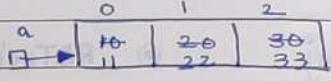


Ans For \leftrightarrow while

[P124.py]

list : []



a = [10 , 20 , 30]

print (f" original : {a} ")

list elements can be modified

a[0] = 11

a[1] = 22

a[2] = 33

print (f" changes : {a} ")

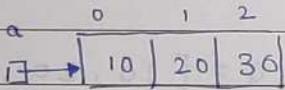
original : [10 , 20 , 30]

changes : [11 , 22 , 33]

[P125.py]

a = [10 , 20 , 30]

print (" elements are : ")



for i in range (len(a)) : # 0 1 2

print (a[i])

end : for

%/p

elements are :

10

20

30

print (" elements are : ")

for x in a : # 10 20 30

print (x)

end : for

read only : for each

%/p

elements are:

10

20

30

| P126.py |

list can contain diff datatype

a = ["Raj", 101, 10.17]
print(a)

%/p

['Raj', 101, 10.17]

| P127.py |

list can contain duplicates elements

a = [10, 20, 30, 10, 40, 50, 20]

print(a)

%/p

[10, 20, 30, 10, 40, 50, 20]

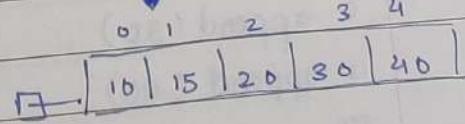
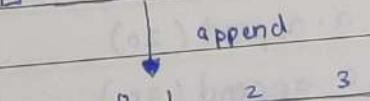
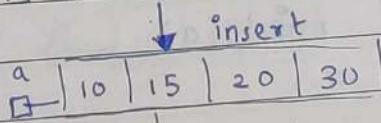
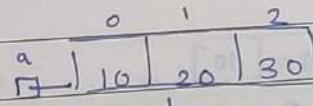
| P128.py |

a = [10, 20, 30]

print(a)

%/p

[10, 20, 30]



a.insert(1, 15)
 # insert(index, value)
 print(a)

o/p

[10, 15, 20, 30]

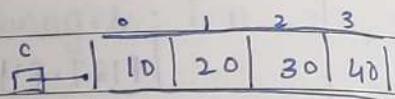
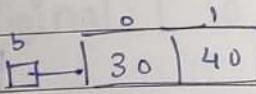
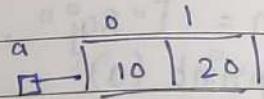
a.append(40)
 print(a)

o/p

[10, 15, 20, 30, 40]

p129.py

a = [10, 20]
 b = [30, 40]
 c = a + b # concatenation
 print(a, b, c, sep = "\n")



o/p

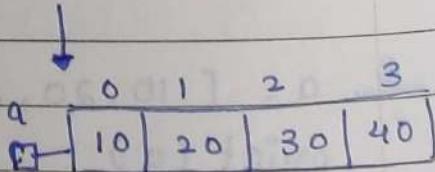
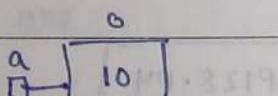
[10, 20]

[30, 40]

[10, 20, 30, 40]

p130.py

a = [10] o/p
 print(a) [10]
 ccc
 a.append(20)
 a.append(30)
 a.append(40)
 ccc



$a = [20, 30, 40]$

a.extend(α)

$a = [20, 30, 40]$

$a + = \alpha$

$a + = [20, 30, 40]$

print(a)

O/P

[10, 20, 30, 40]

|P131.py|

$a = [10, 20, 30]$

print(a)

O/P

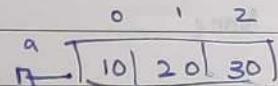
[10, 20, 30]

a.clear()

print(a)

O/P

[]



0

1

2

↓ clear

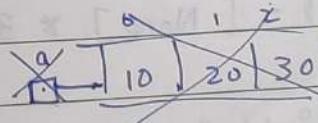
|P132.py|

$a = [10, 20, 30]$

print(a)

O/P

[10, 20, 30]



del a[1]

print(a) # error.

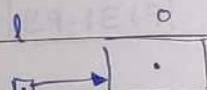
| P133.py |

```
a = list(range(1, 5))
b = list(range(2, 21, 2))
c = list(range(10, 0, -1))
d = list(range(6))

print(a, b, c, d, sep="\n")
```

| P134.py |

```
# 10 int
# 7.8 float
# " " " " str
# True False bool
# None
```



```
l = [None]
print(l)
```

O/P

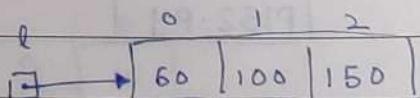
[None]

```
print(len(l))
```

1

| P135.py |

```
i
l = [None] * 3
+
print("enter elements : ")
for i in range(len(l)): # 0 1 2
```



```
— l[i] = int(input())
```

end : for

s = 0

for x in l : # 60 100 150
s = s + x

end : for

print(f"sum : {s}")

S
60
100
150
160
150
310

%/p

enter elements :

60 ↴

100 ↴

150 ↴

sum : 310 ↴

| P136.py |

x = 10

y = 20.77

z = 'raj'

a = None

print(x, y, z, a)

