d	b d	d
b				ес	ас	се	
c a				d	b	d	
b				е	а	е	
а							
a a	е	a a a a a		е	а	е	
B B B	D D	ВВВВ	DDDD	D	В	D	
ссс	ССС	ССС	ССС	ес	a c	се	
D D D D B	ВВВВ	D D	ВВ	D B	B D	B D	D
e e e e e c a	a a a a a	е	а	еса	асе	асе	е
В				D B	B D	B D	D
са				ес	a c	се	
В				D	В	D	
а				е	а	е	
a a	e e	eeeeeeee	aaaaaaaaa	abcdee	eee e	edcbaaaaa	
eeeeedcba bb bb	aaaaabcde dd dd	eeeeeeee	aaaaaaaaa	bcdee		dcbaaaaa	
eeeeedcb	aaaaabcd ccc ccc	eeeeeeee	aaaaaaaaa	cdee		cbaaaaa	
eeeeedc dddd dddd	aaaaabc bbbb bbbb				eee	baaaaa	
eeeeed	aaaaab	eeeeeeee	2222222				
eeeeeeee	aaaaaaaaa aaaaa	66666666	aaaaaaaaa bbbb bbbb		eee	aaaaa	
eeeeeeee	aaaaaaaaa	dddd dddd	bbbb bbbb	dee	eee	baaaaa	

eeeeed	aaaaab							
eeeeeeee	aaaaaaaaa	ccc	ccc	ccc	ccc	cdeeeee	cbaaaaa	
eeeeedc	aaaaabc	hh	bb	44	44	bodoooo	dcbaaaaa	
eeeeeeeee	aaaaaaaaa aaaaabcd	bb	bb	dd	dd	bcdeeeee	испааааа	
eeeeeeee	aaaaaaaaa	а	а	е	е	abcdeeeee	edcbaaaaa	
eeeeedcba	aaaaabcde	а	a	C	C	abcaecee	euchaaaaa	
СССССССВИ	addadabcac							
a a	e e	eeee	eeeee	aaaaa	aaaaa	aBcDeeeee	eDcBaaaaa	
eeeeeDcBa	aaaaaBcDe							
BB BB	DD DD	eeee	eeeee	aaaaa	aaaaa	BcDeeeee	DcBaaaaa	
eeeeeDcB	aaaaaBcD							
ccc ccc	ccc ccc	eeee	eeeee	aaaaa	aaaaa	cDeeeee	сВааааа	
eeeeeDc	aaaaaBc					_	_	
DDDD DDDD	BBBB BBBB	eeee	eeeee	aaaaa	aaaaa	Deeeee	Baaaaa	
eeeeeD	aaaaaB			0000			00000	
eeeeeeee	aaaaaaaaa	eeee	eeeee	aaaa	aaaaa	eeeee	aaaaa	
eeeee	aaaaa aaaaaaaaa	חחחם	DDDD	BBBB	BBBB	Deeeee	Baaaaa	
eeeeeD	aaaaaB	5555		2000		20000	Dadada	
eeeeeeee	aaaaaaaaa	ССС	ccc	ССС	ccc	cDeeeee	сВааааа	
eeeeeDc	aaaaaBc							
eeeeeeee	aaaaaaaaa	BB	BB	DD	DD	BcDeeeee	DcBaaaaa	
eeeeeDcB	aaaaaBcD							
eeeeeeee	aaaaaaaaa	а	а	е	е	aBcDeeeee	eDcBaaaaa	
eeeeeDcBa	aaaaaBcDe							
_	_							
a eeeee	e aaaaa	eeee	eeeee	aaaaa	aaaaa	eeeee	aaaaa	
bbb	ddd	eeee	eeeee	aaaaa	aaaaa	eeeeed	aaaaab	
deeeee	baaaaa	0000	00000	aaaa	adddd	00000	aaaaab	
cccc	cccc	eeee	eeeee	aaaaa	aaaaa	eeeeedc	aaaaabc	
cdeeeee	cbaaaaa							
ddddddd	bbbbbbb	eeee	eeeee	aaaaa	aaaaa	eeeeedcb	aaaaabcd	
bcdeeeee	dcbaaaaa							
eeeeeeee	aaaaaaaaa	eeee	eeeee	aaaaa	aaaaa	eeeeedcba	aaaaabcde	
abcdeeeee	edcbaaaaa							
eeeeeeee	aaaaaaaaa	ddd	dddd	bbbl	obbb	eeeeedcb	aaaaabcd	
bcdeeeee eeeeeeee	dcbaaaaa aaaaaaaaa	00	000	000	200	eeeeedc	aaaaabc	
cdeeeee	cbaaaaaa	CC	CCC	CCC	ccc	eeeeeuc	aadaabt	
eeeeeeee	aaaaaaaaa	b	bb	de	dd	eeeeed	aaaaab	
deeeee	baaaaa			3.				
eeeeeeee	aaaaaaaaa		а	(е	eeeee	aaaaa	
eeeee	aaaaa							
а	е	eeee	eeeee	aaaaa	aaaaa	eeeee	aaaaa	
eeeee	aaaaa		0000			000000	000000	
BBB	DDD	eeee	eeeee	aaaaa	aaaaa	eeeeeD	аааааВ	
Deeeee	Вааааа	0000	eeeee	2222	aaaaa	eeeeeDc	aaaaaBc	
cDeeeee	сВааааа	ccce	CCCCC	uaaa	uuuaa	SEEGEDU	addadbc	
DDDDDDD	BBBBBBB	eeee	eeeee	aaaaa	aaaaa	eeeeeDcB	aaaaaBcD	
BcDeeeee	DcBaaaaa							
eeeeeeee	aaaaaaaaa	eeee	eeeee	aaaaa	aaaaa	eeeeeDcBa	aaaaaBcDe	

