

Objectives

- Indefinite Loops
- Dictionaries

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Review

- How can we make something repeat when some condition is true?
- True or False: Every **for** loop can be converted into a **while** loop
- True or False: A **while** loop is more powerful than a **for** loop

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2

Review: While Loop Syntax

while condition :
statement1
statement2
...
statementn

keyword

body of while loop

loop stops when condition is False

- Like a looped **if** statement
 - Execute statements **only** when condition is true

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Another Way to Read from a File

```
FILENAME="data/years.dat"
dataFile = open(FILENAME, "r")
line = dataFile.readline()
while line != "":
    line = line.rstrip()
    print(line)
    line = dataFile.readline()
dataFile.close()
```

file_read_while.py

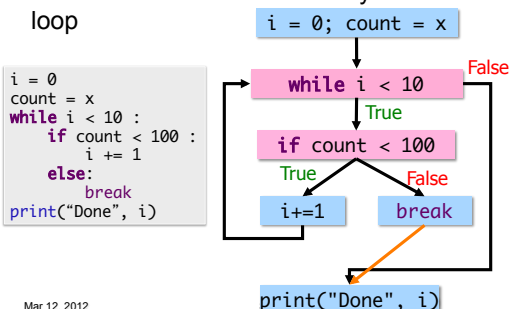
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Use of break statement

- **break** statement can “break you” out of a loop



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while Loops: comparing use of break

```
# condition says when loop
# will continue
x=eval(input("Enter number:"))
while x % 2 != 0 :
    print("Error!")
    x = eval(input("Try
again: "))
print(x, "is an even number.")
```

Says when to keep going

```
# have to look inside loop to
# know when it stops
while True :
    x = eval(input("Enter number:"))
    if x % 2 == 0 :
        break
    print("Error")
print(x, "is an even number.")
```

Says when to stop

Using break statements:
Best when loop has to
execute at least once.

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Flipping Coins

- Problem: How many flips does it take to get 3 consecutive heads?

`consecutiveHeads.py`

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How Does `in` Work for Lists?

- Example: `guess in prevGuesses`, where `prevGuesses` is a list object
 - For each element in list, checks if element equals (`==`) `guess`
- In the worst case, how many elements does `in` have to check?
 - How could we improve the search?

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Faster Lookups

- In my phone's contacts app, if I wanted to know my friend's phone number, ...
 - Would I search through an ordered list of phone numbers?
 - No, I would look up my friend and find the phone number **associated** with my friend
- This type of data structure is known as a **dictionary** in Python
 - Maps a **key** to a **value**
 - Contacts' key: "Friend's name", value: phone number

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Examples of Dictionaries

| Dictionary | Keys | Values |
|--------------------------------|------|--------|
| Dictionary | | |
| Textbook's index | | |
| Cookbook | | |
| URL (Uniform Resource Locator) | | |

- Any other things we've done/used in class?

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10

Examples of Dictionaries

| Dictionary | Keys | Values |
|--------------------------------|-----------|-------------|
| Dictionary | Word | Definition |
| Textbook's index | Keyword | Page number |
| Cookbook | Food type | Recipes |
| URL (Uniform Resource Locator) | URL | Web page |

- Any other things we've done/used in class?

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11

Examples of Dictionaries

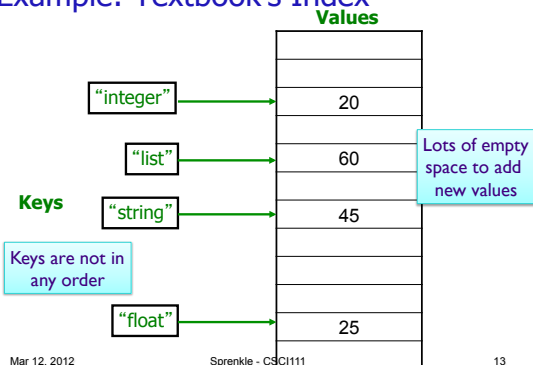
- Real-world:
 - Dictionary
 - Textbook's index
 - Cookbook
 - URL (Uniform Resource Locator)
- Examples from class
 - Variable name → value
 - Function name → function definition
 - ASCII value → character

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Example: Textbook's Index



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Dictionaries in Python

- Map **keys** to **values**
 - Keys are probably **not** alphabetized
 - Mappings are from **one** key to **one** value
 - Keys are **unique**, Values are not necessarily unique
 - Example: student id → last name
 - Keys must be **immutable** (numbers, strings)
- Similar to Hashtables/Hashmaps in other languages

How would we handle if there is more than one value for a given key?