%/p

10 20.77 raj None

| x |
10

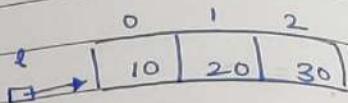
| y |
20.77

| z |

| a |
-

P137.PY

```
l = [None] * 3  
print("enter elements :")  
for i in range(len(l)):  
    l[i] = int(input())
```



```
# s = sum(l)  
# print(f"sum:{s}")  
print(f"sum:{sum(l)}")
```

O/P
enter elements:

10 ↴

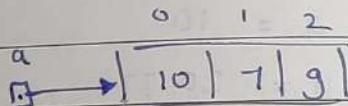
20 ↴

30 ↴

sum:60

P138.PY

```
a = [10, 7, 9]  
b = []  
for x in a:  
    # 10 7 9  
    b.append(x ** 2)  
# end: for  
print(a, b, sep="\n")
```



O/P

[10, 7, 9]

[100, 49, 81]

[P139.py]

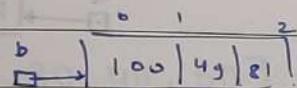
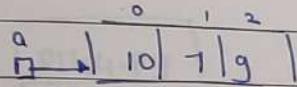
List comprehension

```
a = [10, 7, 9]
```

```
b = [x ** 2 for x in a] # 10 49
```

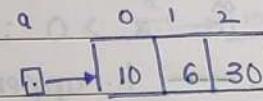
```
# b = [100, 49, 81]
```

```
print(a, b, sep = "\n")
```

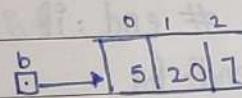


[P140.py]

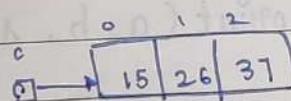
```
a = [10, 6, 30]
```



```
b = [5, 20, 7]
```



```
c = []
```



```
for x, y in zip(a, b):
```

 c.append(x + y)

end: for

```
print(a, b, c, sep = "\n")
```

%/p

[10, 6, 30]

[5, 20, 7]

[15, 26, 31]

[p141.py]

a, b = [10, 6, 30], [5, 20, 7]
c = [x + y for x, y in zip(a, b)]
print(a, b, c, sep = "\n")

Ans

c → [10 20 30] (max)

[p142.py]

a = [10, -40, 30, -20]

b = []

for x in a : # 10 -40 30 -20

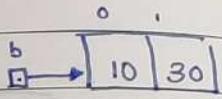
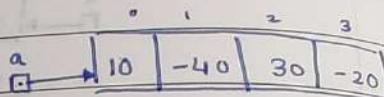
— if x > 0 :

— — b.append(x)

— # end :if

end :for

print(a, b, sep = "\n")



%/p

[10, -40, 30, -20]

[10, 30]

[p143.py]

a = [10, -40, 30, -20]

b = [x for x in a if x > 0] # 10 -40 30 -20

```
# b = [10, 30]
print(a, b, sep = "\n")
```

Ass
neg
odd
even
non-zero
zero

P144.py

```
a = [10, 20, 30, 40, 50]
```

```
print(a)
```

O/P

[10, 20, 30, 40, 50]

```
a.remove(20)
```

This deletes value 20 from list

```
print(a)
```

O/P

[10, 30, 40, 50]

```
a.remove(50)
```

```
print(a)
```

O/P

[10, 30, 40]

P145.py

```
a = [10, 20, 30, 40, 50]
```

```
print(a)
```

O/P

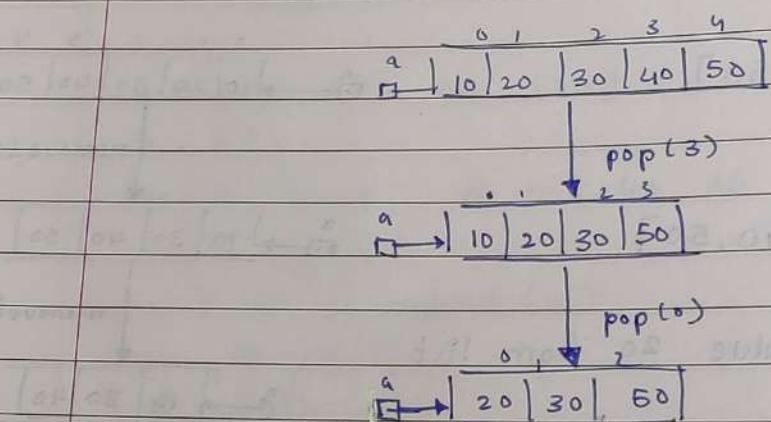
[10, 20, 30, 40, 50]

```
x = a.pop(3)
print(f'{x} is deleted')
print(a)
```

%/P
[10, 20, 30, 50]

```
x = a.pop(0)
print(f'{x} is deleted')
print(a)
```

%/P
[20, 30, 50]



