CS50 for MBAs

cs50.harvard.edu/mba


싸이6甲
PART1
PSY
오빤 '강남스타일'
GANGNAM
STYLE

2,280,759,099

2,280,759,099
2,147,483,647

Haha oh no you thought it was for real??
That was the joke!

Haha I'm sorry! The upgrades actually did take months it's just that they happened ahead of time and the "bug" was an easter egg.

Ah well. Maybe you can
þretend you were trolling them.

cs50.harvard.edu/mba

HTTP Strict Transport Security (HSTS)

```
Strict-Transport-Security: max-age=10886400; includeSubDomains; preload
```

http://cs50.harvard.edu/mba

```
http://cs50.harvard.edu/mba

HTTP/1.1 200 OK
```

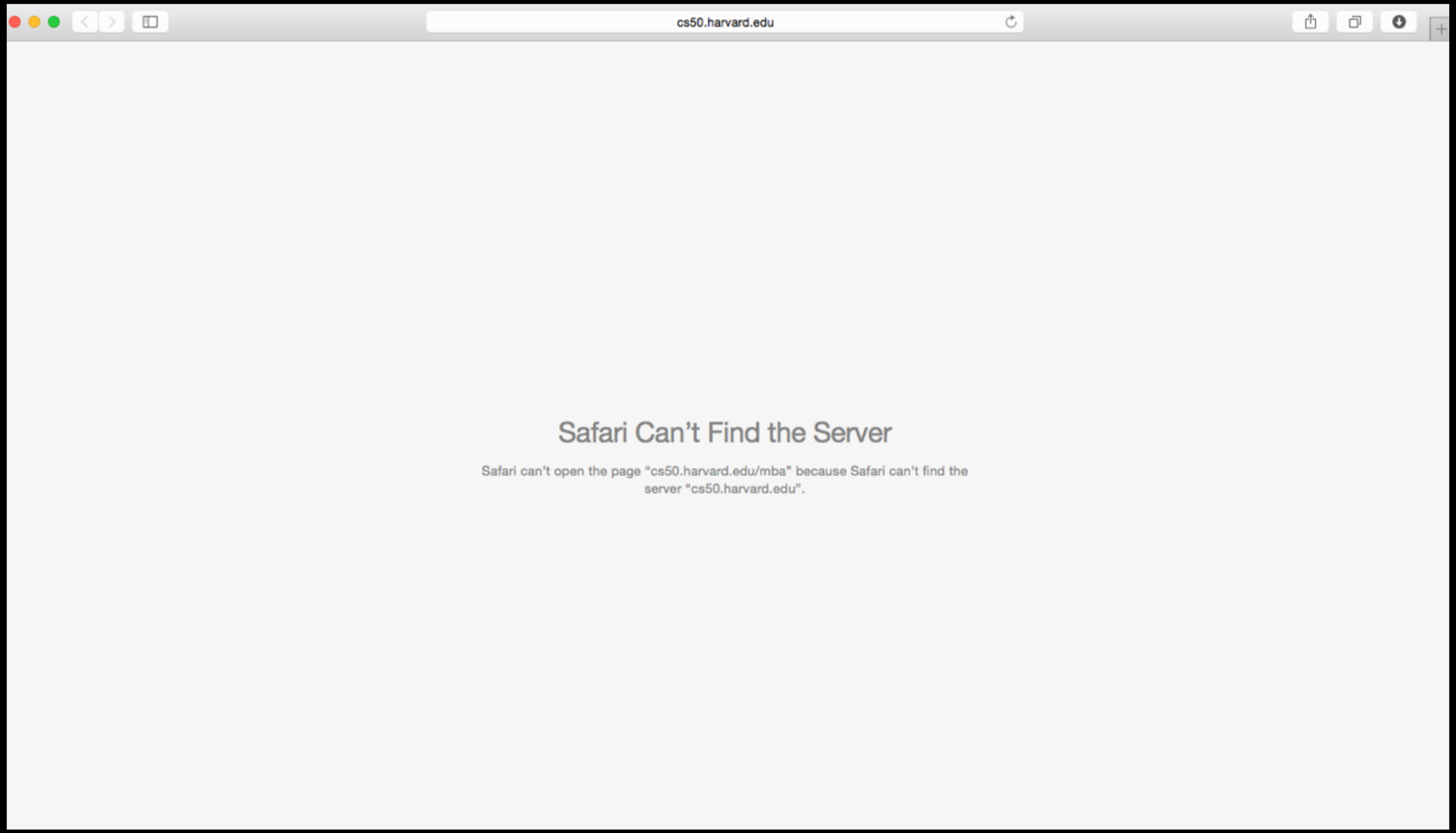
```
http://cs50.harvard.edu/mba

HTTP/1.1 301 Moved Permanently
Location: https://cs50.harvard.edu/mba
```

https://cs50.harvard.edu/mba

```
https://cs50.harvard.edu/mba

HTTP/1.1 301 Moved Permanently
Location: http://cs50.harvard.edu/mba/
```

