



# Introduction to Programming

## CS101

Fall 2011

Lecture #9



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## Introduction to Department of Computer Science

- Date: November 14th, Monday
- Time: 6PM
- Place: E11, Terman Hall



## TA Office Hour

- TAs will review the lectures for the remaining six weeks of TA Office Hour at 307 E11.
- Students who experience difficulties with Python are mostly welcome.
- Unfortunately, the lecture will be in Korean.
- The usual TA Office Hour will be at 308 E11.



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Last week we learned

- Objects
  - object creation
  - object attributes



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  - object creation
  - object attributes

This week we will learn

- Files
  - reading from a file
  - writing to a file
- break
- continue



---

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Mercury

Venus

Earth

Mars

Jupiter

Saturn

Uranus

Neptune



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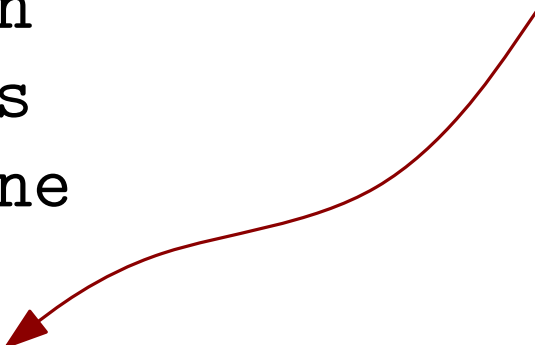
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>>> f = open("C:/CS101/planets.txt", "r")  
>>> s = f.readline()  
>>> s, len(s)  
( 'Mercury\n', 8)
```



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line separator in file



## Reading strings from a file

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Venus Earth Mars Jupiter Saturn Uranus Neptune
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`for`-loop with a file object calls `readline()` automatically for each element, and stops after reading the last line.



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`for`-loop with a file object calls `readline()` automatically for each element, and stops after reading the last line.

Call `f.close()` when finished with the file object.



A typical program for reading the contents of an entire file and storing it in a list:

```
planets = []

f = open("C:/CS101/planets.txt", "r")
for line in f:
    planets.append(line.strip())
f.close()

print planets
```



A typical program for reading the contents of an entire file and storing it in a list:

```
planets = []  
  
f = open("C:/CS101/planets.txt", "r")  
for line in f:  
    planets.append(line.strip())  
f.close()  
  
print planets
```

In fact, file objects provide a method to do this (but then you get all the white space):

```
planets = f.readlines()
```





We want to find the line in the file containing earth:

```
f = open("C:/CS101/planets.txt", "r")
current = 0
earth = 0
for line in f:
    current += 1
    planet = line.strip().lower()
    if planet == "earth":
        earth = current
print "Earth is planet #%d" % earth
```



We want to find the line in the file containing earth:

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f = open("C:/CS101/planets.txt", "r")
current = 0
earth = 0
for line in f:
    current += 1
    planet = line.strip().lower()
    if planet == "earth":
        earth = current
print "Earth is planet #%d" % earth
```

The program reads the entire file, even if earth is right at the beginning. After having found earth, there is no need to continue the loop.



The keyword **break** terminates the current loop:

```
f = open("C:/CS101/planets.txt", "r")
earth = 0
for line in f:
    earth += 1
    planet = line.strip().lower()
    if planet == "earth":
        break
print "Earth is planet #%d" % earth
```



The keyword **break** terminates the current loop:

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f = open("C:/CS101/planets.txt", "r")
earth = 0
for line in f:
    earth += 1
    planet = line.strip().lower()
    if planet == "earth":
        break
print "Earth is planet #%d" % earth
```

**break** breaks out of the innermost loop only:

```
>>> for x in range(10):
...     for y in range(10):
...         print y,
...         if y == 5: break
```



---

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```
f = open("C:/CS101/planet.sc.txt", "r")
earth = 0
for line in f:
    planet = line.strip().lower()
    if planet[0] == "#":
        continue
    earth += 1
    if planet == "earth":
        break
print "Earth is planet #%d" % earth
```



Some data files contain useful comments, let's say starting with a # sign.