Q146.py

```
a = [10, 20, 30, 40, 50]
```

```
print(a)
```

%/P

[10, 20, 30, 40, 50]

```
del a[3]
```

```
print(a)
```

%/P

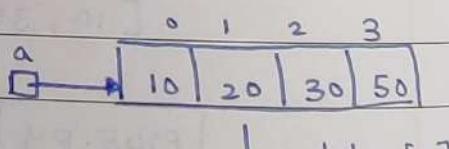
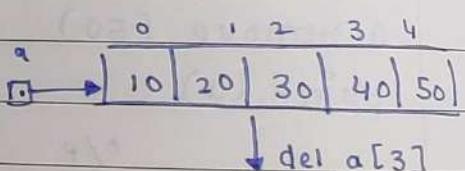
[10, 20, 30, 40, 50]

```
del a[0]
```

%/P

```
print(a)
```

[20, 30, 50]



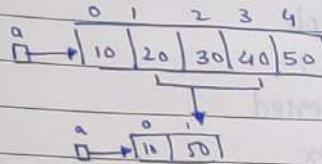
[P147.py]

a = [10, 20, 30, 40, 50]

print(a)

o/p

[10, 20, 30, 40, 50]



del a[1:4]

dels all index elements from 1 to (4-1) 3

print(a)

o/p

[10, 50]

[P148.py]

a = [10, 20, 30, 40, 50]

print(a)

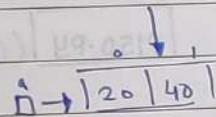
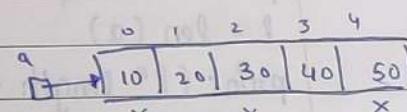
o/p

[10, 20, 30, 40, 50]

del a[4], a[2], a[0]

o/p

print(a) [20, 40]



* list

[]

ordered : ✓

remove : ✓

index : ✓

pop : ✓

modify : ✓

del list-obj [index] : ✓

append : ✓

del list-obj : ✓

extend : ✓

clear : ✓

+ = : ✓

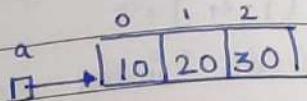
+ : ✓

len : ✓

* Tuple
()
ordered
index

p149.py

```
a = (10, 20, 30)
print(a)
print(a[0])
print(a[1])
print(a[2])
l = len(a)
print(f" length : {l}")
```



o/p
(10, 20, 30)

10

20

30

3

p150.py

```
c1 = (10, 20, 30)
print(" elements are : ")
for i in range(len(a)): # o/p
    print(a[i])
# end : for
for x in a
    print(x)
# end : for
```

elements are:

10

20

30

elements are:

10

20

30

p151.py

```
a = (10, 20, 30)
print(a)
```

o/p
(10, 20, 30)

ccc

```
a[0] = 40
a[1] = 50 # error
a[2] = 60
```

""

tuple is read only.

[p152.py]

```
a = (101, 70.77, 'Raj') # different datatype
print(a)
```

```
b = (20, 30, 10, 20, 10, 50, 60) # duplicates are allowed
print(b)
```

o/p

(101, 70.77, 'Raj')

(20, 30, 10, 20, 10, 50, 60)

[p153.py]

```
a = (10, 20, 30)
```

```
print(a)
```

tuple : read only

a.insert(1, 15) # error

a.append(40) # error

a.extend(140, 50) # error

a.remove(20) # error

x = a.pop(2) # error

del a[2] # error

a.clear() # error

o/p

(10, 20, 30)

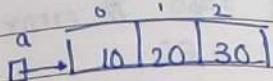
P154.py

```
a = (10, 20, 30)
```

```
print(a)
```

O/P

(10, 20, 30)



```
del(a)
```

print(a) # error because the whole tuple is deleted

P155.py

```
a = (10, 20)
```

```
print(a)
```

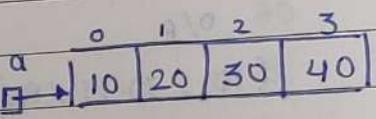
"

```
x = (30, 40)
```

```
a += x
```

"

```
a += (30, 40)
```



O/P

(10, 20)

(10, 20, 30, 40)

a += [50, 6] # error can not concatenate list & tuple

P156.py

```
a = [10, 20]
```

O/P

```
print(a)
```

[10, 20]

```
a += [30, 40]
```

[10, 20, 30, 40]

```
print(a)
```

[10, 20, 30, 40, 50, 60]

```
a += (50, 60)
```

we can add tuple in list.

```
print(a)
```

P157 .py

```
a = (10, 20)
b = (30, 40)
c = a + b # we can concatenate two tuples.
print(a, b, c, sep="\n")
o/p
(10, 20)
(30, 40)
(10, 20, 30, 40)
```

P158 .py

```
a = [10, 20] # list
b = (30, 40) # tuple
# c = a + b # error cannot concatenate list and
# tuple.
d = a + list(b)
print(d)
o/p
[10, 20, 30, 40]
(10, 20, 30, 40)
[10, 20]
(30, 40)
```

e = tuple(a) + b

print(e)

print(a)

print(b)

list + list ✓

tuple + tuple ✓

list + tuple ✗

tuple + list ✗

[P159.py]

a = [10]

print(type(a))

O/P

<class 'list'>

b = 10

print(type(b))