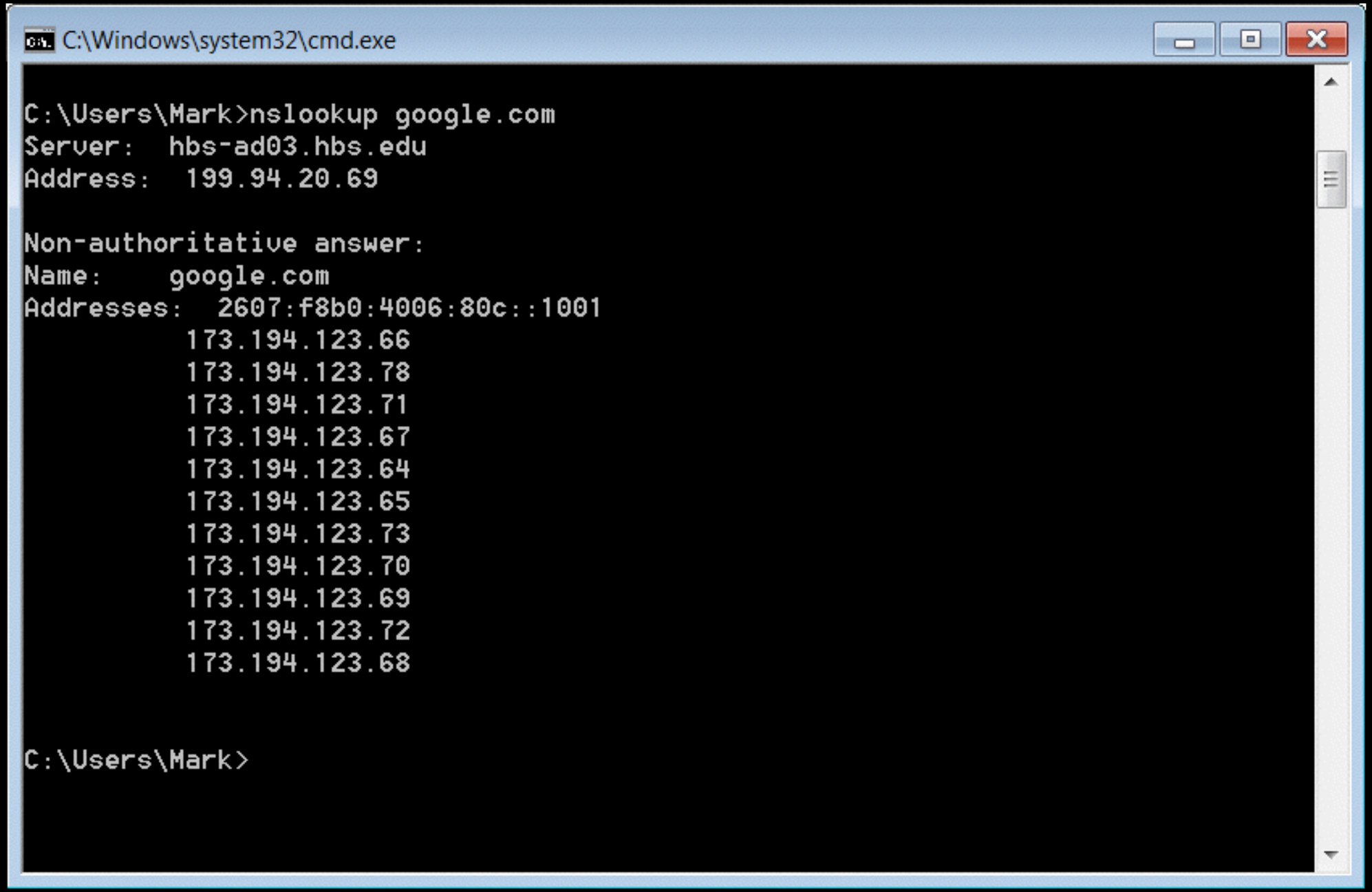

cs50.harvard.edu
Safari Can’t Find the Server
Safari can't open the page “cs50.harvard.edu/mba” because Safari can’t find the server “cs50.harvard.edu”.