aBcDeeeee	eDcBaaaaa				
eeeeeeee	aaaaaaaaa	DDDDDDD	BBBBBBB	eeeeeDcB	aaaaaBcD
BcDeeeee	DcBaaaaa				
eeeeeeee	aaaaaaaaa	ccccc	cccc	eeeeeDc	aaaaaBc
cDeeeee	сВааааа				
eeeeeeee	aaaaaaaaa	BBB	DDD	eeeeeD	aaaaaB
Deeeee	Baaaaa				
eeeeeeee	aaaaaaaaa	а	е	eeeee	aaaaa
eeeee	aaaaa				

2. Code: 1-while loop

3. Code: 2-while loop

4. Code: 1-for loop

5. Code: 2-for loop

6. Code: while-for loop

7. Code: for-while loop

2.14.5.2.4. Ex4a: 9x9

1. Generic table

2. Code+Output

Code Output

第1種寫法	去,稍微瑣码	卒,但較清	楚・易了解				
1x1=1 1x9=9	1x2=2	1x3=3	1x4=4	1x5=5	1x6=6	1x7=7	1x8=8
2x1=2 2x9=18	2x2=4	2x3=6	2x4=8	2x5=10	2x6=12	2x7=14	2x8=16
3x1=3 3x9=27	3x2=6	3x3=9	3x4=12	3x5=15	3x6=18	3x7=21	3x8=24
4x1=4 4x9=36	4x2=8	4x3=12	4x4=16	4x5=20	4x6=24	4x7=28	4x8=32
5x1=5 5x9=45	5x2=10	5x3=15	5x4=20	5x5=25	5x6=30	5x7=35	5x8=40
5x1=6 5x9=54	6x2=12	6x3=18	6x4=24	6x5=30	6x6=36	6x7=42	6x8=48
7x1=7 7x9=63	7x2=14	7x3=21	7x4=28	7x5=35	7x6=42	7x7=49	7x8=56
8x1=8 8x9=72	8x2=16	8x3=24	8x4=32	8x5=40	8x6=48	8x7=56	8x8=64
9x1=9 9x9=81	9x2=18	9x3=27	9x4=36	9x5=45	9x6=54	9x7=63	9x8=72
		 ,但稍微難					
		while lo		1vE_ 5	1,46- 6	1,47- 7	1,40- 0
1x1= 1 1x9= 9	1XZ= 2	1X3= 3	1X4= 4	1x5= 5	1X6= 6	1X/= /	1X8= 8

