

Dictionaries

CSSE 120—Rose Hulman Institute of Technology

Data Collections

- Frequently several individual pieces of data are related
- We can collect them together in one object
- Examples:
 - ▣ A **list** or **tuple** contains an ordered sequence of items
 - ▣ A **string** contains an ordered sequence of characters
 - ▣ A **custom object**. Example from zellegraphics: A **Line object** contains two endpoints, a color, and the window in which it is drawn
 - ▣ A **dictionary** (defined soon) contains key-value pairs

List - review

- an ordered collection of items
- Usually homogeneous (all items of the same type), but Python does not require this
- Access is **by position** (index) in the list
 - ▣

```
>>> animals = ['dog', 'cat', 'cow']  
>>> animals[1]  
'cat'  
>>> animals[1:3]  
['cat', 'cow']  
>>> animals[1] = ['pig']  
>>> animals  
['dog', 'pig', 'cow']
```

More list mutations

- Items can be added, removed, or replaced

- ▣

```
>>> animals = ['dog', 'cat', 'cow']
>>> animals.append('pig')
>>> animals
['dog', 'cat', 'cow', 'pig']
>>> animals[1:3] = ['cow', 'cat', 'goat']
>>> animals
['dog', 'cow', 'cat', 'goat', 'pig']
>>> animals[1:2] = []
>>> animals
['dog', 'cat', 'goat', 'pig']
```

Dictionary

- A collections object in which each item is a **key-value** pair
- No two items may have the same key
 - ▣ So a dictionary is a function (in the mathematical sense)
- Items are not stored in any particular order
- Typically all keys are same type (not required)
- Keys must be immutable (i.e., number, string, tuple)
- Access to items is by key
 - ▣ key's purpose is similar to list's index
 - ▣ syntax also similar

Your turn

- Open IDLE and make a quick dict

- Try the following:

```
>>> myDict = {'name':'Dave', 'gpa':3.5}
```

```
>>> print myDict
```

```
>>> myDict['name']
```

```
>>> myDict['gpa']
```

```
>>> dir(dict)
```

Dictionary methods

Assume that there is a dictionary named dict1

- `dict1.get(k [,d])` → if k is a key in the dictionary return the value for that key, else return d. d is an optional parameter
- `dict1.has_key(k)` → True if dict1 has a key k, else False
- `dict1.items()` → list of dict1's (key, value) pairs, as tuples
- `dict1.keys()` → list of dict1 's keys
- `dict1.pop(k [,d])` → remove key and return value
- `dict1.values()` → list of dict1 's values
- Open [dictionaryMethods.py](#)

Another dictionary example

- `gradeLowestScore = { } # empty dictionary`
`gradeLowestScore['A'] = 89.5`
`gradeLowestScore['B+'] = 84.5`
`gradeLowestScore['B'] = 79.5`
`gradeLowestScore['C+'] = 74.5`
`gradeLowestScore['C'] = 69.5`
`gradeLowestScore['D+'] = 64.5`
`gradeLowestScore['D'] = 59.5`
`gradeLowestScore['F'] = 0.0`
- `difference = gradeLowestScore['B'] - gradeLowestScore['C']`

dict initialization & operations

```
□ >>> gradeLowestScore = {'A':89.5, 'B+':84.5, 'B':79.5,
                           'C+':74.5, 'C':69.5, 'D+':64.5, 'D': 59.5, 'F': 0.0}
>>> gradeLowestScore['C']
69.5
>>> gradeLowestScore['C'] = 68.0 # new value for key 'C'
>>> gradeLowestScore.keys()
['A', 'C+', 'C', 'B', 'D+', 'F', 'D', 'B+']
>>> gradeLowestScore.values()
[89.5, 74.5, 68.0, 79.5, 64.5, 0.0, 59.5, 84.5]
>>> gradeLowestScore.items()
[('A', 89.5), ('C+', 74.5), ('C', 68.0), ('B', 79.5), ('D+',
64.5), ('F', 0.0), ('D', 59.5), ('B+', 84.5)]
>>> gradeLowestScore.pop('C') # remove 'C' item
68.0
>>> 'C' in gradeLowestScore
False
>>> 'D' in gradeLowestScore
True
```

dict's *get* method

- What if we try to find the lowest score for an "E" grade?
- ```
>>> gradeLowestScore['E']
```

```
Traceback (most recent call last):
 File "<pyshell#2>", line 1, in <module>
 gradeLowestScore['E']
KeyError: 'E'
```
- The **get** method has a similar purpose, but lets us provide a value to return if the key we search for is not in the dictionary:
- ```
>>> gradeLowestScore.get('E', 'No such key')
```

```
'No such key'
```

Two main dictionary uses

- A collection of similar objects
 - ▣ Designed for fast lookup by key
- Storing different properties of a single object

Use 1: Collection of similar objects

□ Examples:

- ▣ A movie database in which we use the title as the key and look up the director.
- ▣ A phone database in which we use the person's name as the key and look up the phone number

□ In-class exercise

- ▣ Create a concordance for a text file.
- ▣ This is just a list of words in the file and the line numbers on which each word occurs

Use 2: Properties of a single object

- Represent a card (blackjack) as a dictionary
- properties: 'cardName', 'suit', 'value'

```
# A card is represented by a dictionary with keys  
# cardName, suit, and value
```

```
def makeCard (cardName, suit):  
    card = {}  
    card['suit'] = suit  
    card['cardName'] = cardName  
    card['value'] = cardValue(cardName)  
    return card
```