This is CS50

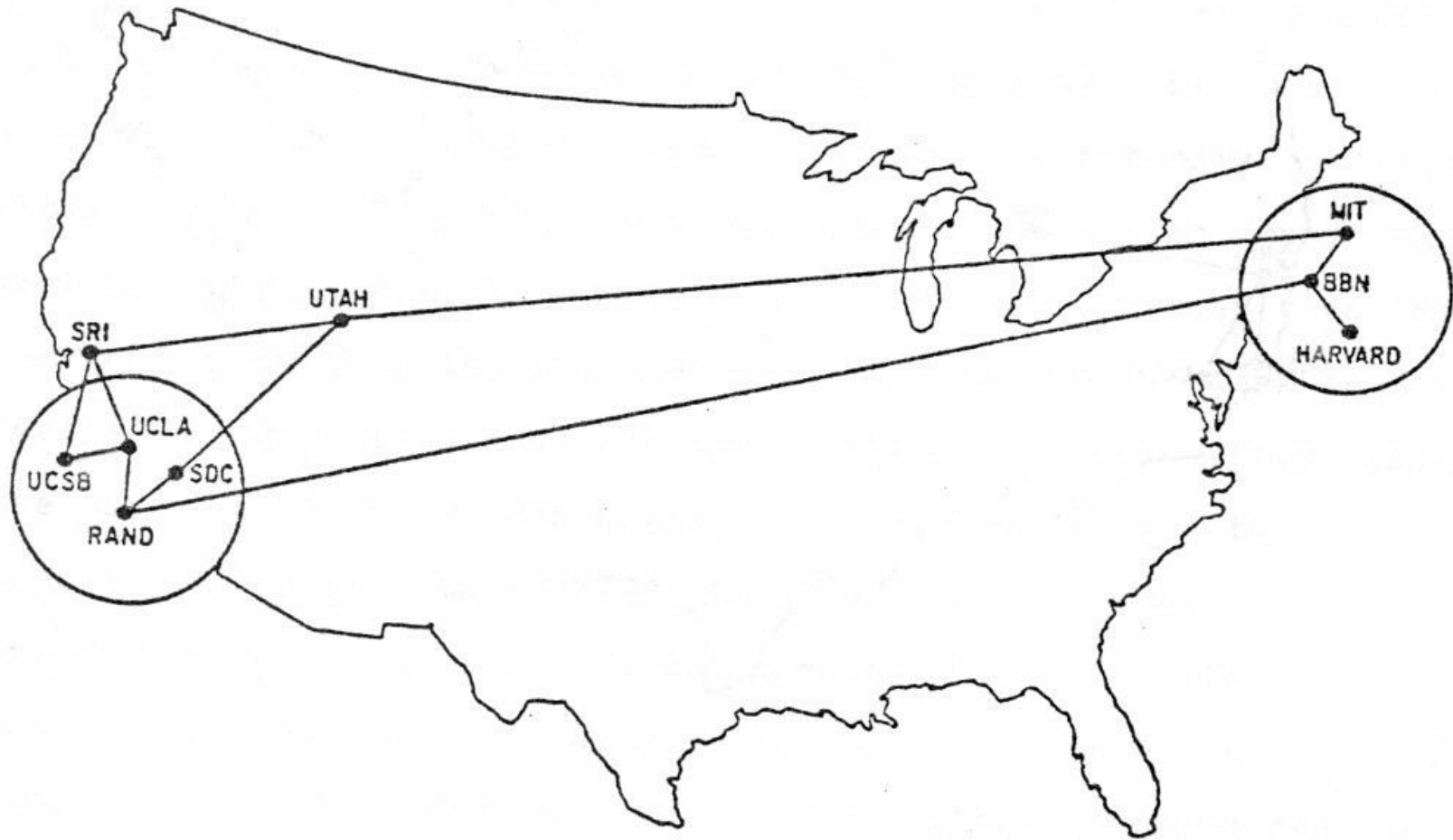|				
"GERMANE"	"ABSTRACT THAT AWAY"	"WHEREBY"	"LET ME PROPOSE"	"I CLAIM"
"SWEEP UNDER THE RUG"	"DELIBERATELY"	"MOREOVER"	"BY CONTRAST"	SOMEONE AT HARVARD ASKS A QUESTION YOU CAN'T HEAR
"HUMANS" (as opposed to technology)	MALAN MOVES WEIRDLY TO MAKE THE LECTURE LOOK GOOD	CS50 FREE SPACE	"HOPEFULLY BY NOW YOU UNDERSTAND [SOMETHING YOU DO NOT UNDERSTAND]"	"UNDERNEATH THE HOOD"
"IT TURNS OUT THAT..."	"MORE ON THAT LATER"	"PHEW!"	"SHORT ANSWER / LONG ANSWER"	"LET ME ACTUALLY GO AHEAD AND..."
"SO TO SPEAK"	YALE SLANDER	"FOR ALL INTENTS AND PURPOSES"	"ADMITTEDLY"	YOU GET JEALOUS OF THE HARVARD KIDS' SNACK

