CSIT881
Programming and Data Structures

Dictionary

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Objectives

- Dictionary
- Problem solving with Dictionary

Dictionary

used to store key-value pairs

```
empty = {}  # this is an empty dictionary

person = {
   "first_name": "Amanda",
   "last_name": "Smith",
   "age": 20
} # information about a person

state_abb = {
   "NSW": "New South Wales",
   "ACT": "Australian Capital Territory",
   "NT": "Northern Territory",
   "QLD": "Queensland",
   "SA": "South Australia",
   "TAS": "Tasmania",
   "VIC": "Victoria",
   "WA": "Western Australia"
} # Australian state abbreviations
```

Dictionary

Two main purposes:

- Grouping data together (like class/object)

```
person = {
  "first_name": "Amanda",
  "last_name": "Smith",
  "age": 20
}
```

- Mapping

```
state_abb = {
  "NSW": "New South Wales",
  "ACT": "Australian Capital Territory",
  "NT": "Northern Territory",
  "QLD": "Queensland",
  "SA": "South Australia",
  "TAS": "Tasmania",
  "VIC": "Victoria",
  "WA": "Western Australia"
}
```

Dictionary

- Mapping

```
digit_to_word = {
    0: "zero",
    1: "one",
    2: "two",
    3: "three",
    4: "four",
    5: "five",
    6: "six",
    7: "seven",
    8: "eight",
    9: "nine"
}
```

Dictionary

- Mapping

```
word_to_digit = {
    "zero": 0,
    "one": 1,
    "two": 2,
    "three": 3,
    "four": 4,
    "five": 5,
    "six": 6,
    "seven": 7,
    "eight": 8,
    "nine": 9
}
```

Dictionary

```
person = {
  "first_name": "Amanda",
  "last_name": "Smith",
  "age": 20
}
```

using function `print` to print out the whole dictionary

```
print(person)
```

Dictionary - get value

```
person = {
  "first_name": "Amanda",
  "last_name": "Smith",
  "age": 20
}
```

Values can be retrieved using function **get** with the corresponding keys:

```
first_name = person.get("first_name")    → "Amanda"

last_name = person.get("last_name")      → "Smith"

age = person.get("age")                  → 20

address = person.get("address")          → None
```

None

```
person = {
  "first_name": "Amanda",
  "last_name": "Smith",
  "age": 20
}
```

In Python, `None` is equivalent to null in other programming languages:

```
email = person.get("email")        # → None

if (email is None):
  print("User has no email")
else:
  print("User email is " + email)
```

Dictionary - get value with default value

```
person = {
  "first_name": "Amanda",
  "last_name": "Smith",
  "age": 20
}
```

We can specify a **default value** in the function `get` if the key-value pair is not found:

```
std_type = person.get("student_type", "N/A")   # → "N/A"

credit_point = person.get("credit_point", 0)   # → 0
```

Dictionary - get value

```
digit_to_word = {
    0: "zero",
    1: "one",
    2: "two",
    3: "three",
    4: "four",
    5: "five",
    6: "six",
    7: "seven",
    8: "eight",
    9: "nine"
}

print(digit_to_word.get(7))
```

Dictionary - get value

```
word_to_digit = {
    "zero": 0,
    "one": 1,
    "two": 2,
    "three": 3,
    "four": 4,
    "five": 5,
    "six": 6,
    "seven": 7,
    "eight": 8,
    "nine": 9
}

print(word_to_digit.get("eight"))
```

Dictionary - update values

```
person = {
  "first_name": "Amanda",
  "last_name": "Smith",
  "age": 20
}
```

we can change the existing values:

```
person["first_name"] = "Mandy"
person["last_name"] = "Jones"
person["age"] = 24
```

Dictionary - add new key-value

```
person = {
  "first_name": "Amanda",
  "last_name": "Smith",
  "age": 20
}
```

we can add new key-value pair:

```
person["email"] = "Mandy.Jones@gmail.com"
person["gpa_score"] = 3.5
```

Dictionary - delete key-value

```
person = {
  "first_name": "Mandy",
  "last_name": "Jones",
  "age": 24,
  "email": "Mandy.Jones@gmail.com"
}
```

we can delete a key-value pair:

```
del person["email"]
```

we can delete **all** key-value pairs, the dictionary becomes empty:

```
person.clear()
```

Dictionary - get all keys

```
person = {
  "first_name": "Amanda",
  "last_name": "Smith",
  "age": 20
}
```

We can get the list of all keys:

```
all_keys = person.keys()

for key in all_keys:
  print(key)
```

