Objectives

- Advanced problem solving with `for` loops

More on C→F Temperature Conversion

- -7°C -> °F = -44.6°F
  - My sister said, "I understood that I had input 'the opposite of 7°C', which is 'the opposite of 44.6°F'."
- So today I tried this: (-7)°C -> °F = 19.4°F
  - My sister said, "I was just surprised that negating is a function that normally comes after the conversion."

`for` loop review

```
for i in xrange(5):
    # like assigning i values(0,1,2,3,4)

    # rest of loop body …
```

- Note: when have `xrange(5)`
  - i gets values (0, 1, 2, 3, 4)
  - Which means that loop executes 5 times
- Optional: start and step parameters

Practicing `for` Loops

- Print the following:
  - A) 1 2 3 4 5
  - B) 2 5 8 11
  - C)
    ```
    ****
    ****
    ****
    ```


Practice: Assign Students to Groups

- Using a **`for`** loop and the modulo (%) operator, assign students to groups
  - How would you "model" students (given the above problem specification)?

Practice: Assign Students to Groups

- Using a **`for`** loop and the modulo (%) operator, assign students to groups
  - How would you "model" students (given the above problem specification)?
- Output for five students in 3 groups:

```
Student 0 is in group 1
Student 1 is in group 2
Student 2 is in group 3
Student 3 is in group 1
Student 4 is in group 2
```

Practice: Assign Students to Groups

- Using a **for** loop and the modulo (%) operator, assign students to groups
  - How would you "model" students (given the above problem specification)?

```
numStudents = 12
numGroups = 4
for student in xrange(numStudents):
     whichGroup = (student % numGroups) + 1
     print student, "is in group", whichGroup
```


Practicing for Loops

- Print the following:

```
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
```

What is getting repeated?
How many times?

Nested for Loops

- Use when need to repeat a loop
  - Good programming practice: use different variables for inner and outer loop variable

```
for x in xrange(N):
    statementa

    for y in xrange(M):
        statementb
```

Outer loop

Inner loop

- Analysis: how many times are **statementa** and statementb repeated?

Fence Post Problem

- Given some posts and some beams to connect the posts, build a fence that is *X* fenceposts long

```
Posts: |
Beams: -
```


Practice: Draw a Tic-Tac-Toe Board

```
   |   |
-----------
   |   |
-----------
   |   |
```

What is getting repeated?
How many times?

RANDOM MODULE

random module

- Python provides the **random** module to generate pseudo-random numbers
- Why "pseudo-random"?
  - Actually generates a list of random numbers and grabs the next one off the list
  - A "seed" is used to initialize the random number generator, which decides which list to use
    - By default, the current time is used as the seed

Some random Functions

- `random()`
  - Returns the next random floating point number in the range [0.0, 1.0)
- `randint(a, b)`
  - Return a random integer N such that a ≤ N ≤ b

```
import random

#random.seed(1)     # module.function()

for x in xrange(10):
    print random.random()
```


VA Lottery: Pick 4

- To play: you pick 4 numbers between 0 and 9
- To win: select the numbers that are selected by the magic ping-pong ball machine
- Your job: Simulate the magic ping-pong ball machines
  - Display the number on one line

VA Lottery: Pick 4

- To play: you pick 4 numbers between 0 and 9
- To win: select the numbers that are selected by the magic ping-pong ball machine
- Your job: Simulate the magic ping-pong ball machines
  - Revision: display number as #-#-#-#

For Friday

- Lab 2 is due
- Read rest of Four Puzzles from Cyberspace and write summary on Sakai