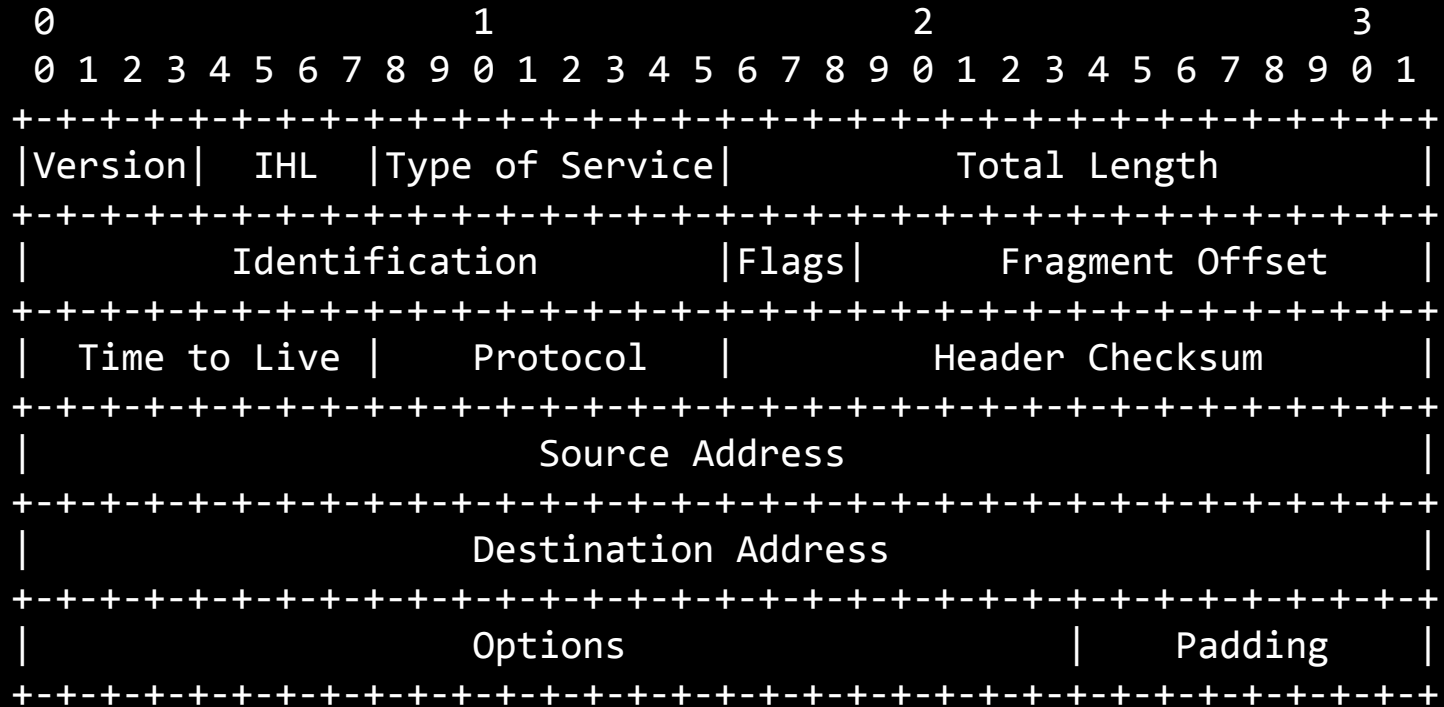internet

The ARPANET in December 1969

routers

TCP/IP

IP

#.#.#.#

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|Version|  IHL  |Type of Service|          Total Length         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|         Identification        |Flags|      Fragment Offset    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  Time to Live |    Protocol   |         Header Checksum        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                       Source Address                          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                    Destination Address                        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                    Options                    |    Padding     |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
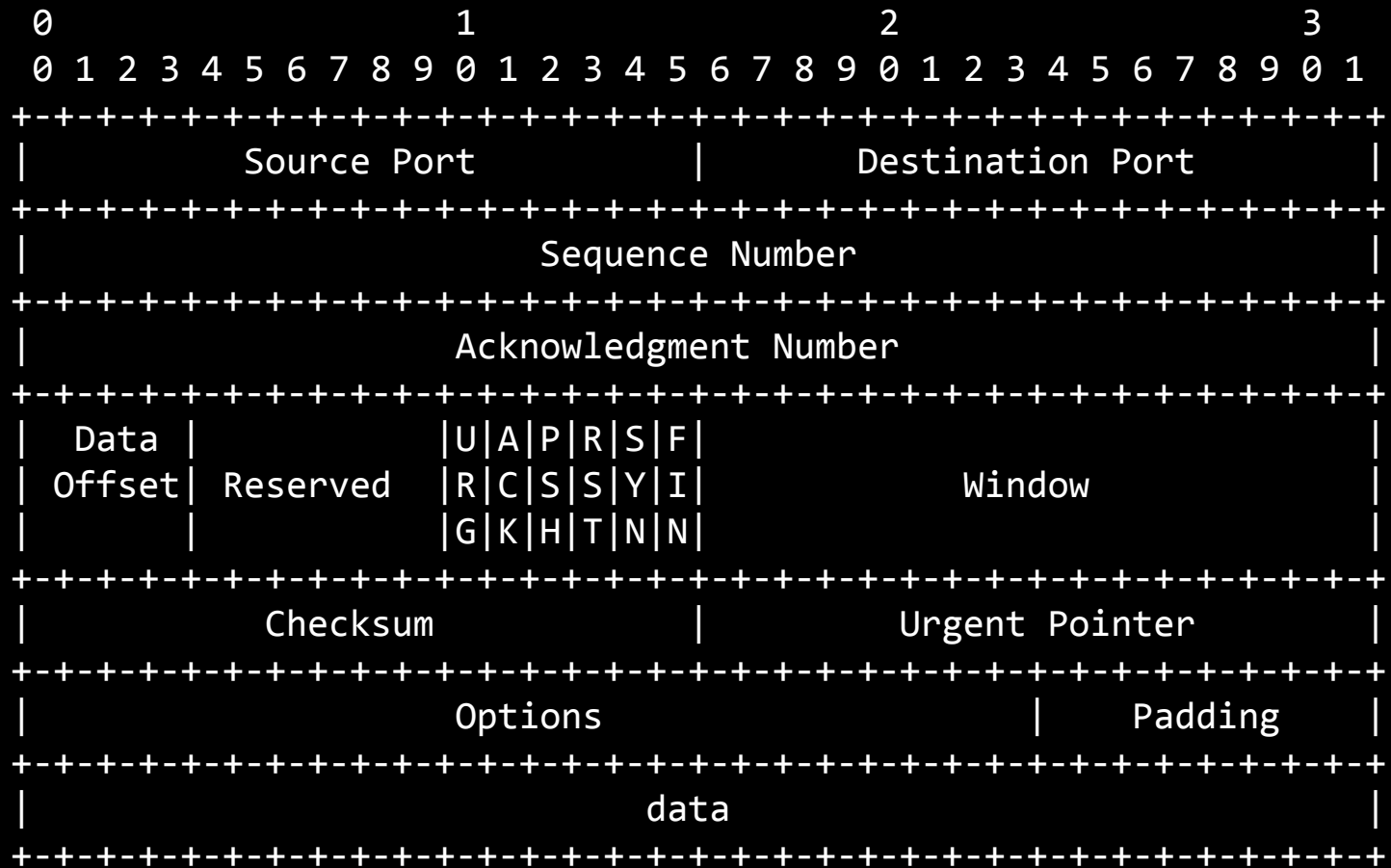
Example Internet Datagram Header

TCP

ports

80	HTTP
443	HTTPS
...	

```
    0                   1                   2                   3
    0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |          Source Port          |       Destination Port        |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                        Sequence Number                        |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                    Acknowledgment Number                      |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   | Data  |           |U|A|P|R|S|F|                               |
   | Offset| Reserved  |R|C|S|S|Y|I|            Window             |
   |       |           |G|K|H|T|N|N|                               |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |           Checksum            |         Urgent Pointer        |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                    Options                    |    Padding    |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                             data                              |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

                            TCP Header Format
```

DNS

Domain Name	IP Address