Dictionary - get all values

```
person = {
  "first_name": "Amanda",
  "last_name": "Smith",
  "age": 20
}
```

We can get the list of all values:

```
all_values = person.values()

for value in all_values:
  print(value)
```

Capital cities

```
capital_city = {
  "Australia": "Canberra",
  "Denmark": "Copenhagen",
  "Ireland": "Dublin",
  "New Zealand": "Wellington",
  "Nepal": "Kathmandu"
}

# ask user to enter country
country = input("Enter country: ")

# retrieve the capital city
capital = capital_city.get(country)

# display capital
print("Capital city of {0} is {1}".format(country, capital))
```

```
Enter country: Australia
Capital city of Australia is Canberra
```

Capital cities

```
capital_city = ...

# ask user to enter country
country = input("Enter country: ")

# retrieve the capital city
capital = capital_city.get(country)

# display capital
if capital is None:
  print("Sorry I don't know the capital city of " + country)
else:
  print("Capital city of {0} is {1}".format(country, capital))
```

```
Enter country: Atzovia
Sorry I don't know the capital city of Atzovia
```

State abbreviation

```
state_abb = {
  "NSW": "New South Wales",
  "ACT": "Australian Capital Territory",
  "NT": "Northern Territory",
  "QLD": "Queensland",
  "SA": "South Australia",
  "TAS": "Tasmania",
  "VIC": "Victoria",
  "WA": "Western Australia"
}

# ask user to enter state code
state_code = input("Enter state NSW/ACT/NT/QLD/SA/TAS/VIC/WA: ")

# retrieve the state name
state_name = state_abb.get(state_code)

print("The state you entered is " + state_name)
```

```
Enter state NSW/ACT/NT/QLD/SA/TAS/VIC/WA: NT
The state you entered is Northern Territory
```

Example: Subject selection

```
Welcome to subject enrolment

Enter subject code: MATH111
Enter credit point: 10

Add more subjects? Y/N: Y
Enter subject code: CS222
Enter credit point: 4

Add more subjects? Y/N: Y
Enter subject code: LOGIC333
Enter credit point: 5

Add more subjects? Y/N: N

Subject code                CP
MATH111                     10
CS222                        4
LOGIC333                     5
```

Example: Subject selection

```
Welcome to subject enrolment

Enter subject code: MATH111
Enter credit point: 10

Add more subjects? Y/N: Y
Enter subject code: CS222
Enter credit point: 4

Add more subjects? Y/N: Y
Enter subject code: LOGIC333
Enter credit point: 5

Add more subjects? Y/N: N

Subject code                CP
MATH111                     10
CS222                        4
LOGIC333                     5
```

Put subject information into a **dictionary**

```
{
  "code": "MATH111",
  "cp": 10
}
```

```
{
  "code": "CS222",
  "cp": 4
}
```

```
{
  "code": "LOGIC333",
  "cp": 5
}
```

Put all these dictionaries into a **list**

Example: Subject selection

```
# display greeting
print("Welcome to subject enrolment")

# create a list to store subject dictionaries
subject_list = []

while True:
  # ask user to enter subject info
  ...

  # create a dictionary to hold subject info
  subject = ...

  # add subject to list
  subject_list.append(subject)

  # ask user if they want to continue
  more_subject = input("Add more subjects? Y/N: ")
  if (more_subject == "N"):
    break
```

Example: Subject selection

```
...
while True:
  # ask user to enter subject info
  subject_code = input("Enter subject code: ")
  user_input = input("Enter credit point: ")
  subject_cp = int(user_input)

  # create a dictionary to hold subject info
  subject = {
    "code": subject_code,
    "cp": subject_cp
  }

  # add subject to list
  subject_list.append(subject)

  # ask user if they want to continue
  more_subject = input("Add more subjects? Y/N: ")
  if (more_subject == "N"):
    break
```

Example: Subject selection

```
...
# display the selected subjects
print("{0:<15}{1:>15}".format("Subject code", "CP"))

for i in range(0, len(subject_list)):
  # get the ith subject from the list
  # which is a dictionary
  subject = subject_list[i]

  # get subject info out of the dictionary
  subject_code = subject.get("code")
  subject_cp = subject.get("cp")

  # display subject info
  print("{0:<15}{1:>15}".format(subject_code, subject_cp))
```

```
Subject code                 CP
MATH111                      10
CS222                         4
LOGIC333                      5
```

Problem solving

```
Please enter numerical code: 017689

You have entered: zero-one-seven-six-eight-nine
```