Generating Lists

MARCH 8TH, 2013

Generating lists

- Python has a built-in function called `range` that allows us to generate lists using *arithmetic progressions*.

- It can have one, two, or three arguments, all of which must be integers.

```
>>> range(10)
[0, 1, 2, 3, 4, 5, 6, 7, 8, 9]
 >>> range(3, 11)
[3, 4, 5, 6, 7, 8, 9, 10]
>>> range(0, 30, 5)
[0, 5, 10, 15, 20, 25]
>>> range(0, 10, 3)
[0, 3, 6, 9]
>>> range(0, -10, -1)
[0, -1, -2, -3, -4, -5, -6, -7, -8, -9]
>>> range(0)
[]
>>> range(1, 0)
 []
```

The `range` function is useful in `for`-loops

```
for i in range(1, 10, 2):
        print i*i
```

- Repeats the execution of the body of the `for`-loop for each value of `i` = 1, 3, 5, 7, and 9.
- Equivalent to

```
i = 1
while i < 10:
        print i*i
        i = i + 2
```

- But more convenient for simple loops because no need to initialize before loop and no need to update within loop.

More examples of for-loops

```
L = ["hello", "hi", "bye"]
for e in L:
    print e + e
```

```
s = "What is this sentence?"
for ch in s:
    print ch
```

Generating Lists: Initialization

- Here is another useful way of generating lists , particularly for initializing them, i.e., assign them “initial” values at the start of a program.

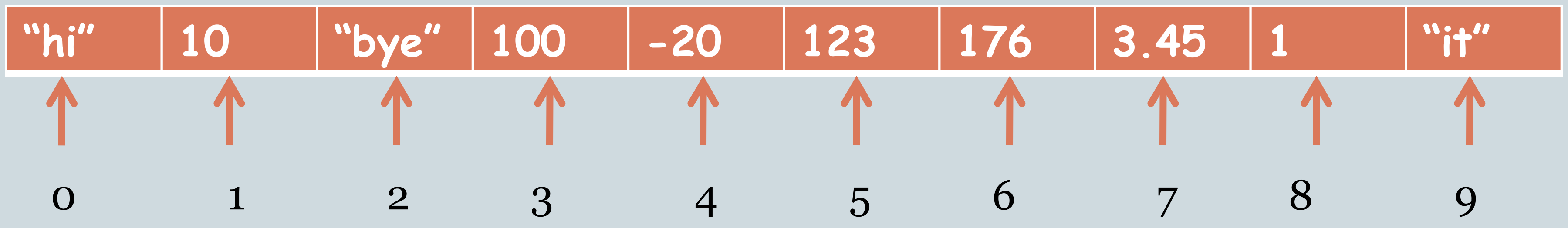
Example:

```
n = 25
L = [8]*n
```

This assigns to L a list of length 25 consisting of the integer 8.

Accessing slices of lists and strings

L = [“hi”, 10, “bye”, 100, -20, 123, 176, 3.45, 1, “it”]



Examples:

- L[2:5] is [“bye”, 100, -20]
- L[:2] is [“hi”, 10]
- L[4:4] is []
- L[4] = -20
- L[:len(L):2] = [“hi”, “bye”, -20, 176, 1]
- L[2:5][1] = 100
- L[1:5][:2] = [10, “bye”]

Slice Notation

- The basic notation

```
L[start:end] # sublist with items indexed start through end – 1
L[start:] # sublist with items indexed start through end of list
L[:end] # sublist with items from the start of the list through index end-1
L[:] # a copy of the original list
```

- The notation can also be used with a third parameter, step.

```
L[start:end:step] # sublist with items indexed start, not past end, in
increments of step
```

- Step can also be negative, in which case the elements are listed in reverse order

Problem

- Read a positive integer *n* and roll two *n*-sided dice a million times and output the distribution of the sums.

- In other words,
  - the number of times 2 appears as the sum,
  - the number of times 3 appears as the sum,
  - the number of times 4 appears as the sum,
  - …
  - the number of times 2n appears as the sum.

rollDistribution.py

```
# Programmer: Sriram Pemmaraju
# Date: 2/29/2012

# This program rolls a pair of n-sided dice a million times and reports the frequency of each outcome.
# An outcome is the sum of the two numbers that appear on the top face of the two dice. Note that for
# a pair of n-sided dice, the outcomes will be in the range 2..2n.

import random

n = int(raw_input("Please type the number of sides in your dice."))

L = [0]*(2*n+1) # Creates a list of length 2*n+1 with all elements of the
                # list initialized to 0

for i in range(1000000):

        # Roll the two n-sided dice and record the outcome
         outcome = random.randint(1, n) + random.randint(1, n)

        # L[outcome] stores the number of times outcome has appeared
        # So this element in the list needs to be incremented
        L[outcome] = L[outcome] + 1


#Report the contents of slots 2, 3, ...
print L[2:]
```