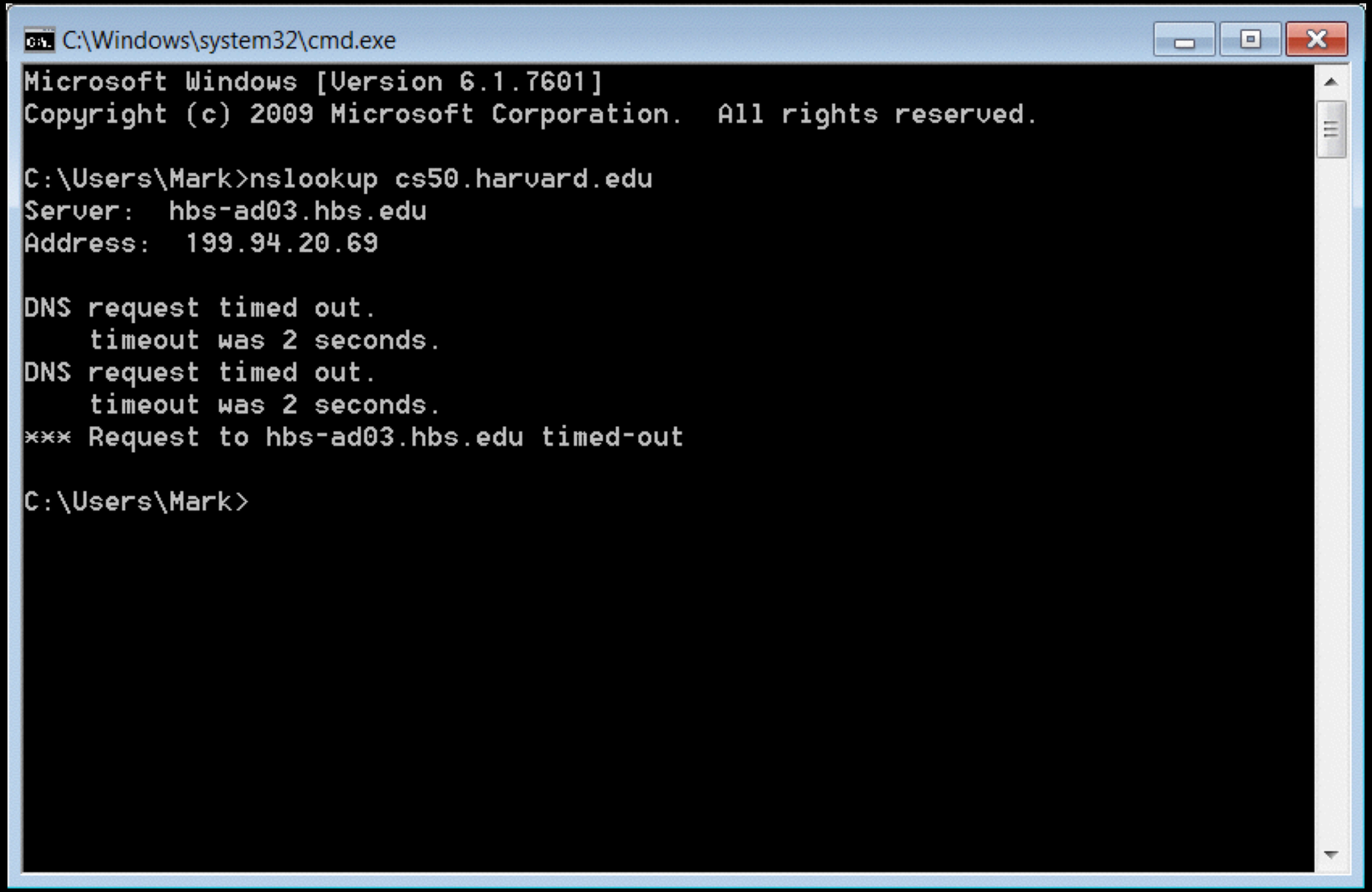
Server not found

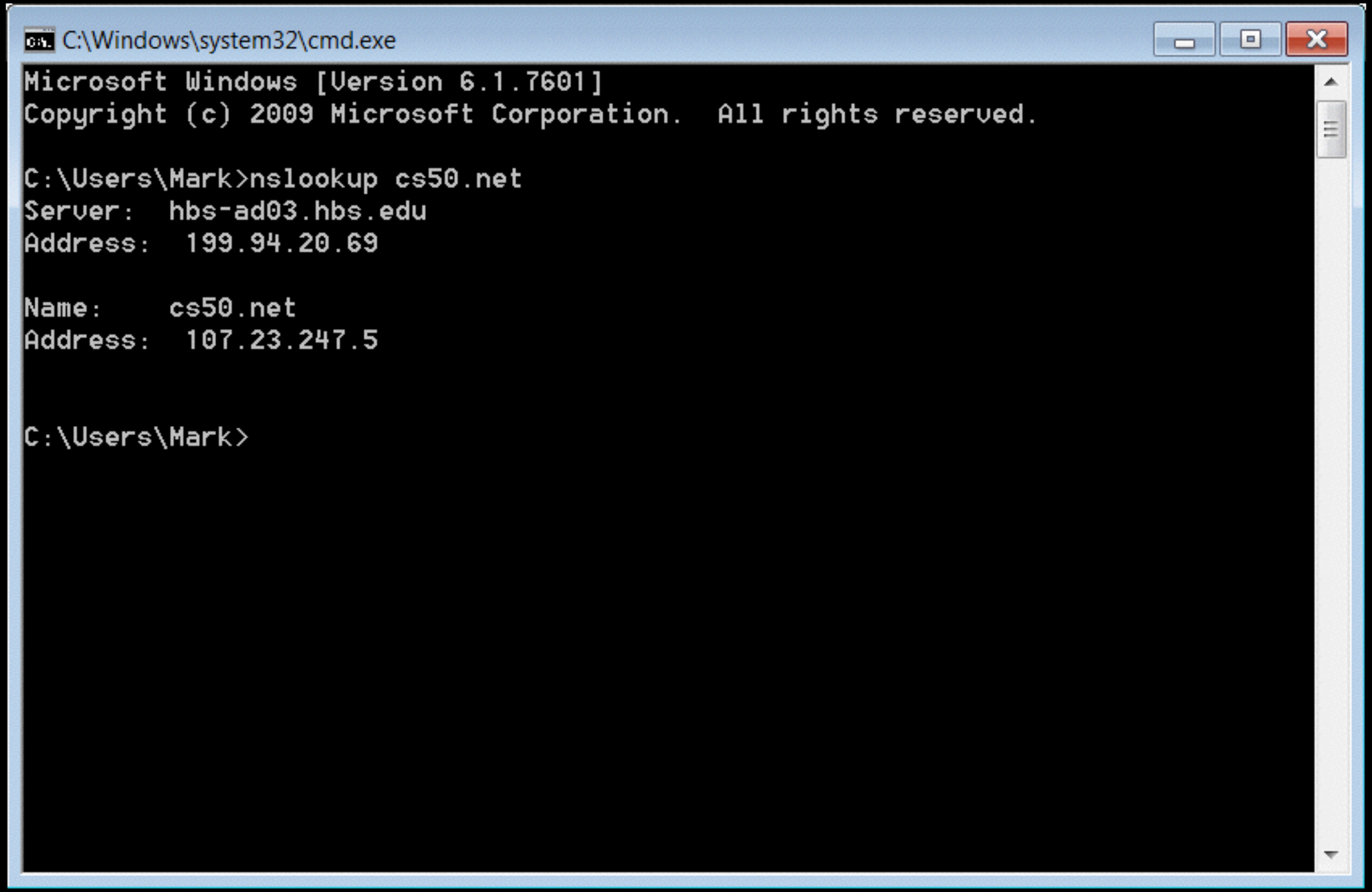
Firefox can't find the server at cs50.harvard.edu.

- Check the address for typing errors such as **ww**.example.com instead of **www**.example.com
- If you are unable to load any pages, check your computer's network connection.
- If your computer or network is protected by a firewall or proxy, make sure that Firefox is permitted to access the Web.

Try Again


C:\Windows\system32\cmd.exe
C:\Users\Mark>nslookup google.com
Server: hbs-ad03.hbs.edu
Address: 199.94.20.69
Non-authoritative answer:
Name: google.com
Addresses: 2607:f8b0:4006:80c::1001
          173.194.123.66
          173.194.123.78
          173.194.123.71
          173.194.123.67
          173.194.123.64
          173.194.123.65
          173.194.123.73
          173.194.123.70
          173.194.123.69
          173.194.123.72
          173.194.123.68
C:\Users\Mark>

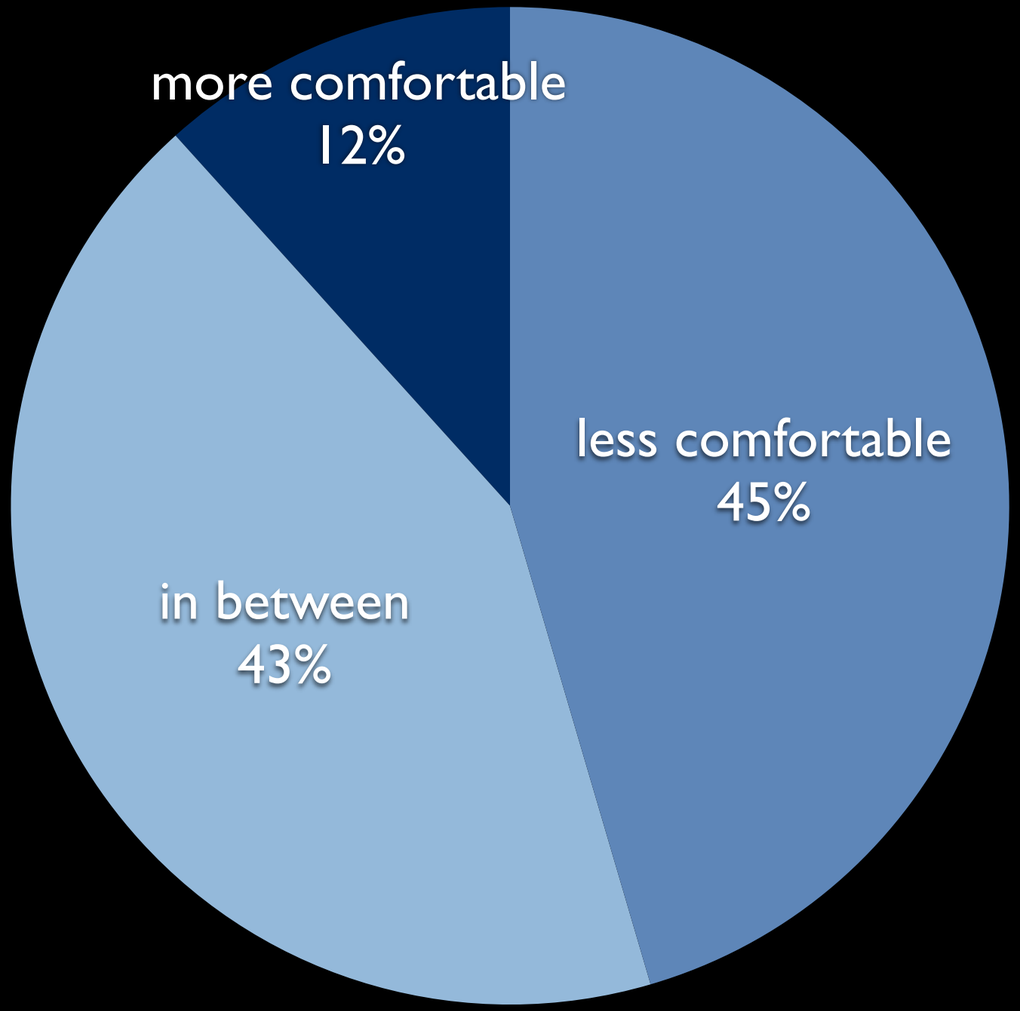

C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.
C:\Users\Mark>nslookup cs50.harvard.edu
Server: hbs-ad03.hbs.edu
Address: 199.94.20.69
DNS request timed out.
timeout was 2 seconds.
DNS request timed out.
timeout was 2 seconds.
*** Request to hbs-ad03.hbs.edu timed-out
C:\Users\Mark>