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f = open("C:/CS101/planet.sc.txt", "r")
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for line in f:
    planet = line.strip().lower()
    if planet[0] == "#":
        continue
    earth += 1
    if planet == "earth":
        break
print "Earth is planet #%d" % earth
```

`continue` makes the loop move to the next element immediately



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Let's do some word games. We use a file `words.txt` with 113809 English words (<http://icon.shef.ac.uk/Moby/>).





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Let's print all English words longer than 18 letters:

```
f = open("C:/CS101/words.txt", "r")
```

```
for line in f:
    word = line.strip()
    if len(word) > 18:
        print word
```

```
f.close()
```



Count all the words without the letter 'e':

```
f = open("C:/CS101/words.txt", "r")

count = 0
for line in f:
    word = line.strip()
    if not "e" in word:
        count += 1

print "%d words have no 'e'" % count
f.close()
```



Let's find all words whose letters are sorted:

```
def is_abecedarian(word):  
    for i in range(1, len(word)):  
        if word[i-1] > word[i]:  
            return False  
    return True  
  
f = open("C:/CS101/words.txt", "r")  
  
for line in f:  
    word = line.strip()  
    if is_abecedarian(word):  
        print word  
  
f.close()
```



## Three double letters in a row?

---

Is there a word that has three double letters in a row?

Committee and Mississippi are close...



## Three double letters in a row?

Is there a word that has three double letters in a row?

Committee and Mississippi are close...

```
def three_doubles(word):  
    s = ""  
    for i in range(1, len(word)):  
        if word[i-1] == word[i]:  
            s = s + "*"  
        else:  
            s = s + " "  
    return "* * *" in s
```



---

We can also create and write to files:

```
f = open("C:/CS101/test.txt", "w")  
f.write("CS101 is fantastic\n")  
f.close()
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f = open("C:/CS101/test.txt", "w")  
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Use mode `"w"` to open a file for writing.

The file object has a method `write(text)` to write to the file. Unlike `print`, this does not start a new line after the `text`, not even a single space. Use `\n` to include a line break.





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The file object has a method `write(text)` to write to the file. Unlike `print`, this does not start a new line after the `text`, not even a single space. Use `\n` to include a line break.

Do not forget to `close()` the file—otherwise, the file contents may be incomplete.



---

Let's exercise with a currency exchange rate data set. We use files `1994.txt` ... `2009.txt` with the KRW-USD exchange rate for every day. ([www.oanda.com](http://www.oanda.com))

2009/05/11	0.00080110
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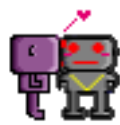


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We first read the entire data set (16 files) into a long list of pairs:

```
[... (20091227, 1154), (20091228, 1154),  
(20091229, 1167), (20091230, 1167),  
(20091231, 1163)]
```



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(20091231, 1163)]
```

Let's find the maximum, minimum, and average for each year.