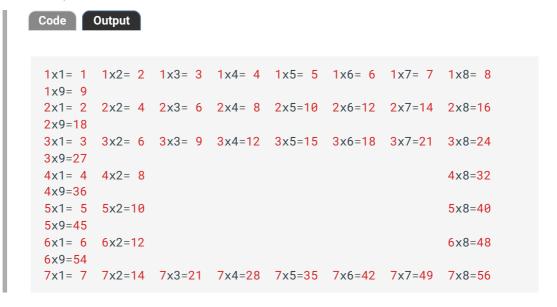
2x1= 2 2x9=18	2x2= 4	2x3= 6	2x4= 8	2x5=10	2x6=12	2x7=14	2x8=16
3x1= 3	3x2= 6	3x3= 9	3x4=12	3x5=15	3x6=18	3x7=21	3x8=24
3x9=27 4x1= 4	4x2= 8	4x3=12	4x4=16	4x5=20	4x6=24	4x7=28	4x8=32
4x9=36 5x1= 5	5x2=10	5x3=15	5x4=20	5x5=25	5x6=30	5x7=35	5x8=40
5x9=45 5x1= 6 5x9=54	6x2=12	6x3=18	6x4=24	6x5=30	6x6=36	6x7=42	6x8=48
7x1= 7 7x9=63	7x2=14	7x3=21	7x4=28	7x5=35	7x6=42	7x7=49	7x8=56
3x1= 8 3x9=72	8x2=16	8x3=24	8x4=32	8x5=40	8x6=48	8x7=56	8x8=64
	9x2=18	9x3=27	9x4=36	9x5=45	9x6=54	9x7=63	9x8=72
		nile loop					
				1x5= 5	1x6= 6	1x7= 7	1x8= 8
2x1= 2 2x9=18	2x2= 4	2x3= 6	2x4= 8	2x5=10	2x6=12	2x7=14	2x8=16
x1= 3 x9=27	3x2= 6	3x3= 9	3x4=12	3x5=15	3x6=18	3x7=21	3x8=24
x1= 4 x9=36	4x2= 8	4x3=12	4x4=16	4x5=20	4x6=24	4x7=28	4x8=32
5x1= 5 5x9=45	5x2=10	5x3=15	5x4=20	5x5=25	5x6=30	5x7=35	5x8=40
5x1= 6 5x9=54	6x2=12	6x3=18	6x4=24	6x5=30	6x6=36	6x7=42	6x8=48
	7x2=14	7x3=21	7x4=28	7x5=35	7x6=42	7x7=49	7x8=56
8x1= 8 8x9=72	8x2=16	8x3=24	8x4=32	8x5=40	8x6=48	8x7=56	8x8=64
	9x2=18	9x3=27	9x4=36	9×5=45	9x6=54	9x7=63	9x8=72
 第 2 種寫法	 :・較精簡	 · 但稍微難	 理解				
	: for-fo	-					
1x1= 1 1x9= 9	1x2= 2	1x3= 3	1x4= 4	1x5= 5	1x6= 6	1x7= 7	1x8= 8
2x1= 2 2x9=18	2x2= 4	2x3= 6	2x4= 8	2x5=10	2x6=12	2x7=14	2x8=16
3x1= 3 3x9=27	3x2= 6	3x3= 9	3x4=12	3x5=15	3x6=18	3x7=21	3x8=24
4x1= 4 4x9=36	4x2= 8	4x3=12	4x4=16	4x5=20	4x6=24	4x7=28	4x8=32
5x1= 5 5x9=45	5x2=10	5x3=15	5x4=20	5x5=25	5x6=30	5x7=35	5x8=40
6x1= 6 6x9=54	6x2=12	6x3=18	6x4=24	6x5=30	6x6=36	6x7=42	6x8=48
7x9=63				7x5=35			
8x1= 8	8x2=16	8x3=24	8x4=32	8x5=40	8x6=48	8x7=56	8x8=64

```
8x9 = 72
9x1= 9 9x2=18 9x3=27 9x4=36 9x5=45 9x6=54 9x7=63 9x8=72
9x9=81
第2種寫法,較精簡,但稍微難理解
第4種組合: while-for loop
1x1 = 1 1x2 = 2 1x3 = 3 1x4 = 4 1x5 = 5 1x6 = 6 1x7 = 7 1x8 = 8
1x9 = 9
2x1= 2 2x2= 4 2x3= 6 2x4= 8 2x5=10 2x6=12 2x7=14 2x8=16
2x9=18
3x1= 3 3x2= 6 3x3= 9 3x4=12 3x5=15 3x6=18 3x7=21 3x8=24
3x9=27
4x1= 4 4x2= 8 4x3=12 4x4=16 4x5=20 4x6=24 4x7=28 4x8=32
4x9=36
5x1= 5 5x2=10 5x3=15 5x4=20 5x5=25 5x6=30 5x7=35 5x8=40
5x9=45
6x1= 6 6x2=12 6x3=18 6x4=24 6x5=30 6x6=36 6x7=42 6x8=48
6x9=54
7x1= 7 7x2=14 7x3=21 7x4=28 7x5=35 7x6=42 7x7=49 7x8=56
7x9 = 63
8x1= 8 8x2=16 8x3=24 8x4=32 8x5=40 8x6=48 8x7=56 8x8=64
8x9=72
9x1= 9 9x2=18 9x3=27 9x4=36 9x5=45 9x6=54 9x7=63 9x8=72
9x9=81
```

2.14.5.2.5. Ex4b: 9x9: Fixed Hole Line

1. Question

- a. with a fixed hole line
- b. 9x9 multiplication table with a fixed hole line, such as 5.



```
7x9=63
8x1= 8 8x2=16 8x3=24 8x4=32 8x5=40 8x6=48 8x7=56 8x8=64
8x9=72
9x1= 9 9x2=18 9x3=27 9x4=36 9x5=45 9x6=54 9x7=63 9x8=72
9x9=81
```

2.14.5.2.6. Ex4c: 9x9: Rotated Hole Line

1. Question

- a. with a rotated hole line
- b. 9x9 multiplication table with a fixed hole line, such as 5.
- c. The hole line can be rotated by clock-wise.

Code	Code: TA, 🗄	悵晉, 2018 (0724	output			
1x1= 1 1x9= 9	1x2= 2	1x3= 3	1x4= 4	1x5= 5	1x6= 6	1x7= 7	1x8= 8
	2x2= 4	2x3= 6	2x4= 8	2x5=10	2x6=12	2x7=14	2x8=16
	3x2= 6	3x3= 9	3x4=12	3x5=15	3x6=18	3x7=21	3x8=24
4x1= 4 4x9=36	4x2= 8	4x3=12	4×4=16	4x5=20	4x6=24	4x7=28	4x8=32
5x1= 5 5x9=45	5x2=10						5x8=40
6x1= 6 6x9=54	6x2=12	6x3=18	6x4=24	6x5=30	6x6=36	6x7=42	6x8=48
7x9=63		7x3=21					
8x9=72		8x3=24					
9x1= 9 9x9=81	9x2=18	9x3=27	9x4=36	9x5=45	9x6=54	9x7=63	9x8=72
1x1= 1 1x9= 9	1x2= 2	1x3= 3	1×4= 4	1x5= 5	1x6= 6	1x7= 7	1x8= 8
2x1= 2 2x9=18	2x2= 4	2x3= 6	2x4= 8	2x5=10	2x6=12	2x7=14	2x8=16
3x1= 3 3x9=27	3x2= 6		3x4=12	3×5=15	3x6=18	3x7=21	3x8=24
4x1= 4 4x9=36	4x2= 8	4x3=12		4x5=20	4x6=24	4x7=28	4x8=32
5x1= 5 5x9=45	5x2=10	5x3=15	5x4=20		5x6=30	5x7=35	5x8=40
6x1= 6	6x2=12	6x3=18	6x4=24	6x5=30		6x7=42	6x8=48