C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.
C:\Users\Mark>nslookup cs50.net
Server: hbs-ad03.hbs.edu
Address: 199.94.20.69
Name: cs50.net
Address: 107.23.247.5
C:\Users\Mark>

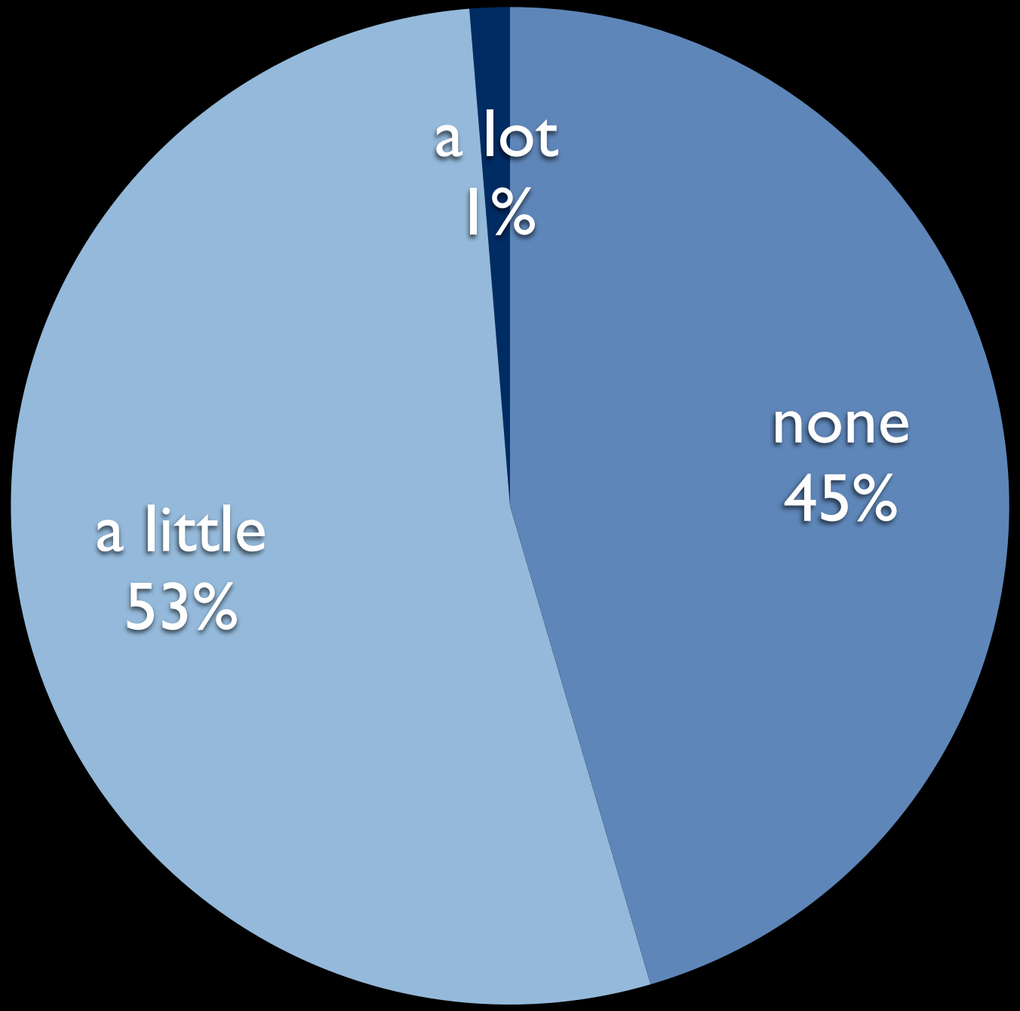
more office hours

coming soon

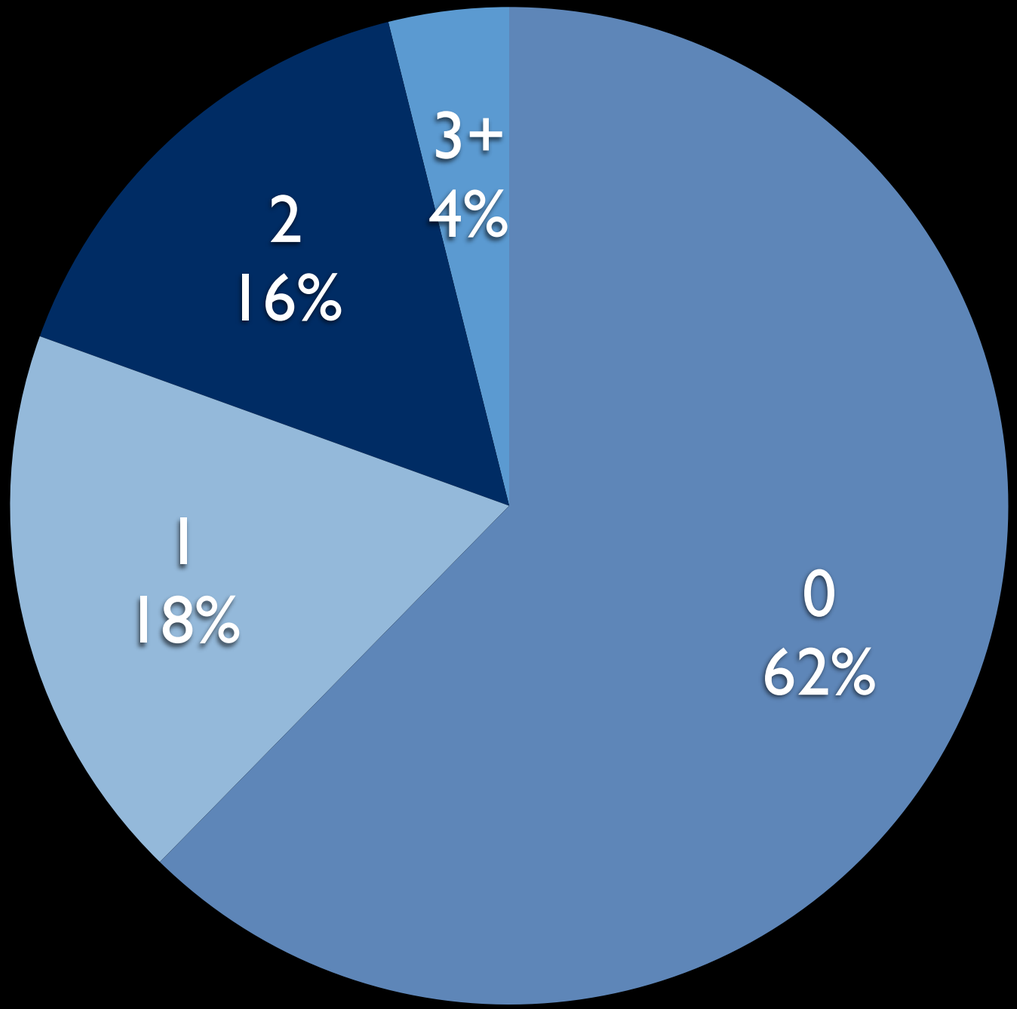
comfort level



