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Python

1 -

```
#
fruits = ["apple", "banana", "cherry"]
numbers = [1, 2, 3, 4, 5]
mixed = ["hello", 42, 3.14, True]

print(" :", fruits)
print(" :", numbers)
print(" :", mixed)
```

```
: ['apple', 'banana', 'cherry']
: [1, 2, 3, 4, 5]
: ['hello', 42, 3.14, True]
```

1.1

```
colors = ["red", "green", "blue"]

#      0
print(f" : {colors[0]}")
print(f" : {colors[-1]}")

#
colors.append("yellow")      #
colors.insert(1, "purple")   #
print(f" : {colors}")

#
colors.remove("purple")      #
last_color = colors.pop()    #
```

```
print(f" : {colors}")
print(f" : {last_color}")
```

```
: red
: blue
: ['red', 'purple', 'green', 'blue', 'yellow']
: ['red', 'green', 'blue']
: yellow
```

1.2

```
numbers = [3, 1, 4, 1, 5, 9, 2, 6]

print(f" : {numbers}")
print(f" : {len(numbers)}")
print(f"1 : {numbers.count(1)}")
print(f"4 : {numbers.index(4)}")

#
numbers.sort()
print(f" : {numbers}")

#
numbers.reverse()
print(f" : {numbers}")

#
squares = [x**2 for x in range(1, 6)]
print(f" : {squares}")
```

```
: [3, 1, 4, 1, 5, 9, 2, 6]
: 8
1 : 2
4 : 2
: [1, 1, 2, 3, 4, 5, 6, 9]
: [9, 6, 5, 4, 3, 2, 1, 1]
: [1, 4, 9, 16, 25]
```

1.3

```
letters = ['a', 'b', 'c', 'd', 'e', 'f', 'g']

print(f"    : {letters}")
print(f" 3 : {letters[:3]}")
print(f" 3 : {letters[-3:]}")
print(f"   : {letters[2:5]}")
print(f"2  : {letters[::2]}")
print(f"   : {letters[::-1]}")
```

```
    : ['a', 'b', 'c', 'd', 'e', 'f', 'g']
 3 : ['a', 'b', 'c']
 3 : ['e', 'f', 'g']
   : ['c', 'd', 'e']
2  : ['a', 'c', 'e', 'g']
   : ['g', 'f', 'e', 'd', 'c', 'b', 'a']
```

2 -

```
#
point = (10, 20)
rgb_color = (255, 128, 0)
person = ("Alice", 25, "Engineer")

print(f" : {point}")
print(f"RGB : {rgb_color}")
print(f" : {person}")

#
print(f"X : {point[0]}")
print(f"Y : {point[1]}")

#
name, age, job = person
print(f" : {name}, : {age}, : {job}")
```

```
 : (10, 20)
RGB : (255, 128, 0)
 : ('Alice', 25, 'Engineer')
X : 10
Y : 20
 : Alice, : 25, : Engineer
```

2.1

```
grades = (85, 92, 78, 92, 88, 92)

print(f" : {grades}")
print(f"92 : {grades.count(92)}")
```

```
print(f"78      : {grades.index(78)}")
print(f"      : {len(grades)}")

#
grades_list = list(grades)
print(f"      : {grades_list}")

new_tuple = tuple([1, 2, 3, 4])
print(f"      : {new_tuple}")
```

```
      : (85, 92, 78, 92, 88, 92)
92    : 3
78    : 2
      : 6
      : [85, 92, 78, 92, 88, 92]
      : (1, 2, 3, 4)
```


3 - -

-

```
#
student = {
    "name": "Alice",
    "age": 20,
    "major": "Computer Science",
    "gpa": 3.8
}

print("  :", student)

#
print(f" : {student['name']}")
print(f"GPA: {student.get('gpa', '   ')}")

# /
student["graduation_year"] = 2025
student["age"] = 21
print("  :", student)
```

```
    : {'name': 'Alice', 'age': 20, 'major': 'Computer Science', 'gpa': 3.8}
    : Alice
GPA: 3.8
    : {'name': 'Alice', 'age': 21, 'major': 'Computer Science', 'gpa': 3.8, 'graduation_year':
```