6x9= 54							
7x1 = 7	7x2=14	7x3=21	7x4=28	7x5=35	7x6=42		7x8=56
7x9=63	0.2-16	0.2-04	0×4-22	0vE-40	0,46 - 40	0×7-E6	0×0-64
8x1 = 8 8x9 = 72	8XZ=10	8x3=24	8X4=3Z	8X3=40	8X0=48	8X7=30	8x8=64
	9x2=18	9x3=27	9×4=36	9x5=45	9x6=54	9x7=63	9x8=72
9x9=81	7.2	2,10 2,					7.6 7.2
1x1= 1	1x2= 2	1x3= 3	1x4= 4	1x5 = 5	1x6= 6	1x7= 7	1x8= 8
1x9= 9							
2x1= 2	2x2= 4	2x3= 6	2x4= 8	2x5=10	2x6=12	2x7=14	2x8=16
2x9=18 3x1=3	222- 6	222- 0	2×4-12		246-10	27-21	2×0-24
3x1 = 3 3x9 = 27	3XZ= 0	3x3= 9	3X4=1Z		3X0=18	3x7=21	3x8=24
4x1 = 4	4x2= 8	4x3=12	4×4=16		4x6=24	4x7=28	4x8= <mark>32</mark>
4x9=36							
5x1= 5	5x2=10	5x3=15	5x4=20		5x6=30	5x7=35	5x8=40
5×9=45							
	6x2=12	6x3=18	6x4=24		6x6=36	6x7=42	6x8=48
6x9=54	7×2-1/	7x3=21	7×1-28		7×6=42	7×7-40	7x8=56
7x9=63	7 7 2 - 1 -	770-21	774-20		770-42	7 7 7 - 4 3	7.00-00
	8x2=16	8x3=24	8x4=32	8x5=40	8x6=48	8x7=56	8x8=64
8x9=72							
	9x2=18	9x3=27	9x4=36	9x5=45	9x6=54	9x7=63	9x8=72
9x9=81							
1∨1= 1	1×2= 2	1x3= 3	1 × 1 = 1	1×5= 5	1×6= 6	1 > 7 = 7	1v8= 8
1x9= 9	1 X Z - Z	170- 0	1X4- 1	170- 0	170- 0	17/- /	170- 0
2x1= 2	2x2= 4	2x3= 6	2x4= 8	2x5=10	2x6=12	2x7=14	2x8=16
2x9=18							
3x1= 3	3x2= 6	3x3= 9	3x4=12	3x5=15	3x6=18		3x8=24
3x9=27 4x1= 4	1×2- Q	4x3=12	1×1-16	1×5-20		4x7=28	4x8=32
4x1 = 4 4x9 = 36	4,2- 0	483-12	474-10	473-20		477-20	480-32
	5x2=10	5x3=15	5×4=20		5x6=30	5x7=35	5x8=40
5×9=45							
	6x2=12	6x3=18		6x5=30	6x6=36	6x7=42	6x8=48
6x9=54	70 11		74 00	75 0.5	76 10	77 10	70 50
	/XZ=14		/x4=28	/X5=35	/xb=42	/x/=49	/X8= <mark>56</mark>
7x9=63 8x1= 8	8x2=16	8x3=24	8x4=32	8×5=40	8x6=48	8x7=56	8×8=64
8x9=72		5A5 24	5X 1 02	37.0 10	37.0 10	37,7 00	CAO O I
9x1= 9	9x2=18	9x3=27	9x4=36	9x5=45	9x6=54	9x7=63	9x8=72
9x9= <mark>81</mark>							

2.14.5.2.7. Ex4d: 9x9: Fct Rotated Line

1. Question

a. with a Hole Line

- b. 9x9 multiplication table with a fixed hole line.
- c. The fixed hole line can be rotated by clock-wise.

