

# Dictionary

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## Introduction to Dictionaries

A dictionary in Python is an unordered collection of key-value pairs. It is also referred to as an associative array, hash table, or hash map in other programming languages. Dictionaries are defined by curly braces `{ }` and contain key:value pairs.

The key features of dictionaries are:

- They are mutable (can be modified after creation)
- Keys must be unique and immutable (strings, numbers, or tuples)
- Values can be of any type
- They are unordered (in Python versions < 3.7)

## Creating Dictionaries

There are multiple methods to create dictionaries in Python. Consider the following examples:

- Empty dictionary

```
empty_dict = {}  
print("Empty dictionary:", empty_dict)
```

Empty dictionary: `{}`

- Dictionary with initial key-value pairs

```
person = {"name": "Alice", "age": 30, "city": "New York"}  
print("Person dictionary:", person)
```

Person dictionary: `{'name': 'Alice', 'age': 30, 'city': 'New York'}`

- Using `dict()` constructor

```
another_person = dict(name="Bob", age=25, city="San Francisco")
print("Another person dictionary:", another_person)
```

Another person dictionary: {'name': 'Bob', 'age': 25, 'city': 'San Francisco'}

- Creating a dictionary from two lists using zip()

```
keys = ["a", "b", "c"]
values = [1, 2, 3]
combined = dict(zip(keys, values))
print("Combined dictionary:", combined)
```

Combined dictionary: {'a': 1, 'b': 2, 'c': 3}

## Accessing and Modifying Dictionary Elements

The contents of dictionaries can be access using [key] or get() method.

```
person = {"name": "Alice", "age": 30, "city": "New York"}

# Using square bracket notation
print("Name:", person["name"])

# Using get() method
print("Age:", person.get("age"))

# Using get() with a default value
print("Country:", person.get("country", "Unknown"))
```

Name: Alice  
Age: 30  
Country: Unknown

The get() method is particularly useful as it allows for the specification of a default value if the key does not exist.

## Modifying Dictionary Elements

These operations illustrate the dynamic nature of dictionaries.

```

person = {"name": "Alice", "age": 30, "city": "New York"}

# Changing a value
person["age"] = 31
print("Updated age:", person["age"])

# Adding a new key-value pair
person["job"] = "Engineer"
print("Updated dictionary:", person)

# Updating multiple key-value pairs
person.update({"age": 32, "country": "USA"})
print("Dictionary after update:", person)

```

Updated age: 31

Updated dictionary: {'name': 'Alice', 'age': 31, 'city': 'New York', 'job': 'Engineer'}

Dictionary after update: {'name': 'Alice', 'age': 32, 'city': 'New York', 'job': 'Engineer', 'country': 'USA'}

These operations illustrate the dynamic nature of dictionaries.

```

# Removing a key-value pair
del person["city"]
print("Dictionary after deletion:", person)

# Removing and returning a value
job = person.pop("job")
print("Removed job:", job)
print("Dictionary after pop:", person)

```

Dictionary after deletion: {'name': 'Alice', 'age': 32, 'job': 'Engineer', 'country': 'USA'}

Removed job: Engineer

Dictionary after pop: {'name': 'Alice', 'age': 32, 'country': 'USA'}

## Dictionary Methods

Python provides several useful methods for working with dictionaries:

```

person = {"name": "Alice", "age": 30, "city": "New York"}

# Get all keys
print("Keys:", person.keys())

# Get all values

```

```

print("Values:", person.values())

# Get all key-value pairs
print("Items:", person.items())

# Clear the dictionary
print("After clear:", person.clear())

```

Keys: dict\_keys(['name', 'age', 'city'])  
 Values: dict\_values(['Alice', 30, 'New York'])  
 Items: dict\_items([('name', 'Alice'), ('age', 30), ('city', 'New York')])  
 After clear: None

To copy a dictionary:

```

# Create a new reference
original = {"x": 1, "y": 2}
reference = original
reference["z"] = 3
print("Original:", original)
print("Reference:", reference)

```

Original: {'x': 1, 'y': 2, 'z': 3}  
 Reference: {'x': 1, 'y': 2, 'z': 3}

```

# Create a copy
original = {"x": 1, "y": 2}
copy = original.copy()
copy["z"] = 3
print("Original:", original)
print("Copy:", copy)

```

Original: {'x': 1, 'y': 2}  
 Copy: {'x': 1, 'y': 2, 'z': 3}