```
Minimum: (19950705, 755)
```

```
Maximum: (19971223, 1960)
```

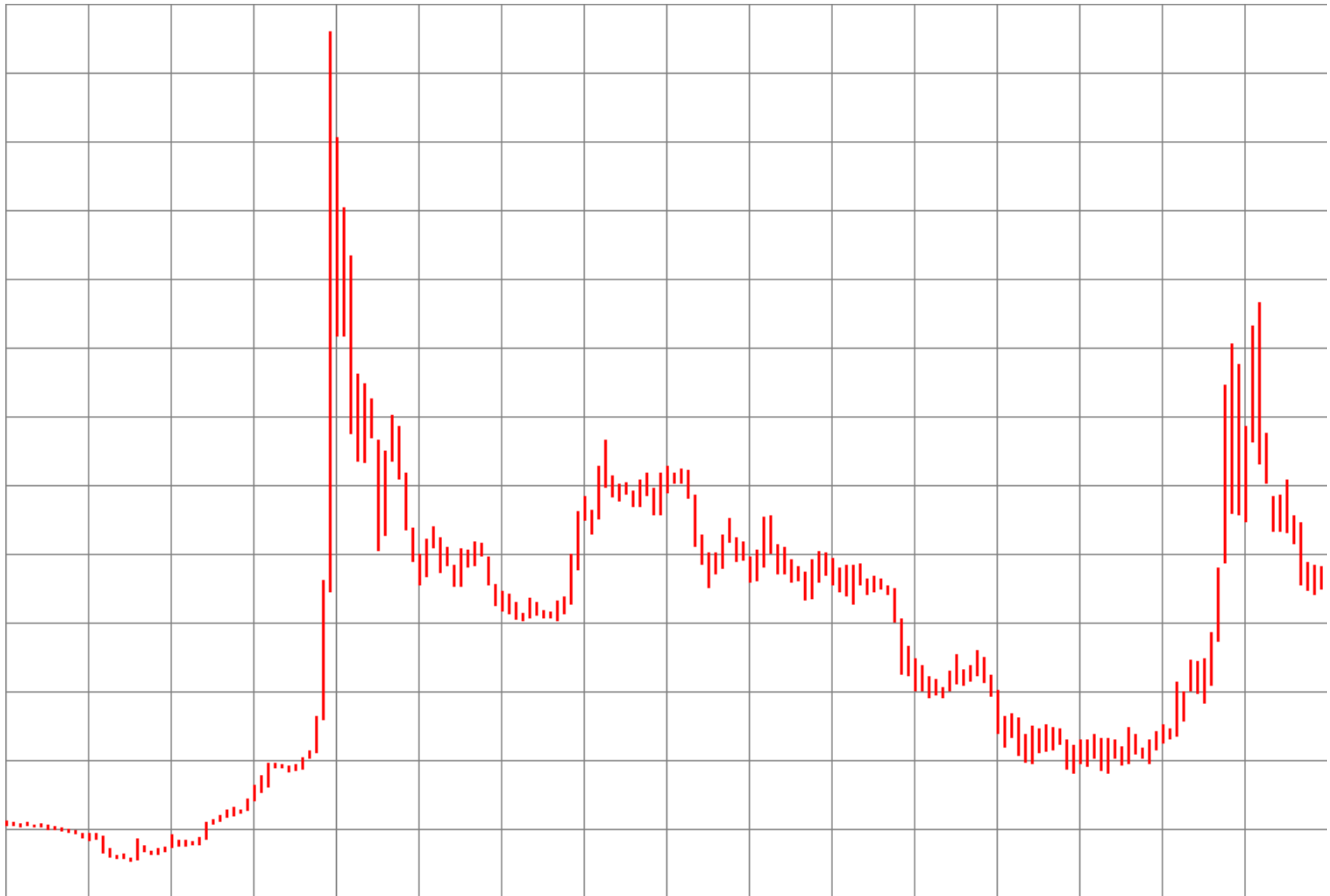


Minimum and maximum for every month of a year:

```
def find_minmax(yr):
    minmax = [ (9999, 0) ] * 12
    data = read_year(yr)
    for d, v in data:
        # make month 0 .. 11
        month = (d / 100) % 100 - 1
        minr, maxr = minmax[month]
        if v < minr:
            minr = v
        if v > maxr:
            maxr = v
        minmax[month] = minr, maxr
    return minmax
```



Let's use `cs1media` to create a nice plot of the exchange rate.





## Case study: maintaining stock

---

Let's write software for a vegetable and fruit shop. We keep a file with the current stock and prices. We should be able to sell items, list the current stock, and report all sales done during the day.





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File format `stock.txt`:

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190,apple,900
```

```
30,orange,1300
```

Let's write software for a vegetable and fruit shop. We keep a file with the current stock and prices. We should be able to sell items, list the current stock, and report all sales done during the day.

File format `stock.txt`:

```
190,apple,900  
30,orange,1300
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Main menu:

What would you like to do:

- S) Sell item
- P) Print stock
- R) Report sales
- E) Exit

Enter your choice>



---

If possible, we test each function after writing it. In the Wing IDE, pressing **Run** executes your current file. You can then use the functions inside the file from the Python shell. (From the command line, use `python -i script.py`)



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Testing `load_stock("stock.txt")`:

```
>>> load_stock("stock.txt")
[(190, 'apple', 900), (30, 'orange', 1300),
(13, 'pineapple', 5500), (60, 'carrot', 600),
(30, 'cucumber', 900), (20, 'egg plant', 1100),
(10, 'zucchini', 1300), (70, 'garlic', 300)]
```



We can test code before having written all the functions called:

```
def main():  
    stock = load_stock(stock_file_name)  
    sales = []  
    while True:  
        s = show_menu()  
        if s == 'e':  
            break  
        elif s == 's':  
            sell(stock, sales)  
        elif s == 'p':  
            print_stock(stock)  
        elif s == 'r':  
            print_sales(sales)
```

need these functions to test

needed only when selected