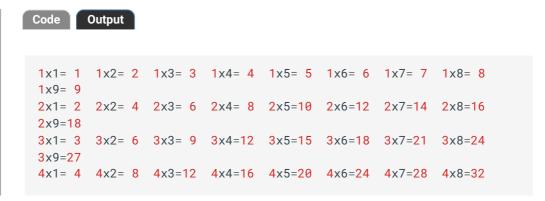
Code	Code: 二專	班, 黃文昌,	20180602	Outpu	ıt		
	1x2= 2	1x3= 3	1x4= 4	1x5= 5	1x6= 6	1x7= 7	1x8= 8
1x9 = 9 2x1 = 2	2x2= 4	2x3= 6	2x4= 8	2×5=10	2x6=12	2x7=14	2x8=16
2x9=18 3x1= 3 3x9=27		3x3= 9	3x4=12	3x5=15	3x6=18	3x7=21	3x8=24
		4x3=12	4x4=16	4x5=20	4x6=24	4x7=28	4×8=32
5x1= 5 5x9=45	5x2=10						5x8=40
6x1= 6 6x9=54	6x2=12	6x3=18	6x4=24	6x5=30	6x6=36	6x7=42	6×8=48
7x1= 7 7x9=63	7x2=14	7x3=21	7x4=28	7x5=35	7x6=42	7 x7= 49	7x8=56
8x9=72					8x6=48		
9x1= 9 9x9=81	9x2=18	9x3=27	9x4=36	9x5=45	9x6=54	9x7=63	9x8=72
1x1= 1 1x9= 9	1x2= 2	1x3= 3	1×4= 4	1x5= 5	1x6= 6	1x7= 7	1×8= 8
2x1= 2 2x9=18	2x2= 4	2x3= 6	2x4= 8	2x5=10	2x6=12	2x7=14	2×8=16
3x1=3 3x9=27			3x4=12	3x5=15	3x6=18	3x7=21	3x8=24
4x1= 4 4x9=36	4x2= 8	4x3=12		4x5=20	4x6=24	4x7=28	4x8=32
5x1= 5 5x9=45	5x2=10	5x3=15	5x4=20		5x6=30	5x7=35	5x8=40
6x1= 6 6x9=54	6x2=12	6x3=18	6x4=24	6x5=30		6x7=42	6x8=48
7x1= 7 7x9=63	7x2=14	7x3= <mark>2</mark> 1	7x4=28	7x5=35	7x6=42		7x8=56
8x9=72					8x6=48		
9x9= <mark>81</mark>					9x6=54		
1x9= 9					1x6= 6		
2x1= 2 2x9=18					2x6=12		
3x1= 3 3x9=27			3x4=12 4x4=16		3x6=18	3x7=21 4x7=28	
4x9=36			5x4=20			5x7=35	
0X1- 0	0AZ-10	070-10	3AT-20		070-00	3X7-00	UNU- 1 0

5x9=45							
6x1 = 6	6x2=12	6x3=18	6x4=24		6x6=36	6x7=42	6x8=48
6x9=54							
7x1 = 7	7x2=14	7x3=21	7x4=28		7x6=42	7x7=49	7x8=56
7x9=63							
8x1 = 8	8x2=16	8x3=24	8x4=32	8x5=40	8x6=48	8x7=56	8x8=64
8x9=72							
9x1 = 9	9x2=18	9x3=27	9x4=36	9x5=45	9x6=54	9x7=63	9x8=72
9x9=81							
	1x2 = 2	1x3 = 3	$1 \times 4 = 4$	1x5 = 5	1x6 = 6	1x7 = 7	1x8= 8
1x9= 9							
		2x3 = 6	2x4 = 8	2x5=10	2x6=12	2x7=14	2x8=16
2x9=18							
	3x2 = 6	3x3 = 9	3x4=12	3x5=15	3x6=18		3x8=24
3x9=27							
		4x3=12	4x4=16	4x5=20		4x7=28	4x8=32
4x9=36							
	5x2=10	5x3=15	5x4=20		5x6=30	5x/=35	5x8=40
5x9=45							
6x1= 6	6x2=12	6x3=18		6x5=30	6x6=36	6x/=42	6x8=48
6x9=54	7.0.44		7 4 00	7 5 05	7 6 40	7 7 40	7.0.56
	/x2=14		/x4=28	/x5=35	/x6=42	/x/=49	/x8=56
7x9=63	0.0 10	0.40 0.4	0.4 00	0.45 40	0.46 40	07 50	0,40 64
	8XZ=16	8x3=24	8X4=32	8X5=4U	8X0=48	8X/=56	8X8=64
8x9=72	0.0 10	0.40 07	0.4 06	0.45 45	0,46 - 54	07 60	0.40 70
	9XZ=18	9x3=27	9X4=36	9X5=45	9X0=54	9X/=63	9X8=/Z
9x9=81							

2.14.5.2.8. Ex4e: 9x9: Fct Var Rotated Line

1. Question

- a. with a Variable Hole Line
- b. 9x9 multiplication table with a variable hole line, e.g., 1x2, 2x3, etc.
- c. The variable hole line can be rotated by clock-wise.