<class 'int'>

$2 * (7 + 3)$

$2 * (10) \times 4$

20

c = (10)

print(type(c))

<class 'tuple'>

d = (10,)

print(type(d))

[P160.py]

O/P

a = [10, 20]

print(type(a))

<class 'list'>

b = (10, 20)

print(type(b))

<class 'tuple'>

[P161.py]

O/P

a = (10, 20, 30)

(10, 20, 30)

print(a)

a += (40) # error (10, 20, 30, 40)

a += (40,)

print(a)

* Collection / Data structure

set

list] ordered
tuple

a = [10, 20, 30]

$\hat{a} \rightarrow \boxed{10 \mid 20 \mid 30}$

b = (10, 20, 30)

$\hat{b} \rightarrow \boxed{10 \mid 20 \mid 30}$

set : unordered

[P162.py]

a = { 10, 20, 30, 40 }

$\hat{a} \rightarrow \boxed{10 \mid 20 \mid 30 \mid 40}$

unordered : No Index

print(a)

o/p

{ 40, 10, 20, 30 }

l = len(a)

print(f' length : { l } ')

o/p

length : 4.

[P163.py]

a = { 10, 20, 30, 40 }

""

print(a[0]) # error

print(a[1]) # error

```
for i in range(len(a)):  
    print(a[i]) # error  
# end: for
```

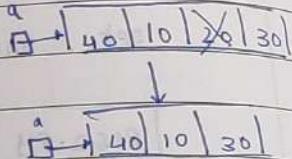
```
'''  
for x in a: # 40 10 20 30  
    print(x)  
# end: for
```

[P164.py]

```
a = {10, 20, 30, 40}
```

```
print(a) o/p
```

```
{40, 10, 20, 30}
```



```
a.remove(20)
```

```
print(a)
```

```
o/p
```

```
{40, 10, 30}
```

```
'''
```

```
i = a.pop(1) # error
```

```
del a[1] # error
```

```
del a[1:3] # error
```

```
a.insert(1, 12) # error
```

```
'''
```

[P165.py]

```
a = {10, 20, 40}
```

```
print(a)
```

```
o/p
```

```
{40, 10, 20}
```



```
'''
```

```
print(a.pop())
```

```
print(a.pop())
```

```
print(a.pop())
```

o/p

40

10

20

```
for _ in range(len(a)):
    print(a.pop())
# end: for
```

[P166.py]

a = {'Raj', 101, 70.77}

print(a)

set can contain diff. datatype

[P167.py]

a = {10, 20, 30, 10, 20, 40}

duplicates are not allowed

print(a)

{40 10 20 30}

[P168.py]

a = {10, 20, 30, 40}

print(a)

o/p

{40, 10, 20, 30}

del a

print(a) # error

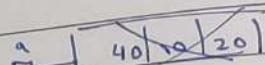
P169.py

```
a = {10, 20, 40}
```

```
print(a)
```

O/P

```
{40, 10, 20}
```



clear

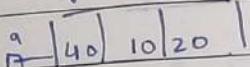
```
a.clear()
```

```
print(a)
```

O/P

```
set: {}
```

add



```
# a.append(10) # error
```

```
a.add(10) # a.add(10)
```

```
a.add(20)
```

```
a.add(40)
```

O/P

```
print(a)
```

```
{40, 10, 20}
```

P170.py

```
a = {10, 20, 40}
```

```
print(a)
```

"

```
x = {60, 70}
```

```
a.extend(x) # error
```

```
a.extend({60, 70}) # error
```

```
a += {60, 70} # error
```

"

P171.py

```
a = {10, 20}
```

```
b = {30, 40}
```

"

```
c = a + b # error
```

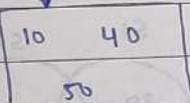
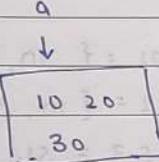
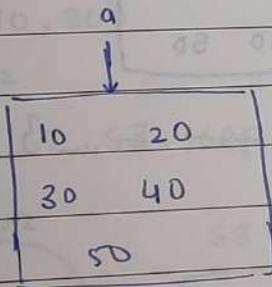
"

	list	tuple	set
ordered	✓	✓	✗
index	✓	✓	✗
symbol	[]	()	{}
len	✓	✓	✓

[P172.py]

```
a = {10, 20, 30}
b = {10, 40, 50}
print(a, b, sep = '\n')
a.update(b) # a = update(b)
print(a, b, sep = '\n')
```

after upd8



[P173.py]

```
a = [10]
print(type(a))
```

o/p
<class 'list'>

```
b = (10)
print(type(b))
```

o/p
<class 'int'>

```
c = (10, )  
print(type(c))
```

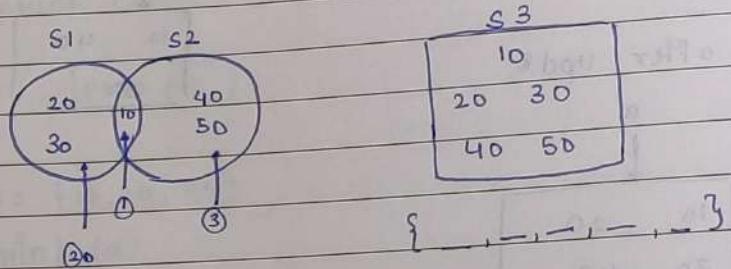
a/p
<class 'tuple'>

```
d = {10}  
print(type(d))
```