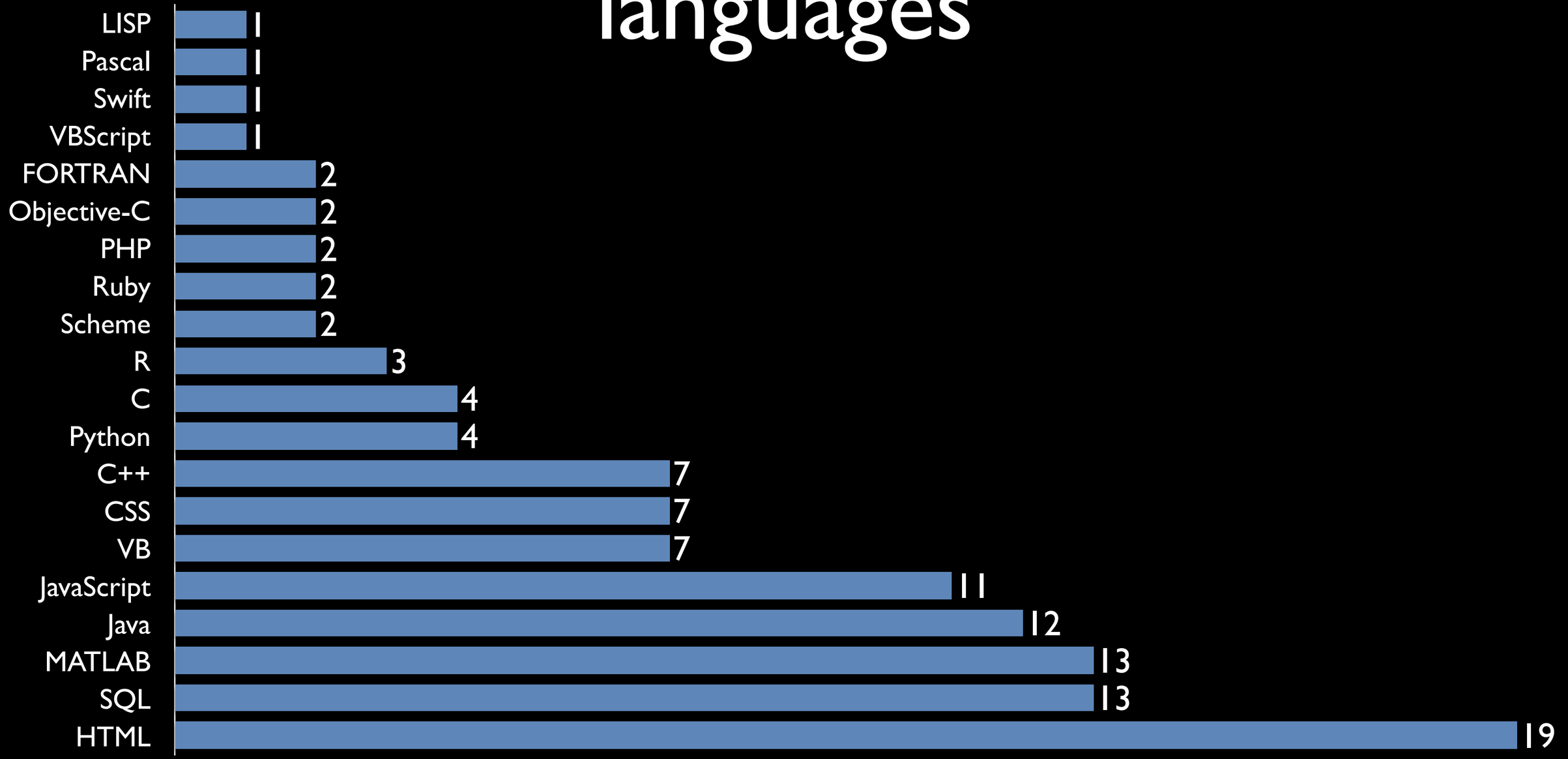
programming experience



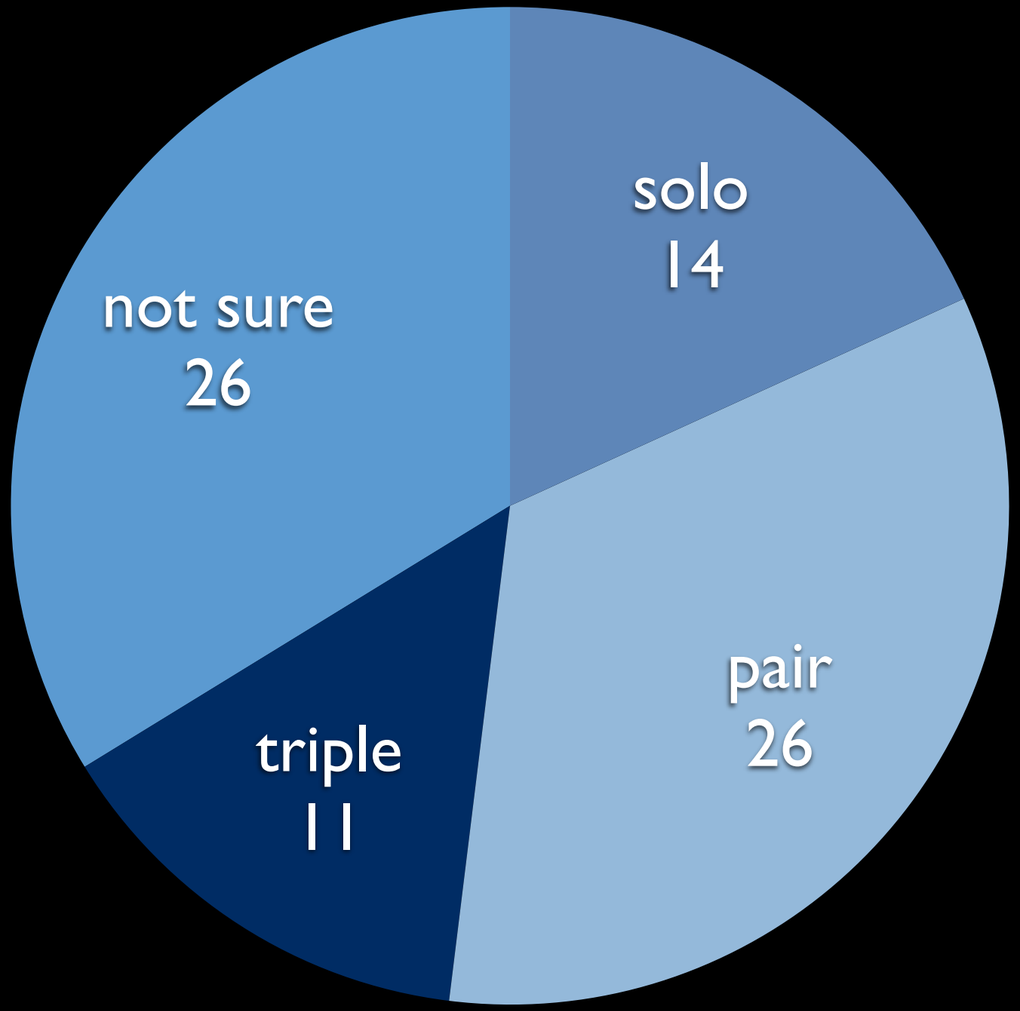
prior CS courses



languages


LISP 1
Pascal 1
Swift 1
VBScript 1
FORTRAN 2
Objective-C 2
PHP 2
Ruby 2
Scheme 2
R 3
C 4
Python 4
C++ 7
CSS 7
VB 7
JavaScript 11
Java 12
MATLAB 13
SQL 13
HTML 19

