Python Basics!

branched control, range, lists

CS101 Lecture #8

2016-10-24

Administrivia

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- Homework #3 is due Wed Oct. 26.
- Homework #4 is due Wed Nov. 4.
- Midterm #1 will be on the day of the 12th lecture (Nov. 7 Monday), covering through Lecture #11. (evening)

Warmup Questions (No quiz this lecture!)

Question #1

```
s = 'ABCDEFGH'
t = ''
i = 0
while i < 8:
    t = t + s[ i+1 ]
    i += 2
```

What is the final value of `t`?

A "ACEG"

B "BDFH"

C "ABCDEF"

D "ABEF"

Question #2

```
s = '0123456789'
t = ''
i = 0
while i < 5:
    if (i%2) == 1:
        t = t + s[ i-1 ]
    if (i%2) == 0:
        t = t + s[ i+1 ]
    i = i + 1
```

What is the final value of `t`?

A "92143"
B "103254"
C "10325"
D "921436"
E None (loop doesn't terminate)

Question #3

```
z = [ 1.2, 0.6, 0.5, 0.3 ]
z = z.sort()
```

What is the final value of `z[1]`?

A `0.6`
B `0.5`
C `None`
D None of the above.

Review Item

What are two changes this code needs to be executable?

```
if x < 1.5:
    x = x + 1
 if x == (1.5 or 2.0):
     x = x - 1
```

Review Item

What are two changes this code needs to be executable?

```
if x < 1.5:
    x = x + 1
if x == 1.5 or x == 2.0:
    x = x - 1
```

Conditional Execution

Example: if statement

```
ans = input( "Enter a number:" )
if float(ans) < 0:
    print( "The number was negative." )
```

Control flow

- *Control flow* represents actual sequence of lines executed by processor.
- *Conditional execution* lets you execute (or not) a block of code based on logical comparison.

Branched control flow

- We often need to make decisions with *several* options.
- *Branched conditional execution* lets you execute one of several blocks of code.

Example

```
def absolute(x):
    if x >= 0:
        return x
    else:
        return -x
```

$if/else$ statement

- We create an `if`/else statement as follows:
  - the keyword `if`
  - a logical comparison (results in `bool`)
  - a **block** of code
  - the keyword `else`
  - a different **block** of code

Sequence operators

- These produce Boolean output.

`in`	Is one string inside of the other?
`not in`	Is one string not inside of the other?

Example

```
def fun(s):
    return s.isalpha() and 'a' in s

x = fun( "sam" ) and fun( "AS" )
```

What is the value of `x`?

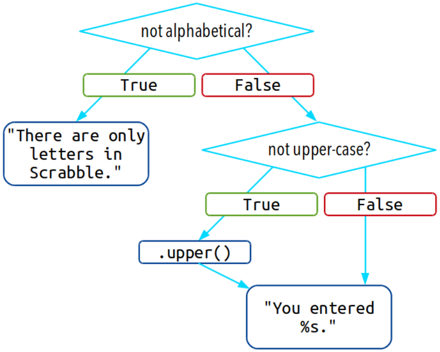
A `True`
B `False`

Nesting

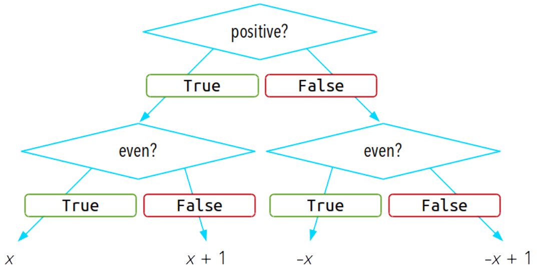
- Sometimes we need to make more than one decision.
- We can *nest* blocks.

```
word = input( 'Enter a Scrabble word:  ' )
if not word.isalpha():
  print( 'There are only letters in Scrabble
else:
  if not word.isupper():  # why not
                          #`word.islower()`?
      word = word.upper()
  print( 'You entered %s.' % word )
```

Nesting


not alphabetical?
True
False
"There are only letters in Scrabble."
not upper-case?
True
False
.upper()
"You entered %s."

Exercise: Nesting

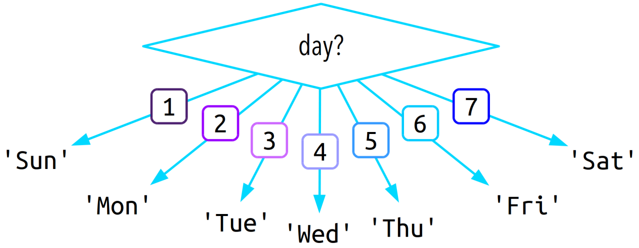


Example

```
def evenpos(x):
    if x >= 0:
        if (x%2) == 0:
            return x
        else:
            return x + 1
    else:
        if (x%2) == 0:
            return -x
        else:
            return (-x) + 1
```

Multi-way branch

- Sometimes we need to select among many choices.



Example

```
if day == 1:
    print("Sunday")
else:
    if day == 2:
        print("Monday")
    else:
        if day == 3:
            print("Tuesday")
        else:
            if day == 4:
                print("Wednesday")
            else:
                if day == 5:
                    print("Thursday")
                else:
                    if day == 6:
                        print("Friday")
                    else:
                        if day == 7:
                          print("Saturday")
```

Example

```
if day == 1:
    print("Sunday")
elif day == 2:
    print("Monday")
elif day == 3:
    print("Tuesday")
elif day == 4:
    print("Wednesday")
elif day == 5:
    print("Thursday")
elif day == 6:
    print("Friday")
elif day == 7:
    print("Saturday")
else:
    print("That is not a valid day.")
```

if/elif/else statement

- We create an `if/elif/else` statement as follows:
  - the keyword `if`
  - a logical comparison (results in `bool`)
  - a **block** of code
  - the keyword `elif`
  - a logical comparison (results in `bool`)
  - a **block** of code
  - the keyword `else`
  - a different **block** of code

Iteration Redux

Example

```
colors = [ 'red', 'yellow', 'blue',
           'jale', 'ulfire' ]
for color in colors:
    print( color )
```

Defining loops: `for`

- A `for` loop requires:
  - the keyword `for`
  - a loop variable
  - the keyword `in`
  - a set of values
  - a **block** of code
- `for` loops iterate over *iterable* types one at a time.

Example

```
s = 'abcdefg'
t = ''
for c in s:
    t = c + t
```

What is the value of `t`?

- A `'abcdefg'`
- B `'gfedcba'`
- C `'a'`
- D `'g'`

Exercise

Write a function to sum all of the digits in a number. *I.e.*,

$$\texttt{12145} \rightarrow \texttt{1 + 2 + 1 + 4 + 5} \rightarrow \texttt{13}$$

Solution (*for*)

```
def sum_digits( n ):
    result = 0
    for letter in str( n ):
        result += int( letter )
    return result
```

Example

```
for i in range(10):
    print(i ** 2)
```

`range` function

- The `range` function returns an `iterator` containing integers.
- `range` can be cast as a `list`.
- Two arguments:
  - (optional) the starting value of the range (inclusive)
  - the ending value of the range (exclusive)

Reminders

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