4x9=36							
5x1= 5	5x2=10	5x3=15	5x4=20	5x5=25	5x6=30	5x7=35	5x8=40
5x9=45 6x1= 6	6v2-12	6x3=18	6×1-21	6×5-20	6×6-26	6×7-12	6x8=48
6x9=54	0 1 2	0.00-10	0.4-24	0.83-30	0.00-30	0 × 7 – 4 Z	0.00-40
7x1 = 7	7x2=14	7x3= <mark>21</mark>	7x4=28	7x5=35	7x6=42	7x7=49	7x8=56
7x9=63							
8x1= 8	8x2=16	8x3=24	8x4=32	8x5=40	8x6=48	8x7=56	8x8=64
8x9=72	9x2=18	0×2-27	0×4-26	0×5-45	0×6-54	0×7-62	9x8=72
9x1 - 9 $9x9 = 81$	972-10	973-27	974-20	973-43	970-04	977-03	370-72
1x1= 1	1x2= 2	1x3= 3	1x4= 4	1x5= 5	1x6= 6	1x7= 7	1x8= 8
1x9 = 9	0.40 - 4	0.40- 6	0.44- 0	0vF-10	0.46 - 10	0.47-14	0.40-16
2x1= 2 2x9=18	ZXZ= 4	2x3= 6	ZX4= 8	ZX3=10	ZX0=1Z	ZX/=14	2x8=16
3x1=3	3x2= 6	3x3= 9	3x4=12	3x5=15	3x6=18	3x7=21	3x8=24
3x9=27							
	4x2= 8	4x3=12	4x4=16	4x5=20	4x6=24	4x7=28	4x8=32
4x9=36 5x1= 5							
5x9=45							
6x1= 6	6x2=12	6x3=18	6x4= 24	6x5=30	6x6=36	6x7=42	6x8=48
6x9=54							
7x1 = 7	7x2=14	7x3=21	7x4=28	7x5=35	7x6=42	7x7=49	7x8=56
7x9=63 8x1= 8	8x2=16	8x3=24	8x4=32	8×5=40	8x6=48	8×7=56	8x8=64
8x9=72							
	9x2=18	9x3=27	9x4=36	9x5=45	9x6=54	9x7=63	9x8=72
9x9=81							
1x1= 1	1x2= 2	1x3= 3	1x4= 4	1x5= 5	1x6= 6	1x7= 7	1x8= 8
1x9= 9							
2x1= 2		2x3= 6	2x4= 8	2x5=10	2x6=12	2x7=14	2x8=16
2x9=18	3x2= 6		3×1-12	3×5=15	3×6=18	3×7=21	3 × 8 = 2 /
3x9=27			0X1 12	0,10	CAC IC	OX7 21	OKO ZI
4x1= 4	4x2= 8	4x3=12		4x5=20	4x6=24	4x7=28	4x8=32
4x9=36	Ev2-10	Ev2-15	Ev/1-20		Ev6-20	Ev7-25	Ev9-10
5x1 = 5 5x9 = 45	5x2=10	383=13	3X4=ZØ		380=30	3X/=33	JX0-40
	6x2=12	6x3=18	6x4=24	6x5=30		6x7=42	6x8=48
6x9=54		7 0 0			-		7.0
7x1= 7 7x9=63	7x2=14	/x3=21	/x4=28	/x5=35	/x6=42		/x8=56
	8x2=16	8x3=24	8x4=32	8x5=40	8x6=48	8x7=56	
8x9=72							
	9x2=18	9x3=27	9x4=36	9x5=45	9x6=54	9x7=63	9x8=72
9x9=81							
1x1= 1	1x2= 2	1x3= 3	1x4= 4	1x5= 5	1x6= 6	1x7= 7	1x8= 8
1x9= 9							
	$2 \times 2 - 1$	2x3 = 6	2x4 = 8		2x6=12	2x7=14	2x8=16
		270					
2x9=18					3x6=18	3x7=21	3x8=24

3x9=27							
	4x2= 8	4x3=12	4x4=16		4x6=24	4x7=28	4x8= <mark>32</mark>
4x9=36	E 0 10	E 0 4 E	F 4 00		F 6 00	F 7 0F	5 0 40
5x1= 5 5x9=45	5x2=10	5x3=15	5x4=20		5x6=30	5x/=35	5x8=40
	6x2=12	6×3=18	6×4=24		6×6=36	6x7=42	6×8=48
6x9=54	UXZ-12	0.00-10	UX4-24		0.00-00	0X7 -42	070-40
	7x2=14	7x3=21	7x4=28		7x6=42	7x7=49	7x8=56
7x9=63							
8x1 = 8	8x2=16	8x3=24	8x4=32		8x6=48	8x7= 56	8x8=64
8x9=72							
	9x2=18	9x3=27	9x4=36	9x5=45	9x6=54	9x7=63	9x8=72
9x9=81							
1x1= 1	1x2= 2	1x3= 3	1×4= 4	1×5= 5	1x6= 6	1×7= 7	1x8= 8
1x9= 9						.,,,	.,,,
2x1= 2	2x2= 4	2x3= 6	2x4= 8	2x5=10	2x6=12	2x7=14	
2x9=18							
	3x2 = 6	3x3 = 9	3x4=12	3x5=15	3x6=18		3x8=24
3x9=27		4 0 40		4 5 00		4 7 00	4 0 00
	4x2= 8	4x3=12	4x4=16	4x5=20		4x/=28	4x8=32
4x9=36 5×1= 5	5x2=10	5×3-15	5×1-20		5×6-30	5×7=35	5×8=40
5x1= 5	3XZ-10	0X0-10	JX4-20		370-30	JX7-33	370-40
6x1= 6	6x2=12	6x3=18		6x5=30	6x6=36	6x7=42	6x8=48
$6 \times 9 = 54$							
	7x2=14		7x4=28	7x5=35	7x6=42	7x7=49	7x8=56
7x9=63		0.00	0.4.00	0 5 40	0 6 45	0 7 54	0.0.64
		8x3=24	8x4=32	8x5=40	8x6=48	8x/=56	8x8=64
8x9=72	9x2=18	0×2-27	0×1-36	0×5-45	0×6-54	0×7-62	0 × 9 – 72
9x1= 9 9x9=81	3AZ-10	3X3-Z7	7A4-00	3XU-4U	3XU-34	3X7-03	370-12
2,7,2 01							

