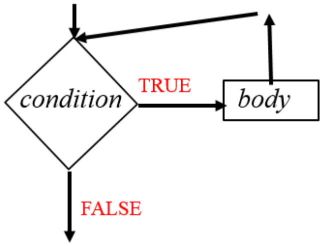
CompSci 101
Introduction to Computer Science



Oct 6, 2016

Prof. Rodger

Announcements

- Reading and RQ due next time
- APT 4 out today, due Oct 18
- Do not discuss exam1 with anyone until it is handed back, likely after fall break
- No Lab this week or next week

- Today:
  - Loops – While, While True
  - Problem Solving

Developing an Algorithm

- http://www.youtube.com/watch?v=AEBbsZK39es

$193, $540, $820, $700, $749. Are these reasonable? Why?

I'm thinking of a number …

- You guess. I'll tell you *high*, *low*, or *correct*
  - Goal: guess quickly, minimal number of guesses
  - Number between 1 and 100…
  - Number between 1 and 1000…

- Can you describe an algorithm, instructions, that would allow someone to use your instructions to play this game correctly. Start with 1 and 100, but ideally your instructions work with 1 and N

bit.ly/101f16-1006-1

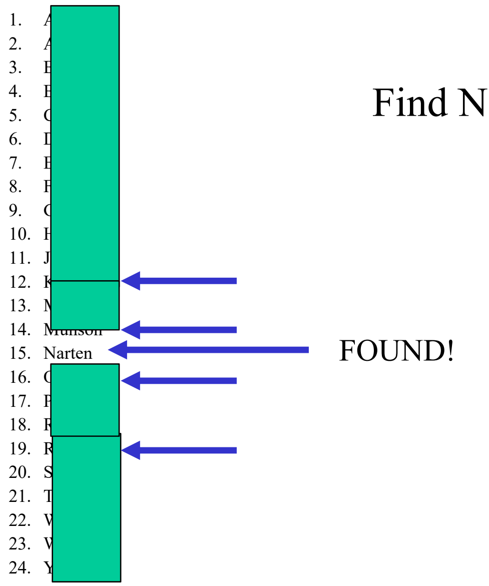
Analyzing the *binary search* algorithm

- Is the algorithm correct?
  - – Try it, again, and again and …
  - – Reason about it: logically, informally, …
- How efficient is the algorithm?
  - – How many guesses will it take (roughly, exactly)
  - – Should we care about efficiency?
- When do we really care about efficiency?
  - – Examples?

Find Narten

1. Anderson
2. Applegate
3. Bethune
4. Brooks
5. Carter
6. Douglas
7. Edwards
8. Franklin
9. Griffin
10. Holhouser
11. Jefferson
12. Klatchy
13. Morgan
14. Munson
15. Narten
16. Oliver
17. Parker
18. Rivers
19. Roberts
20. Stevenson
21. Thomas
22. Wilson
23. Woodrow
24. Yarbrow

Find Narten



Looking for a Needle in a Haystack

- If a computer can examine 10 million names/numbers a second, suppose the list isn't sorted, or I say "yes/no", not "high/low"
  - – How long to search a list of 10 million?
  - – How long to search a list of a billion?
  - – 14 billion pixels in a 2 hour blu-ray movie
- What about using binary search? How many guesses for 1000, 10^{6}, $10^{9,}$ 10^{12}
  - – One of the things to remember: 2^{10} = 1024

Review - Searching for words

- If we had a million words in alphabetical order, how many would we need to look at worst case to find a word?

If you are clever, cut the
number of numbers to look
at in half, over and over again

Review - Searching for words

- If we had a million words in alphabetical order, how many would we need to look at worst case to find a word?
- 20 words!

If you are clever, cut the
number of numbers to look
at in half, over and over again

1,000,000	976.56
500,000	488
250,000	244
125,000	122
62,500	61
31,250	30
15,620	15
7812.5	7.5
3906	3.75
1953	1.875

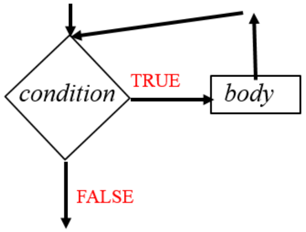
Is number a Prime number?
Bit.ly/101f16-1006-2

```
def isPrime(number):
   if number<4:
      return True
   for n in range(4,number):
       if number/n * n == number:
           return False
   return True
```

While loops

- Repetition when you stop a loop based on a condition
- while CONDITION:

  BODY



  - As long as condition is true, keep executing loop.
  - Must have an update in the body to get closer to condition being false

Examples for while

- Playing chess

```
while (game not over)
        play game
        (game must get closer to ending)
```