likely team size



potential seminars

A/B testing
artificial intelligence
biometrics
case studies
communicating with engineers
data analysis
excel macros
mobile app development
modern technologies and platforms
security
statistical software
UI design
virtual reality
virtualization
web development

potential seminars

A/B testing
artificial intelligence
biometrics
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data analysis
excel macros
mobile app development
modern technologies and platforms
security
statistical software
UI design
virtual reality
virtualization
web development

notes, video

day 0

morse code

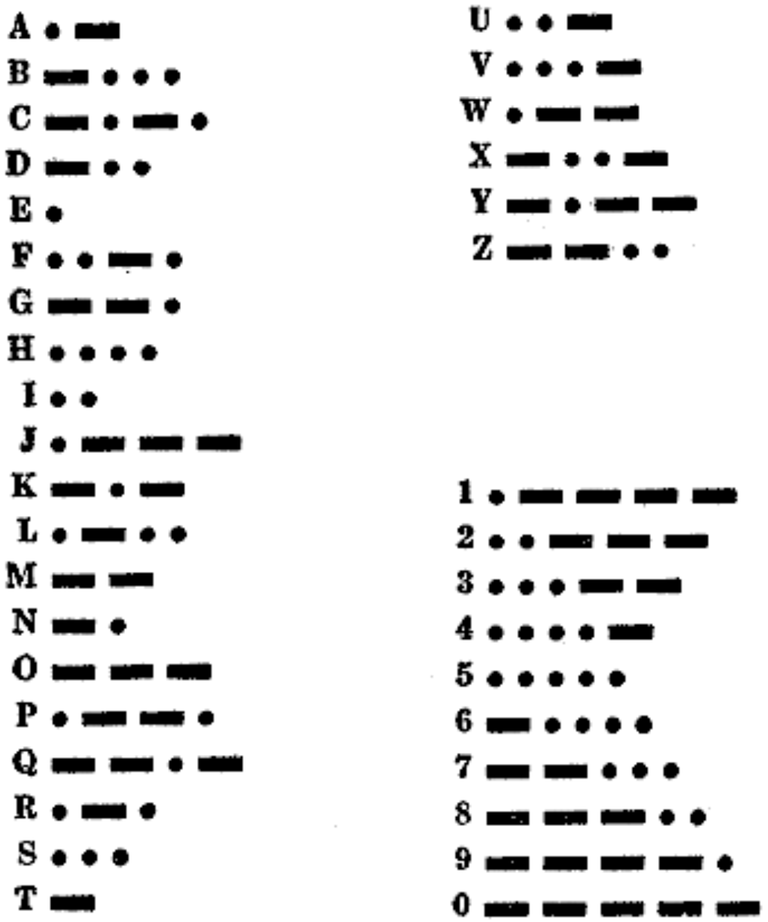


Image adapted from Wikipedia.

How do you represent in binary the number we know in decimal as 42?

00101010

How do you represent in hexadecimal the number we know in decimal as 42?

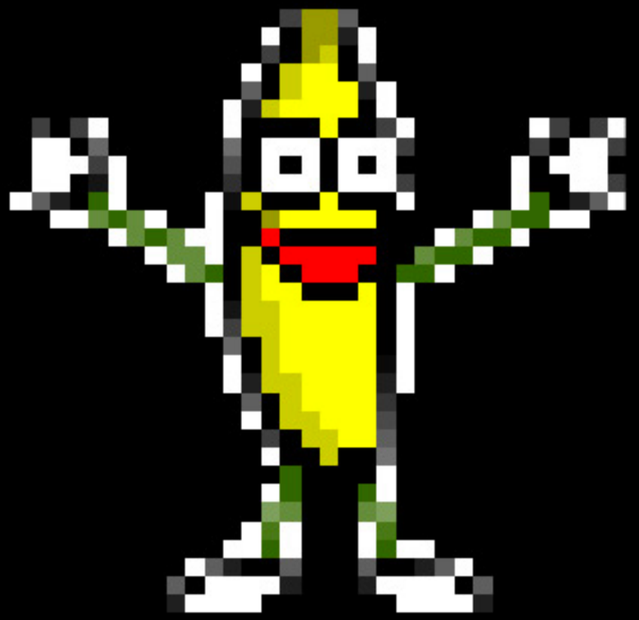
2A

How do you represent

`hello, world`

as a sequence of ASCII values in decimal?

104 101 108 108 111 044 032 119 111 114 108 100



IT'S PEANUT BUTTER JELLY TIME!!!

... to which question is 42 the answer?

Answer to the Ultimate Question of Life,
The Universe, and Everything!

How do you write the number 66 in hexadecimal form?

What was Jackie Robinson's number in professional baseball?

Probably the number of times I shoveled my front yard this winter

Eek don't know!

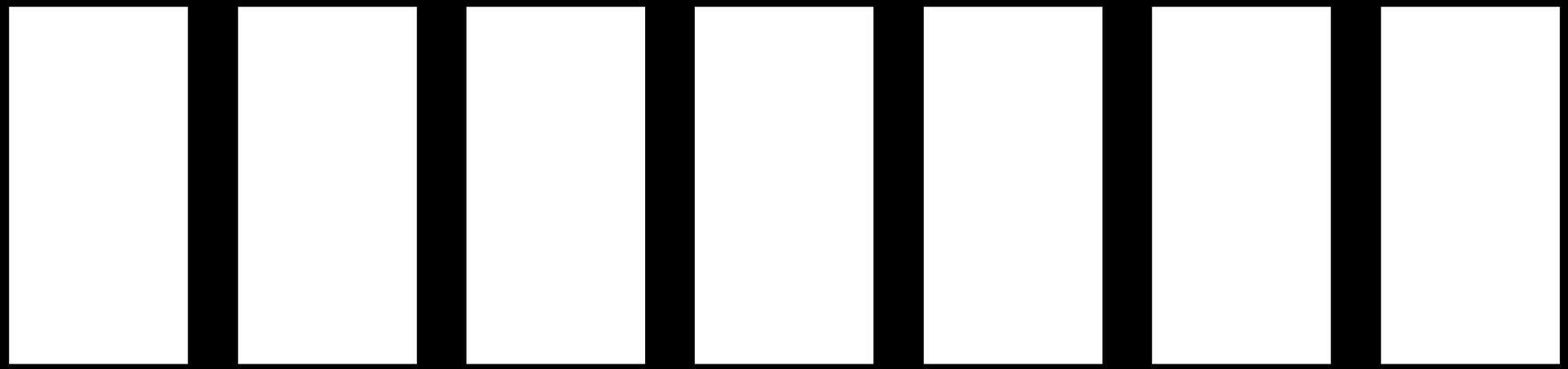
What is the Guinness world record for longest handshake in hours? / 42 hours (and 35 minutes to be exact...)