2.14.5.2.9. Ex4f: 9x9: Fct Var Rotated Box

1. Question

- a. with a Variable Hole Box
- b. 9x9 multiplication table with a variable hole box, e.g., 1x2, 2x3, etc.
- c. The variable hole box can be rotated by clock-wise.



		1x 3= 3	1x	4=	4	1x	5=	5	1x	6=	6	
	1x 8= 8 2x 2= 4	1x 9= 9 2x 3= 6	2x	4=	8	2x	5=	10	2x	6=	12	
	2x 8= 16 3x 2= 6		2 v	1-	10	2 v	5-	15	3x	6-	10	
3x 7= 21		3x 9= 27	37	4-	12	37	J-	13	37	0-	10	
	4x 2= 8 4x 8= 32	4x 3= 12 4x 9= 36	4x	4=	16	4x	5=	20	4x	6=	24	
5x 1= 5	5x 2= 10	5x 3= 15	5x	4=	20	5x	5=	25	5x	6=	30	
	5x 8= 40 6x 2= 12		6x	4=	24	6x	5=	30	6x	6=	36	
	6x 8= 48		7.,	1_	20	7.,	E_	2.5	7.,	c _	40	
	7x 2= 14 7x 8= 56		/ X	4=	20	7x	5=	33	/ X	6=	42	
	8x 2= 16 8x 8= 64	8x 3= 24 8x 9= 72	8x	4=	32	8x	5=	40	8x	6=	48	
9x 1= 9	9x 2= 18	9x 3= 27	9x	4=	36	9x	5=	45	9x	6=	54	
9x 7= 63	9x 8= 72	9x 9= 81										
		1x 3= 3	1x	4=	4	1x	5=	5	1x	6=	6	
	1x 8= 8 2x 2= 4	1x 9= 9 2x 3= 6	2x	4=	8	2x	5=	10	2x	6=	12	
	2x 8= 16 3x 2= 6	2x 9= 18 3x 3= 9	3x	4=	12	3x	5=	15	3x	6=	18	
3x 7= 21	3x 8= 24		ΟX			ΟX	Ü		σx	Ū		
4x 1= 4 4x 9= 36												
5x 1= 5												
5x 9= 45 6x 1= 6												
6x 9= 54 7x 1= 7	7× 2= 14	7x 3= 21	7×	4=	28	7×	5=	35	7×	6=	42	
7x 7= 49	7x 8= 56	7x 9= 63										
	8x 2= 16 8x 8= 64	8x 3= 24 8x 9= 72	8x	4=	32	8x	5=	40	8x	6=	48	
		9x 3= 27	9x	4=	36	9x	5=	45	9x	6=	54	
9X /= 63	9x 8= 72	9X 9= 81										
	1x 2= 2 1x 8= 8	1x 3= 3 1x 9= 9	1x	4=	4	1x	5=	5	1x	6=	6	
2x 1= 2			2x	4=	8	2x	5=	10	2x	6=	12	
2x /= 14 3x 1= 3	2x 8= 16	2x 9= 18				3x	5=	15	3x	6=	18	
3x 7= 21 4x 1= 4	3x 8= 24	3x 9= 27							1.	6-	2.4	
	4x 2- 8 4x 8= 32	4x 9= 36							41	6=	24	
	5x 2= 10 5x 8= 40											
6x 1= 6	6x 2= 12	6x 3= 18	6x	4=	24							
6x 8= 48 7x 1= 7		7x 3= 21	7x	4=	28	7x	5=	35				
7x 9= 63									0.7	6-	10	
8x 1= 8 8x 9= 72	ox Z= 10	8x 3= 24	σx	4=	32	δX	J=	40	σx	0=	40	
9x 1= 9	9x 2= 18	9x 3= 27	9x	4=	36	9x	5=	45	9x	6=	54	