- Finding the 100th prime

Mystery While example

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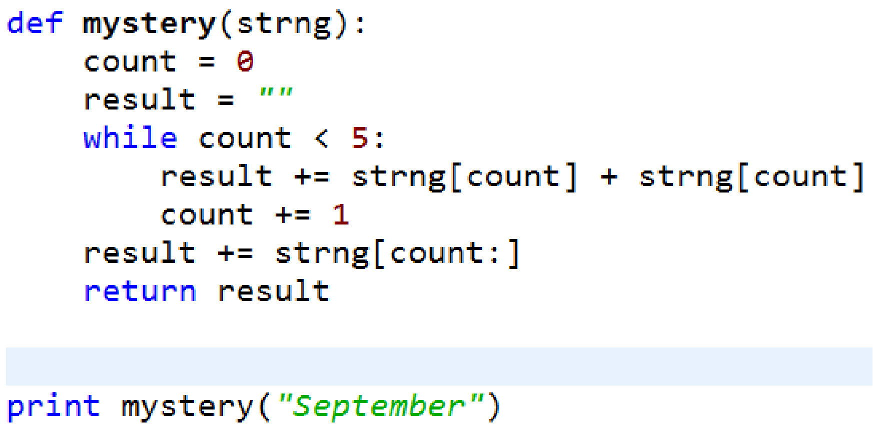


```
def mystery(strng):
    count = 0
    result = ""
    while count < 5:
        result += strng[count] + strng[count]
        count += 1
    result += strng[count:]
    return result

print mystery("September")
```

Problem: Given a number, want the largest list of unique digits from 1 to x whose sum is less than or equal to the number

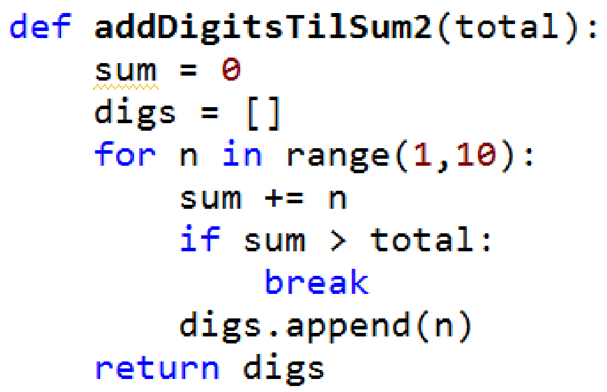
- Given 5

  Answer is 1 + 2 , list [1,2]

- Given 6

  Answer is 1+2+3, list [1,2,3]

bit.ly/101f16-1006-4



```
def addDigitsTilSum2(total):
    sum = 0
    digs = []
    for n in range(1,10):
        sum += n
        if sum > total:
            break
        digs.append(n)
    return digs
```

Looping with while – not sure when to stop

- Playing chess
- Determining the 100th prime number

- Another way – while True
  - Must have ways to break out of infinite loop
  - Must have update – gets closer to ending

while condition vs while True

```
while condition:                while True:
    body                            body
continue                            if condition:
                                        break
                                continue
```

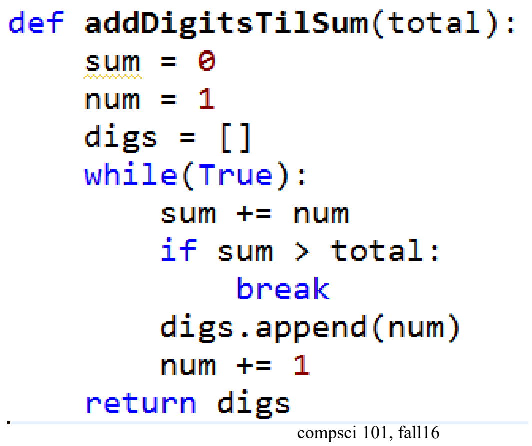
While condition is true - must update

- must get closer to making condition false
- use break to exit

While True

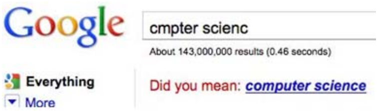
```
initialize
while True:
    if something:
        break
    if something2:
        update
    update
Continue or return
```

Revisit addDigitsTilSum bit.ly/101f16-1006-5



```
def addDigitsTilSum(total):
    sum = 0
    num = 1
    digs = []
    while(True):
        sum += num
        if sum > total:
            break
        digs.append(num)
        num += 1
    return digs
```

Computer Science Duke Alum



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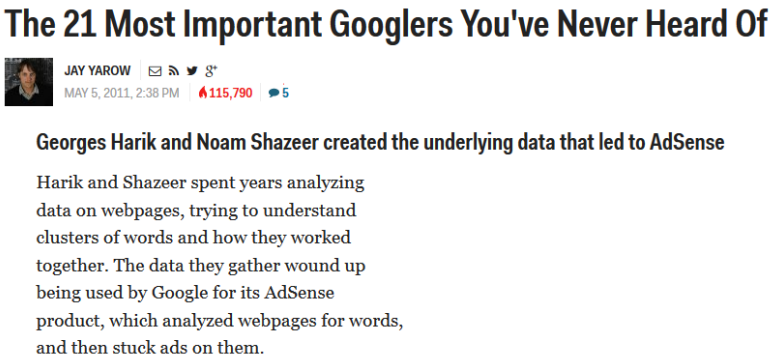
About 143,000,000 results (0.46 seconds)

Did you mean: *computer science*



The 21 Most Important Googlers You've Never Heard Of

JAY YAROW
MAY 5, 2011, 2:38 PM 115,790 5

Georges Harik and Noam Shazeer created the underlying data that led to AdSense

Harik and Shazeer spent years analyzing data on webpages, trying to understand clusters of words and how they worked together. The data they gather wound up being used by Google for its AdSense product, which analyzed webpages for words, and then stuck ads on them.