a/p
<class 'set'>

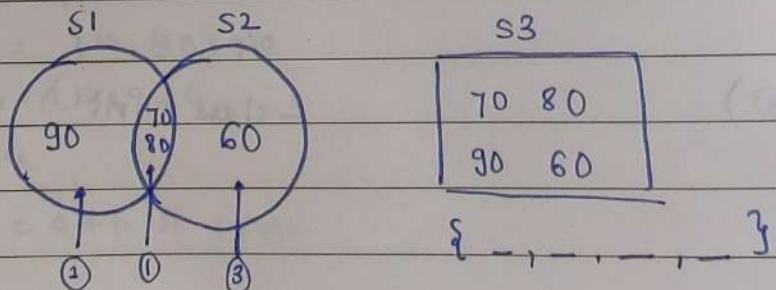
| p174.py |

```
s1 = {10, 20, 30}  
s2 = {10, 40, 50}  
# s3 = s1.union(s2)  
s3 = s1 | s2  
print(s1, s2, s3, sep = "\n")
```



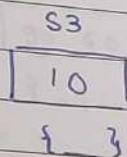
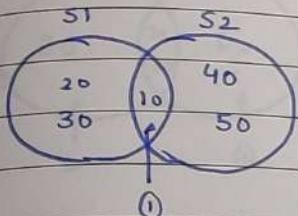
| p175.py |

```
s1 = {10, 80, 90}  
s2 = {60, 70, 80}  
s3 = s1 | s2  
print(s1, s2, s3, sep = "\n")
```



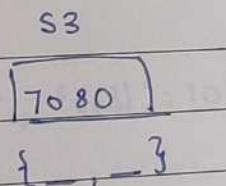
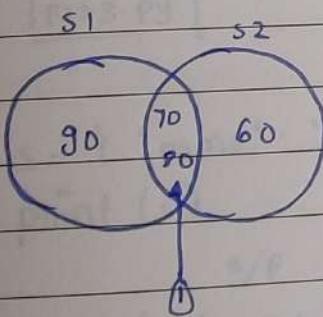
[P176.py]

$S1 = \{10, 20, 30\}$
 $S2 = \{10, 40, 50\}$
 $\# S3 = S1 \cdot \text{intersection}(S2)$
 $S3 = S1 \& S2$
print(S1, S2, S3, sep="\n")



[P177.py]

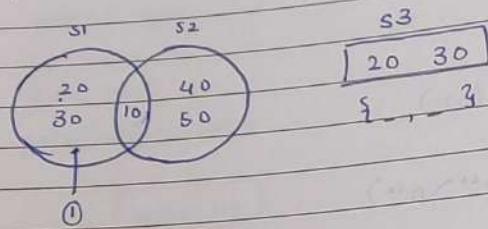
$S1 = \{70, 80, 90\}$
 $S2 = \{60, 70, 80\}$
 $S3 = S1 \& S2$
print(S1, S2, S3, sep="\n")



[P178.py]

$S1 = \{70, 80, 90\}$
 $S2 = \{60, 70, 80\}$
 $\# S3 = S1 \cdot \text{difference}(S2)$
 $S3 = S1 - S2$

`print(s1, s2, s3, sep = "\n")`



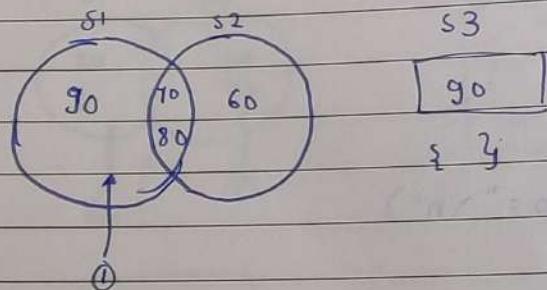
`| P179.py |`

$$s_1 = \{70, 80, 90\}$$

$$s_2 = \{60, 70, 80\}$$

$$s_3 = s_1 \cap s_2$$

`print(s1, s2, s3, sep = "\n")`



`| P180.py |`

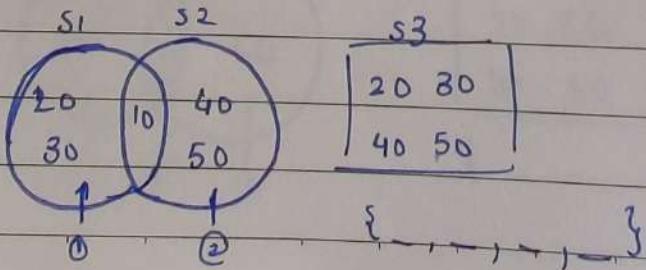
$$s_1 = \{10, 20, 30\}$$

$$s_2 = \{10, 40, 50\}$$

$s_3 = s_1 \cdot \text{symmetric-difference} (s_2)$

$$s_3 = s_1 \Delta s_2$$

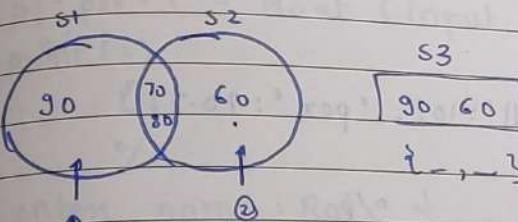
`print(s1, s2, s3, sep = "\n")`



P181.py

 $s1 = \{70, 80, 90\}$ $s2 = \{60, 70, 80\}$ $s3 = s1 \cup s2$

```
print(s1, s2, s3, sep = "\n")
```