What number precedes 43?

questions

What is the minimum level of CS background required for this class? To be fair, the list of topics mentioned was quite intimidating for a novice like me! I am prepared to work hard but don't want to end up taking a class where I have no idea what is going on.

Can we have some case studies?
That's what we do at HBS



4 2 6 8 1 3 7 5

bubble sort

selection sort

insertion sort

$(n - 1)$

$$(n - 1) + (n - 2)$$

$$(n - 1) + (n - 2) + \ldots + 1$$

$$(n - 1) + (n - 2) + \ldots + 1$$

$$n(n - 1)/2$$

$$(n - 1) + (n - 2) + \ldots + 1$$

$$n(n - 1)/2$$

$$(n^2 - n)/2$$

$$(n - 1) + (n - 2) + \ldots + 1$$

$$n(n - 1)/2$$

$$(n^2 - n)/2$$

$$n^2/2 - n/2$$

$$(n - 1) + (n - 2) + \ldots + 1$$

$$n(n - 1)/2$$

$$(n^2 - n)/2$$

$$n^2/2 - n/2$$

$$O(n^2)$$

1,000,000

$n^2/2 - n/2$

$n^2/2 - n/2$

$1{,}000{,}000^2/2 - 1{,}000{,}000/2$

$n^2/2 - n/2$

$1{,}000{,}000^2/2 - 1{,}000{,}000/2$

$500{,}000{,}000{,}000 - 500{,}000$

$n^2/2 - n/2$

$1{,}000{,}000^2/2 - 1{,}000{,}000/2$

$500{,}000{,}000{,}000 - 500{,}000$

$499{,}999{,}500{,}000$

$n^2/2 - n/2$

$1{,}000{,}000^2/2 - 1{,}000{,}000/2$

$500{,}000{,}000{,}000 - 500{,}000$

$499{,}999{,}500{,}000$

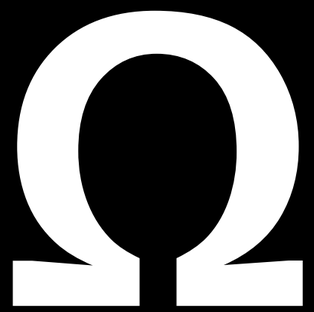
o

$O(n^2)$

$O(n)$

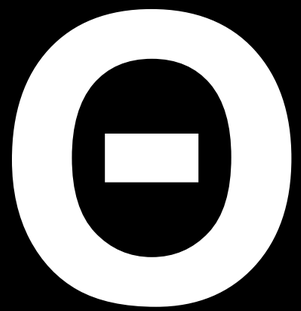
$O(\log n)$

$O(1)$



$\Omega(n)$

$\Omega(1)$



$\Theta(n)$


BubbleSort
Selection...
MergeSort

$O(n \log n)$

merge sort

```
On input of n elements
    if n < 2
        return
    else
        sort left half of elements
        sort right half of elements
        merge sorted halves
```

4 2 6 8 1 3 7 5

4 2 6 8 1 3 7 5

4 2 6 8 1 3 7 5

4 2 6 8 1 3 7 5

4 2 6 8 1 3 7 5

4 2 6 8 1 3 7 5

2

4 2 6 8 1 3 7 5

2 4

4 2 6 8 1 3 7 5

2 4

4 2 6 8 1 3 7 5

2 4

4 2 6 8 1 3 7 5

2 4

4 2 6 8 1 3 7 5

2 4 6

4 2 6 8 1 3 7 5

2 4 6 8

4 2 6 8 1 3 7 5

2 4 6 8

4 2 6 8 1 3 7 5

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4 2 6 8 1 3 7 5

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4 2 6 8 1 3 7 5

2 4 6 8

4 2 6 8 1 3 7 5

2 4 6 8 1

4 2 6 8 1 3 7 5

2 4 6 8 1 3

4 2 6 8 1 3 7 5

2 4 6 8 1 3

4 2 6 8 1 3 7 5

2 4 6 8 1 3

4 2 6 8 1 3 7 5

2 4 6 8 1 3

4 2 6 8 1 3 7 5

2 4 6 8 1 3 5

4 2 6 8 1 3 7 5

2 4 6 8 1 3 5 7

4 2 6 8 1 3 7 5

2 4 6 8 1 3 5 7

1

4 2 6 8 1 3 7 5

2 4 6 8 1 3 5 7

1 2

4 2 6 8 1 3 7 5

2 4 6 8 1 3 5 7

1 2 3

4 2 6 8 1 3 7 5

2 4 6 8 1 3 5 7

1 2 3 4

4 2 6 8 1 3 7 5

2 4 6 8 1 3 5 7

1 2 3 4 5

4 2 6 8 1 3 7 5

2 4 6 8 1 3 5 7

1 2 3 4 5 6

4 2 6 8 1 3 7 5

2 4 6 8 1 3 5 7

1 2 3 4 5 6 7

4	2	6	8	1	3	7	5
2	4	6	8	1	3	5	7
1	2	3	4	5	6	7	8

4 2 6 8 1 3 7 5

2 4 6 8 1 3 5 7

1 2 3 4 5 6 7 8

```
On input of n elements
    if n < 2
        return
    else
        sort left half of elements
        sort right half of elements
        merge sorted halves
```

```
On input of n elements
    if n < 2
        return
    else
        sort left half of elements
        sort right half of elements
        merge sorted halves
```

$$T(n) = O(1)$$

if $n < 2$

```
On input of n elements
    if n < 2
        return
    else
        sort left half of elements
        sort right half of elements
        merge sorted halves
```

```
On input of n elements
    if n < 2
        return
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        sort left half of elements
        sort right half of elements
        merge sorted halves
```