9x 7= 63	9x 8= 72	9x 9= 81			
1x 1= 1 1x 7= 7 2x 1= 2 2x 7= 14 3x 1= 3 3x 7= 21 4x 1= 4 4x 7= 28 5x 1= 5 5x 7= 35	1x 2= 2 1x 8= 8 2x 2= 4 2x 8= 16 3x 2= 6 3x 8= 24	1x 3= 3 1x 9= 9 2x 3= 6 2x 9= 18 3x 3= 9 3x 9= 27 4x 3= 12 4x 9= 36 5x 3= 15 5x 9= 45	1x 4= 4	1x 5= 5	1x 6= 6
7x 1= 7 7x 7= 49 8x 1= 8 8x 7= 56	6x 8= 48 7x 2= 14 7x 8= 56 8x 2= 16 8x 8= 64 9x 2= 18	7x 3= 21 7x 9= 63 8x 3= 24 8x 9= 72	9x 4= 36	9x 5= 45	9x 6= 54
9x 7= 63	9x 8= 72	9x 9= 81			
	1x 2= 2 1x 8= 8		1x 4= 4	1x 5= 5	1x 6= 6
2x 1= 2 2x 9= 18	2x 2= 4	2x 3= 6	2x 4= 8	2x 5= 10	2x 6= 12
3x 1= 3 3x 9= 27	3x 2= 6	3x 3= 9	3x 4= 12	3x 5= 15	
5x 1= 5	4x 9= 36 5x 2= 10	5x 3= 15	4x 4= 16		
6x 1= 6	5x 8= 40 6x 2= 12				6x 6= 36
7x 1= 7				7x 5= 35	7x 6= 42
7x 7= 49 8x 1= 8			8x 4= 32	8x 5= 40	8x 6= 48
9x 1= 9	9x 2= 18 9x 8= 72	9x 3= 27	9x 4= 36	9x 5= 45	9x 6= 54
	1x 2= 2 1x 8= 8		1x 4= 4	1x 5= 5	1x 6= 6
2x 1= 2	2x 2= 4 2x 8= 16	2x 3= 6	2x 4= 8	2x 5= 10	2x 6= 12
3x 1= 3	3x 2= 6 3x 8= 24	3x 3= 9	3x 4= 12	3x 5= 15	3x 6= 18
4x 1= 4	4x 2= 8 4x 8= 32	4x 3= 12	4x 4= 16	4x 5= 20	4x 6= 24
5x 1= 5	5x 2= 10 5x 8= 40	5x 3= 15	5x 4= 20	5x 5= 25	5x 6= 30
	6x 2= 12 6x 8= 48		6x 4= 24	6x 5= 30	6x 6= 36
	7x 2= 14 7x 8= 56		7x 4= 28	7x 5= 35	7x 6= 42
8x 1= 8	8x 2= 16	8x 3= 24	8x 4= 32	8x 5= 40	8x 6= 48

8x 7= 56 8x 8= 64 8x 9= 72 9x 1= 9 9x 2= 18 9x 3= 27 9x 4= 36 9x 5= 45 9x 6= 54 9x 7= 63 9x 8= 72 9x 9= 81

Note

- 1. Start: 20120311
- 2. System Environment:

```
Listing 2.14.5.2.9.2 requirements.txt
                                     # Sphinx
   sphinx==7.1.2
                                    # Graphviz
2
   graphviz > = 0.20.1
   sphinxbootstrap4theme>=0.6.0
                                    # Theme: Bootstrap
3
                                    # Theme: Material
4
   sphinx-material>=<mark>0.0.35</mark>
   sphinxcontrib-plantuml>=<mark>0.25</mark>
                                    # PlantUML
5
   sphinxcontrib.bibtex>=2.5.0
                                    # Bibliography
6
7
   sphinx-autorun>=1.1.1
                                    # ExecCode: pycon
   sphinx-execute-code-python3>=0.3 # ExecCode
8
   btd.sphinx.inheritance-diagram>=2.3.1  # Diagram
9
   sphinx-copybutton>=<mark>0.5.1</mark>
10
                                    # Copy button
11
   sphinx_code_tabs>=0.5.3
                                    # Tabs
12
   sphinx-immaterial>=0.11.3
                                    # Tabs
13
14
   #-- Library Upgrade Error by Library Itself
15
16
   # >> It needs to fix by library owner
   # >> After fixed, we need to try it later
17
18
19
   pydantic==1.10.10
                                     # 2.0: sphinx compiler
20
   error, 20230701
21
22
   #-- Minor Extension
23
24
   sphinxcontrib.httpdomain>=1.8.1 # HTTP API
25
26
27
   #sphinxcontrib-blockdiag>=3.0.0  # Diagram: block
   #sphinxcontrib-actdiag>=3.0.0
                                    # Diagram: activity
28
   #sphinxcontrib-nwdiag>=2.0.0
                                    # Diagram: network
29
   #sphinxcontrib-seqdiag>=3.0.0
                                    # Diagram: sequence
30
31
32
33
   #-- Still Wait For Upgrading Version
34
35
36
37
   #-- Still Under Testing
   #-----
38
39
   #numpy>=1.24.2
                                    # Figure: numpy
40
41
   #-----
42
43
   #-----
44
   #sphinxcontrib.jsdemo==0.1.4 # ExecCode: Need replace
45
   add_js_file()
```

```
#sphinxcontrib.slide==1.0.0  # Slide: Slideshare
#hieroglyph==2.1.0  # Slide: make slides

#matplotlib>=3.7.1  # Plot: Need Python >= v3.8

#manim==0.17.2  # Diagram: scipy, numpy need

gcc
#sphinx_diagrams==0.4.0  # Diagram: Need GKE access
#sphinx-tabs>=3.4.1  # Tabs: Conflict w/

sphinx-material
```