P182.py

```
s = {x ** 2 for x in range(10, 21)} # set
```

comprehension

 $\# s = \{100, 121, 144, \dots, 400\}$

```
print(s)
```

P183.py

```
s = {'name': 'Raj', 'roll': 101, 'per': 70.77} # dict
```

```
print(s)
```

o/p

```
{'name': 'Raj', 'roll': 101, 'per': 70.77}
```

S:	[name]	Raj
	['roll']	101
	['per']	70.77

dict : dictionary

key → value

'name' Raj

'roll' 101

'per' 70.77

| P184.py |

s = { 'name': 'Raj', 'roll': 101, 'per': 70.77 }

print(s['name'])

O/P

Raj

print(s['roll'])

101

print(s['per'])

70.77

| P185.py |

s = {} # dic

s['name'] = 'Raj'

s	→	['name']	Raj
		['roll']	101
		['per']	70.77

s['roll'] = 101

s['per'] = 70.77

print(f"Name : { s['name'] }")

print(f"Roll : { s['roll'] }")

print(f"Per : { s['per'] }")

O/P

Name: Raj

Roll : 101

Per : 70.77

[ex6.py]

```
s = dict.fromkeys(['name', 'roll', 'per'])
```

```
s['name'] = input('enter name: ')
s['roll'] = int(input('enter roll: '))
s['per'] = float(input('enter per: '))
print(s)
```

o/p

```
enter name: Raj ↴
enter roll: 201 ↴
enter per: 80.88 ↴
```

```
{'name': 'Raj', 'roll': 201, 'per': 80.88}
```

['name']	Raj
['roll']	201
['per']	80.88

[ex7.py]

dict containing list

```
s = {'name': 'Ravi', 'fruits': ['Mango', 'Kiwi', 'Grapes']}
```

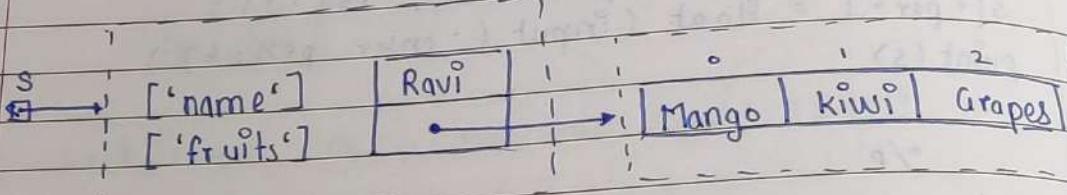
```
print(f'{s["name"]} likes : "')
```

```
for x in s['fruits']: # Mango Kiwi Grapes
```

```
    print(x)
```

```
# end: for
```

Ravi likes:
Mango
Kiwi
Grapes



p188.py

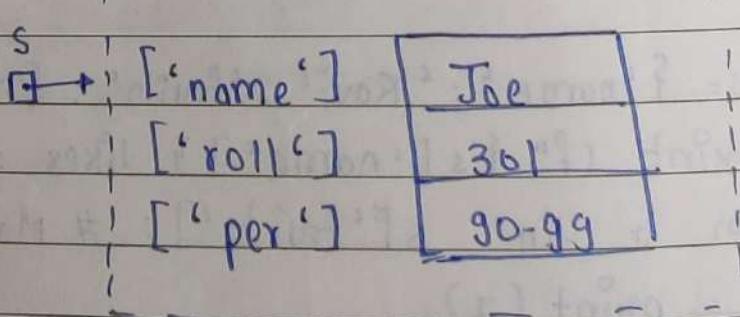
```
s = { 'name' : 'Joe', 'roll': 301, 'per' : 90.99 }  
print('keys :')  
for x in s.keys(): # 'name' 'roll' 'per'  
    print(x)  
# end: for  
print('keys :')  
for x in s: # 'name' 'roll' 'per'  
    print(x)  
# end: for
```

Keys:

name

roll

per



P189.py

```
s = {'name': 'Joe', 'roll': 301, 'per': 90.99}
print ('values :')
for x in s.values():
    print (x)
# end: for
print ('Record :')
for k,v in s.items():
    print (f'{k} : {v}')
# end: for
```