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Why Dictionaries?

- Another way to store data
- Allow fast lookup of data
 - Requires keys, unique keys
 - Data may not have a natural mapping

| Pros | Cons |
|---|--------------------------------------|
| Fast lookup (<i>much</i> faster than lists if a lot of elements) | Requires a lot of space, unique keys |

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Creating Dictionaries in Python

Syntax:

```
{<key>:<value>, ..., <key>:<value>}
```

```
empty = {}
ascii = { 'a':97, 'b':98, 'c':99, ..., 'z':122 }
```

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Dictionary Operations

| | |
|--------------------|----------------------|
| Indexing | <dict>[<key>] |
| Length (# of keys) | len(<dict>) |
| Iteration | for <key> in <dict>: |
| Membership | <key> in <dict> |
| Deletion | del <dict>[<key>] |

Unlike strings and lists, doesn't make sense to do slicing, concatenation, repetition for dictionaries

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Dictionary Methods

| Method Name | Functionality |
|---------------------------|---|
| <dict>.clear() | Remove all items from dictionary |
| <dict>.keys() | Returns a <i>copy</i> of dictionary's list of keys |
| <dict>.values() | Returns a <i>copy</i> of dictionary's list of values |
| <dict>.get(x [, default]) | Returns <dict>[x] if x is a key; Otherwise, returns None (or default value) |

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Accessing Values using Keys

- Syntax:
`<dictionary>[<key>]`
- Examples:

```
ascii['z']  
contacts['friendname']
```

- **KeyError** if key is not in dictionary
 - Runtime error; exits program

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Accessing Values Using get Method

- `<dict>.get(x [,default])`
 - Returns `<dict>[x]` if `x` is a key; Otherwise, returns `None` (or default value)

```
ascii.get('z')  
directory.get('friendname')
```

- If no mapping, get **None** back instead of **KeyError**

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Accessing Values

- Typically, you will check if dictionary has a key before trying to access the key

```
if 'friend' in contacts:  
    number = contacts['friend']
```

Know mapping exists
before trying to access

- Or handle if get default back

```
number = contacts.get('friend')  
if number is None:  
    # do something ...
```

No phone number exists

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Recall: Special Value None

- Special value we can use
 - E.g., Return value from function when there is an error
- Similar to **null** in Java

- If you execute

```
list = list.sort()  
print(list)
```

- Prints `None` because `list.sort()` does **not** return anything

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Example Using None

```
# returns the lowercase letter translated by the key.  
# If letter is not a lowercase letter, returns None  
def translateLetter( letter, key ):  
    if letter < 'a' or letter > 'z':  
        return None  
    #As usual ...
```

```
# example use  
encLetter = translateLetter(char, key)  
if encLetter is None:  
    print("Error in message: ", char)
```

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Inserting Key-Value Pairs

- Syntax:
`<dictionary>[<key>] = <value>`
- `ascii['a'] = 97`
 - Creates new mapping of 'a' → 97

ascii_dictionary.py

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24

Textbook's Index

bookindex["dictionary"]=58

Keys

"integer"

→ 20

"list"

→ 60

"string"

→ 45

"float"

→ 25

Values

| |
|----|
| |
| |
| 20 |
| 60 |
| 45 |
| |
| |
| 25 |
| |

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25

Textbook's Index

bookindex["dictionary"]=58

Keys

"integer"

→ 20

"list"

→ 60

"string"

→ 45

"dictionary"

→ 58

"float"

→ 25

Values

| |
|----|
| |
| |
| 20 |
| 60 |
| 45 |
| 58 |
| |
| 25 |
| |

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26

Adding/Modifying Key-Value Pairs

- Syntax:
 <dictionary>[<key>] = <value>
- directory['registrar'] = 8455
 - Adds mapping for 'registrar' to 8455
- OR
- Modifies old entry if it existed to 8455

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27

This Week

- Lab 8
 - Function/Module practice
 - Indefinite loops
 - Exception handling
- 7:30 p.m. Talk by Katherine Crowley
 - Stackhouse Theater
 - Answer questions on Sakai
- Wed class: 2:05 p.m.-2:50 p.m.
- Broader Issue: Sensor Networks

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28