Lecture 20

While Loops

Announcements for This Lecture

Assignments

- A4 is (mostly) graded
  - **Mean**: 89, **Median**: 92
  - **Mean Time**: 7-8 hours
- A5 graded next week
  - Will finish it after exam
  - If you need it to study, take your solution to a consultant
- A6 is now posted
  - Due two weeks from today

Prelim 2

- Tuesday 7:30-9pm
  - A–Q (Kennedy 1116)
  - R–T (Warren 131)
  - U–Z (Warren 231)
- Review Session Sunday
  - 4-6pm in Room TBA
  - Solutions posted afterwards
- Make-ups announced Fri
  - Still looking at conflicts

Recall: For Loops

```
# Print contents of seq
x = seq[0]
print x
x = seq[1]
print x
…
x = seq[len(seq)-1]
print x
```

- **Remember**:
  - Cannot program …
  - Reason for recursion

The for-loop:

```
for x in seq:
    print x
```

- Key Concepts
  - **loop sequence:** seq
  - **loop variable**: x
  - **body**: print x
  - Also called **repetend**

Important Concept in CS: Doing Things Repeatedly

1. Process each item in a sequence
   - Compute aggregate statistics fo such as the mean, median, stan
   - Send everyone in a Facebook group an appointment time

```
for x in sequence:
    process x
```

2. Perform *n* trials or get *n* samples.
   - A4: draw a triangle six times to m
   - Run a protein-folding simulati

```
for x in range(n):
    do next thing
```

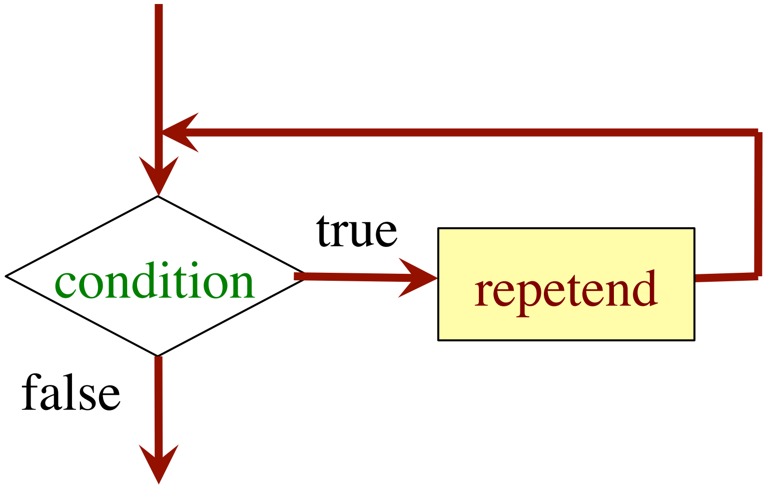
3. Do something an unknown number of times
   - CUAUV team, vehicle keeps moving until reached its goal

????

Beyond Sequences: The **while**-loop

```
while <condition>:
    statement 1
    …
    statement n
```

repetend or **body**



- Relationship to for-loop
  - Broader notion of "still stuff to do"
  - Must explicitly ensure condition becomes false

while Versus for

```
# process range b..c
for k in range(b,c+1)
    process k
```

```
# process range b..c
k = b
while k <= c:
    process k
    k = k+1
```

Must remember to increment

- Makes list c+1-b elements
- List uses up memory
- Impractical for large ranges

- Just needs an int
- Much less memory usage
- Best for large ranges

Note on Ranges

- m..n is a range containing n+1-m values
  - 2..5 contains 2, 3, 4, 5. Contains 5+1 – 2 = 4 values
  - 2..4 contains 2, 3, 4. Contains 4+1 – 2 = 3 values
  - 2..3 contains 2, 3. Contains 3+1 – 2 = 2 values
  - 2..2 contains 2. Contains 2+1 – 2 = 1 values
  - 2..1 contains ???

What does 2..1 contain?

A: nothing
B: 2,1
C: 1
D: 2
E: something else

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  - 2..1 contains ???

- The notation m..n, always implies that m <= n+1
  - So you can assume that even if we do not say it
  - If m = n+1, the range has 0 values

while Versus for

```
# incr seq elements
for k in range(len(seq)):
    seq[k] = seq[k]+1
```

Makes a **second** list.

```
# incr seq elements
k = 0
while k < len(seq):
    seq[k] = seq[k]+1
    k = k+1
```

while is more flexible, but is **much tricker** to use

Patterns for Processing Integers

range a..b-1

```
i = a
while i < b:
    process integer I
    i = i + 1
```

range c..d

```
i= c
while i <= d:
    process integer I
    i= i + 1
```

```
# store in count # of '/'s in  String s
count = 0
i = 0
while i < len(s):
    if s[i] == '/':
        count= count + 1
    i= i +1
# count is # of  '/'s in s[0..s.length()-1]
```

```
# Store in double var. v the sum
# 1/1   + 1/2 + ...+ 1/n
v = 0;     # call this 1/0 for today
i = 0
while i <= n:
    v = v + 1.0 / i
    i= i +1
# v= 1/1   + 1/2 + ...+ 1/n
```

While-Loops and Flow

```
print 'Before while'
count = 0
i = 0
while i < 3:
    print 'Start loop '+`i`
    count = count + I
    i = i + 1
    print 'End loop '
print 'After while'
```

Output:

```
Before while
Start loop 0
End loop
Start loop 1
End loop
Start loop 2
End loop
After while
```