3.1

```
inventory = {
    "apples": 50,
    "bananas": 30,
    "oranges": 25
```

```

}

print(" :", inventory)

#
print(" :", list(inventory.keys()))
print(" :", list(inventory.values()))
print(" :", list(inventory.items()))

#
print(" :", "apples" in inventory)
print(" :", "grapes" in inventory)

#
removed = inventory.pop("bananas", 0)
print(f" {removed} ")
print(" :", inventory)

: {'apples': 50, 'bananas': 30, 'oranges': 25}
: ['apples', 'bananas', 'oranges']
: [50, 30, 25]
: [('apples', 50), ('bananas', 30), ('oranges', 25)]
: True
: False
30
: {'apples': 50, 'oranges': 25}

```

3.2

```

scores = {"Alice": 95, "Bob": 87, "Charlie": 92}

#
print(" :")
for name in scores:
    print(f" {name}")

#
print(" :")
for score in scores.values():

```

```
        print(f"    {score}")

# -
print("    :")
for name, score in scores.items():
    print(f"    {name}: {score}")
```

```
:
Alice
Bob
Charlie
:
95
87
92
:
Alice: 95
Bob: 87
Charlie: 92
```

4 -

```
#
fruits = {"apple", "banana", "cherry"}
numbers = {1, 2, 3, 4, 5}
mixed_set = {1, "hello", 3.14}

print("    :", fruits)
print("    :", numbers)

#
fruits.add("orange")
print("    :", fruits)

#
fruits.discard("banana") #
print("    :", fruits)
```

```
: {'banana', 'cherry', 'apple'}
: {1, 2, 3, 4, 5}
: {'banana', 'cherry', 'orange', 'apple'}
: {'cherry', 'orange', 'apple'}
```

4.1

```
set_a = {1, 2, 3, 4, 5}
set_b = {4, 5, 6, 7, 8}

print(f"  A: {set_a}")
print(f"  B: {set_b}")

#
```

```

print(f" (A ∪ B): {set_a | set_b}")
print(f" (A ∩ B): {set_a & set_b}")
print(f" (A - B): {set_a - set_b}")
print(f" : {set_a ^ set_b}")

#
print(f"3 A : {3 in set_a}")
print(f"A B : {set_a.issubset(set_b)}")

```

```

A: {1, 2, 3, 4, 5}
B: {4, 5, 6, 7, 8}
(A ∪ B): {1, 2, 3, 4, 5, 6, 7, 8}
(A ∩ B): {4, 5}
(A - B): {1, 2, 3}
: {1, 2, 3, 6, 7, 8}
3 A : True
A B : False

```

5

	RGB
-	
	ID

```
#
shopping_list = ["milk", "bread", "eggs"]      # :
coordinates = (40.7128, -74.0060)              # :
student_grades = {"math": 95, "science": 87}    # :
unique_visitors = {"alice", "bob", "charlie"}  # :
```

6

6.1

```
#
squares = []
for x in range(1, 6):
    squares.append(x**2)
print("  :", squares)

#
squares = [x**2 for x in range(1, 6)]
print("  :", squares)

#
even_squares = [x**2 for x in range(1, 11) if x % 2 == 0]
print("  :", even_squares)

#
words = ["hello", "world", "python"]
uppercase = [word.upper() for word in words]
print("  :", uppercase)
```

```
: [1, 4, 9, 16, 25]
: [1, 4, 9, 16, 25]
: [4, 16, 36, 64, 100]
: ['HELLO', 'WORLD', 'PYTHON']
```