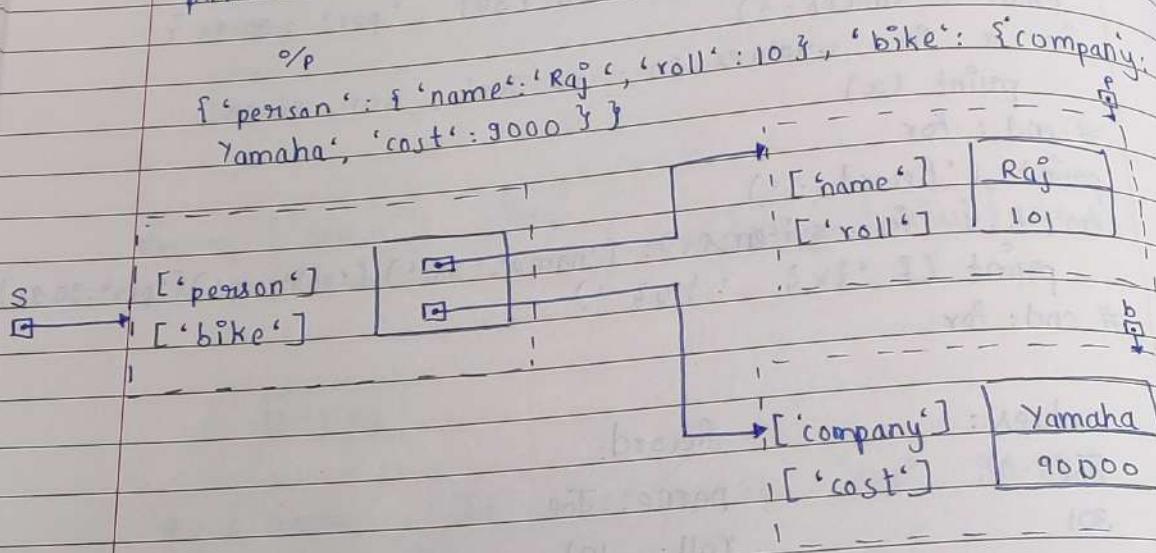
values : Record:
Joe name: Joe
301 roll: 101
90.99 per: 90.99

s	:	['name']	Joe
→		['roll']	301
,		['per']	90.99

P190.py

```
p = {'name': 'Raj', 'roll': 101}
b = {'company': 'Yamaha', 'cost': 90000}
s = {'person': p, 'bike': b}
```

Nested dict (one dict is inside another dict)
print(s)



PIG1.PY

p = { 'name': 'Raj', 'roll': 101 }

b = { 'company': 'Yamaha', 'cost': 90000 }

s = { 'person': p, 'bike': b }

print('keys: ')

```

for k in s.keys(): # 'person', 'bike'
    print(k)
# end: for
print
  
```

```
print ('values : ')
for v in s:
    print(v)
# end: for
```

Keys:

person

bike

values:

```
{'name': 'Raj', 'roll': 101}
```

```
{'company': 'Yamaha', 'cost': 90000}
```

Ass:
name: Raj

roll: 101

company: Yamaha

cost: 90000.

PIG2.PY

```
states = ['Mah', 'UP', 'MP']
```

```
cities = ['Mumbai', 'Lucknow', 'Bhopal']
```

```
d = {k: v for k, v in zip(states, cities)}
```

```
# d = {'Mah': 'Mumba', 'UP': 'Lucknow', 'MP': 'Bhopal'}
```

```
print(d)
```

dict comprehension

d	['Mah']	Mumbai
	['UP']	Lucknow
	['MP']	Bhopal

+ Comprehension

List ✓

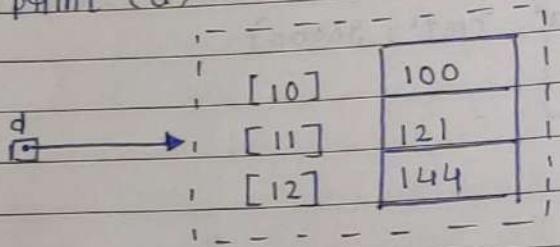
Set ✓

Dict ✓

tuple ✗

[p193.py]

```
d = {x : x * * 2 for x in range(10,13)} # 10 11 12  
# d = {10: 100, 11: 121, 12: 144}  
print(d)
```



[p194.py]

```
# nested list ( 2- Dimensional Arrays )
```

```
a = [[10, 20], [30, 40]]
```

""

```
a = [  
    [10, 20],  
    [30, 40]  
]
```

""

`print(a)`

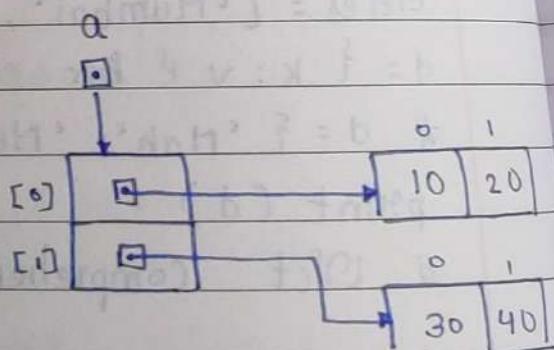
`print('elements are :')`

`print(a[0][0])`

`print(a[0][1])`

`print(a[1][0])`

`print(a[1][1])`



O/P

$[10, 20]$, $[30, 40]$]
elements are:

10

20

30

40

P195.PY

nested list (2 dim arr)

