Generating Lists

MARCH 11TH, 2015

The range type

- Python 3 has a *sequence type* called range
- An object of type range is essentially an *arithmetic progression*.
- **Examples:**

```
>>> r = range(1, 20, 3)
>>> list(r)
[1, 4, 7, 10, 13, 16, 19]
```

Starts at 1; increases by 3; stops before 20.

```
>>> r = range(5, 11)
>>> list(r)
[5, 6, 7, 8, 9, 10]
```

Starts at 5; increases by 1 (default increment). Stops before 11.

```
>>> r = range(10)
>>> list(r)
[0, 1, 2, 3, 4, 5, 6, 7, 8, 9]
```

Starts at 0, which is the default starting point. Increases by 1, which is the default increment.

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.

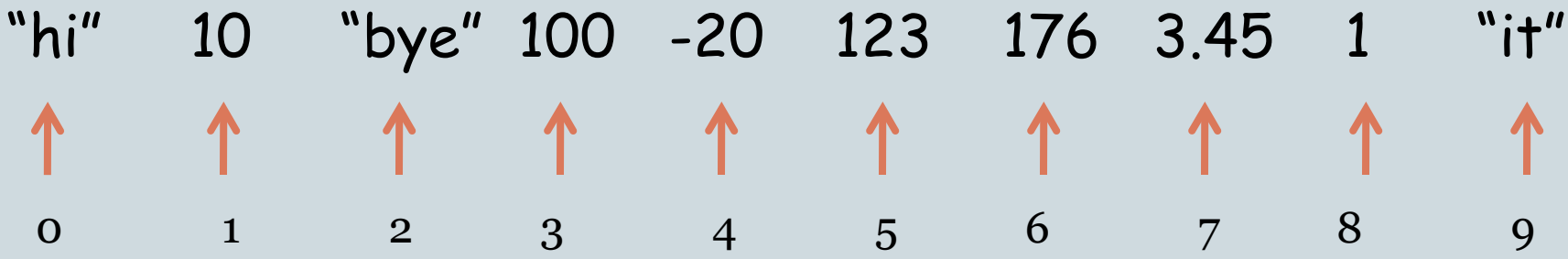
More examples of for-loops

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

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

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:]
```