6.2

```
#
names = ["Alice", "Bob", "Charlie"]
```

```
ages = [25, 30, 35]
people = {name: age for name, age in zip(names, ages)}
print(" :", people)

#
squares_dict = {x: x**2 for x in range(1, 6)}
print(" :", squares_dict)

#
high_scores = {name: score for name, score in scores.items() if score > 90}
print(" :", high_scores)
```

```
: {'Alice': 25, 'Bob': 30, 'Charlie': 35}
: {1: 1, 2: 4, 3: 9, 4: 16, 5: 25}
: {'Alice': 95, 'Charlie': 92}
```


7

7.1 1:

```
#
students = []

#
def add_student(name, age, grades):
    student = {
        "name": name,
        "age": age,
        "grades": grades,
        "average": sum(grades) / len(grades)
    }
    students.append(student)

#
add_student("Alice", 20, [95, 87, 92])
add_student("Bob", 19, [78, 84, 88])
add_student("Charlie", 21, [92, 96, 89])

#
print("===      ===")
for student in students:
    print(f" : {student['name']}")
    print(f" : {student['age']}")
    print(f" : {student['grades']}")
    print(f" : {student['average']:.1f}")
    print("-" * 20)
```

```
===      ===
: Alice
: 20
: [95, 87, 92]
```

```

: 91.3
-----
: Bob
: 19
: [78, 84, 88]
: 83.3
-----
: Charlie
: 21
: [92, 96, 89]
: 92.3
-----

```

7.2 2:

```

#
text = "python is great python is powerful python is fun"
words = text.split()

# 1:
word_count = {}
for word in words:
    word_count[word] = word_count.get(word, 0) + 1

print("  :")
for word, count in word_count.items():
    print(f"{word}: {count}")

# 2: Counter collections
from collections import Counter
word_count_2 = Counter(words)
print("\nCounter :", dict(word_count_2))

```

```

:
python: 3
is: 3
great: 1
powerful: 1
fun: 1

```

```
Counter : {'python': 3, 'is': 3, 'great': 1, 'powerful': 1, 'fun': 1}
```

7.3 3:

```
#
math_students = {"Alice", "Bob", "Charlie", "David"}
science_students = {"Bob", "Charlie", "Eve", "Frank"}
english_students = {"Alice", "Charlie", "Eve", "Grace"}

print("  :", math_students)
print("  :", science_students)
print("  :", english_students)

#
both_math_science = math_students & science_students
print("    :", both_math_science)

all_students = math_students | science_students | english_students
print("  :", all_students)

only_math = math_students - science_students - english_students
print("  :", only_math)

: {'Bob', 'Charlie', 'David', 'Alice'}
: {'Bob', 'Eve', 'Charlie', 'Frank'}
: {'Eve', 'Charlie', 'Grace', 'Alice'}
: {'Bob', 'Charlie'}
: {'Bob', 'Eve', 'David', 'Charlie', 'Frank', 'Grace', 'Alice'}
: {'David'}
```

8

8.1

- 1.
- 2.
- 3.
- 4.
5. `remove()` `pop()`

8.2

1. **2**
2. **2**
- 3.
- 4.

8.3

- 1.
2. -
3. -
4. `my_list[-1]` `my_list[len(my_list)-1]`
5. `remove()` `pop()`

9

- 1.
- 2.
3. `get()`
- 4.
- 5.

10

1. -
- 2.
3. `is ==`
4. Python 3.7+

11

```
import time

#      vs
large_list = list(range(10000))
large_set = set(range(10000))

#
start = time.time()
9999 in large_list
list_time = time.time() - start

#
start = time.time()
9999 in large_set
set_time = time.time() - start

print(f"      : {list_time:.6f} ")
print(f"      : {set_time:.6f} ")
print(f"      {list_time/set_time:.1f} ")
```

```
: 0.000073
: 0.000016
4.6
```

12

Python

13

- [Python](#)
- [Real Python: Python](#)
- [Collections](#)