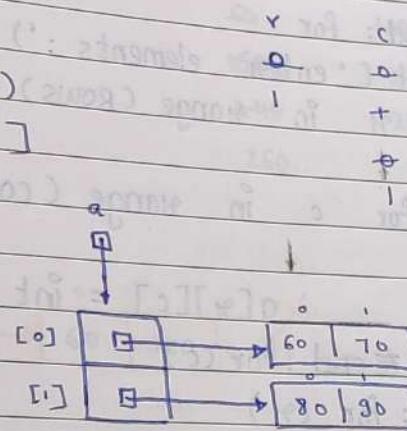
a = $[[0, 0], [0, 1]]$

a[1][0] = 80

a[0][1] = 70

a[1][1] = 90

a[0][0] = 60



for r in range(2): # 0 1

for c in range(2): # 0 1

print(a[r][c], end=' \t')

end: for(c)

print()

end: for(r)

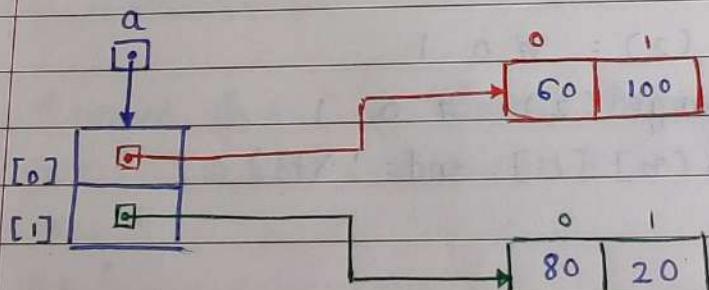
O/P

60	10
80	90

P196.PY

```

ROWS = 2
COLNS = 2
a = [None] * ROWS
for r in range(ROWS):
    a[r] = [None] * COLNS
# end : for
print('enter elements :')
for r1 in range(ROWS): # 0
    for c in range(COLNS): # 0
        a[r1][c] = int(input())
# end : for (r1)
    
```



enter elements :

60 ↴

100 ↴

80 ↴

20 ↴

M T W T F S S
 Page No.:
 Date:
 YOUVA

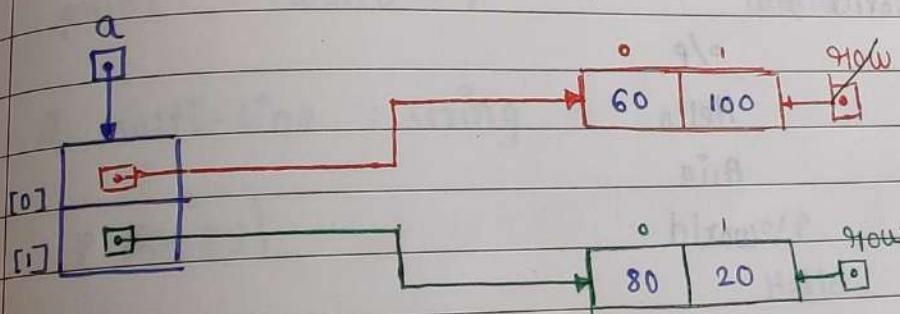
```

s = 0
for row in a : # [ ] []
  for x in row : # [ ] []
    s = s + x
  # end: for(x)
# end: for (row)
print(f' sum: {s}')
  
```

enter elem

sum: 260

s	x
0	60
60	100
160	80
240	20
260	



s = 0

for row in a : # [] []

s = s + sum(row)

end: row

print(f' sum: {s}')

s

0

+60

260

sum: 260

[p198.py]

```
print ('Hello \n Asia \n world')
```

Hello
Asia
World

[p199.py]

```
print ('Hello \n'  
      'Asia \n'  
      'world')
```

o/p

Hello
Asia
world

[p200.py]

a,b,c = 10, 20, 30

```
print (f'a: {a} \n b: {b} \n c: {c}')
```

o/p

a:10

b:20

c:30

[p201.py]

a,b,c = 10, 20, 30

print

print(f'a:{a}\n' f'b:{b}\n' f'c:{c}')

o/p
a:10
b:20
c:30

[P202.py]

print("Hello")

o/p

Hello

print("World")

o/p

World

multi-line : string

[P203.py]

print("Hello\nWorld\nAsia")

o/p

Hello

World

Asia

[P204.py]

print("""Hello\nWorld\nAsia""")

o/p

Hello

World

Asia.

[P205.py]

```

x = int(input('enter a no.: '))
s = x ** 2
print(f' square : {s}')

```

pgm: _____

date: _____

pgmer: _____

'''

pgm: _____

date: _____

pgmer: _____

666

[P206.py]

print('Hello');

o/p

Hello

[P207.py]

print('Hello'); print('World')

o/p

Hello

World

P208.py

a, b, c = 10, 20, 30

print(a, b, c)

o/p
10 20 30

P209.py

a = 10 ; b = 20 ; c = 30

print(a, b, c)

o/p

10, 20 30

P210.py

s = 10 + 20 + 30 + 40 + 50

print(s)

o/p

150

P211.py

s = (10 + 20 + 30 +

40 + 50)

print(s)

o/p

150.