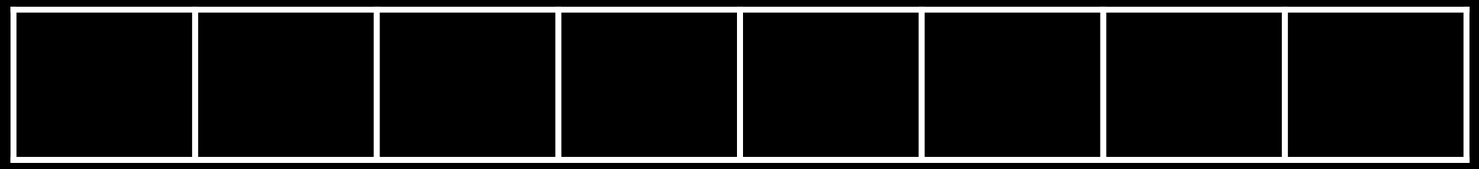
```
On input of n elements
    if n < 2
        return
    else
        sort left half of elements
        sort right half of elements
        merge sorted halves
```

$$T(n) = T(n/2) + T(n/2) + O(n)$$

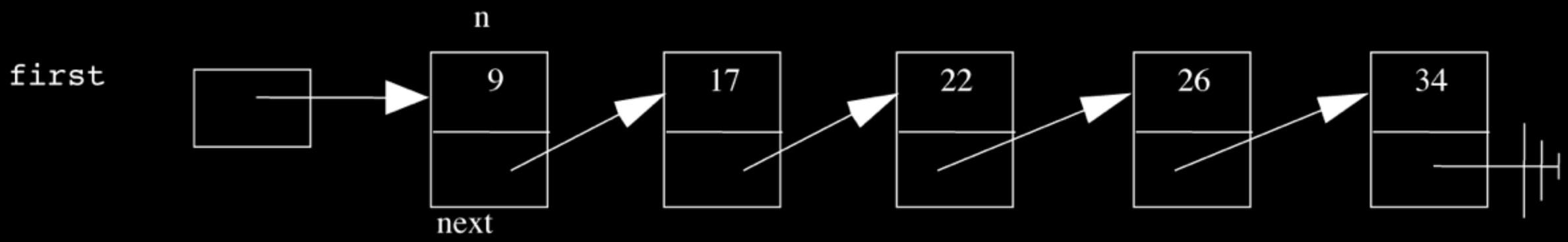
if $n \geq 2$

$O(n \log n)$

array



linked list



http://cs.calvin.edu/books/c++/ds/1e/

binary search tree

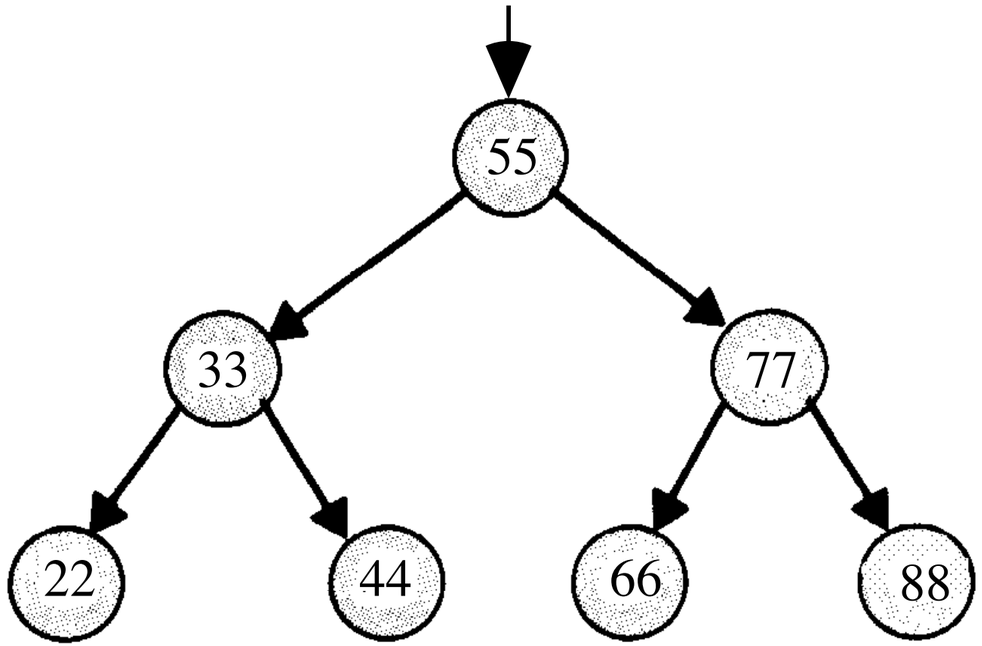
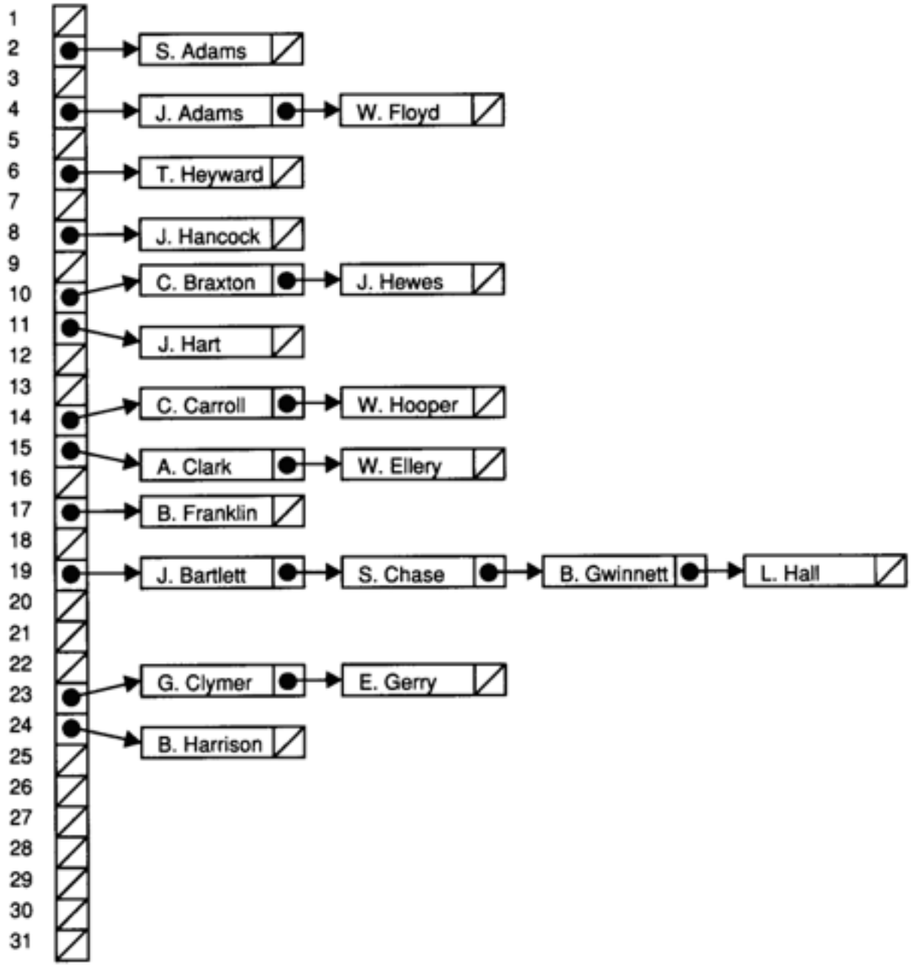


Figure from http://cs.calvin.edu/books/c++/ds/1e/.


THANKS FOR YOUR

http://www.blogcdn.com/www.engadget.com/media/2008/05/iphone_line_1-1.jpg

hash table, with separate chaining



assignment 1

due by 7:00am tomorrow


Insert sort

to be continued