Fully Qualified Domain Name	IP Address

DHCP

HTTP

HTTPS

https://www.example.com

https://www.example.com/

https://www.example.com/path

https://www.example.com/file.html

https://www.example.com/folder/

https://www.example.com/folder/file.html

https://www.example.com/folder/file.html

https://www.example.com/folder/file.html

https://www.example.com/folder/file.html

https://www.example.com/folder/file.html

https://www.example.com/folder/file.html

GET

POST

. . .

```
GET / HTTP/2
Host: www.harvard.edu
...
```

```
HTTP/2 200
Content-Type: text/html
...
```

developer tools

```
HTTP/2 301
Location: https://www.harvard.edu/
...
```

```
GET / HTTP/2
Host: harvard.edu
...
```

```
HTTP/2 404
Content-Type: text/html
...
```

```
200 OK
301 Moved Permanently
302 Found
304 Not Modified
307 Temporary Redirect
401 Unauthorized
403 Forbidden
404 Not Found
418 I'm a Teapot
500 Internal Server Error
503 Service Unavailable
...
```

```
GET / HTTP/1.1
Host: safetyschool.org
...
```

HTML

tags

attributes

```html
<!DOCTYPE html>

<html lang="en">
    <head>
        <title>
            hello, title
        </title>
    </head>
    <body>
        hello, body
    </body>
</html>
```

http-server

```
<!DOCTYPE html>

<html lang="en">
    <head>
        <title>
            hello, title
        </title>
    </head>
    <body>
        hello, body
    </body>
</html>
```

```html
<!DOCTYPE html>

<html lang="en">
    <head>
        <title>
            hello, title
        </title>
    </head>
    <body>
        hello, body
    </body>
</html>
```

```
<!DOCTYPE html>

<html lang="en">
    <head>
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            hello, title
        </title>
    </head>
    <body>
        hello, body
    </body>
</html>
```

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<!DOCTYPE html>

<html lang="en">
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    </head>
    <body>
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<!DOCTYPE html>

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        </title>
    </head>
    <body>
        hello, body
    </body>
</html>
```
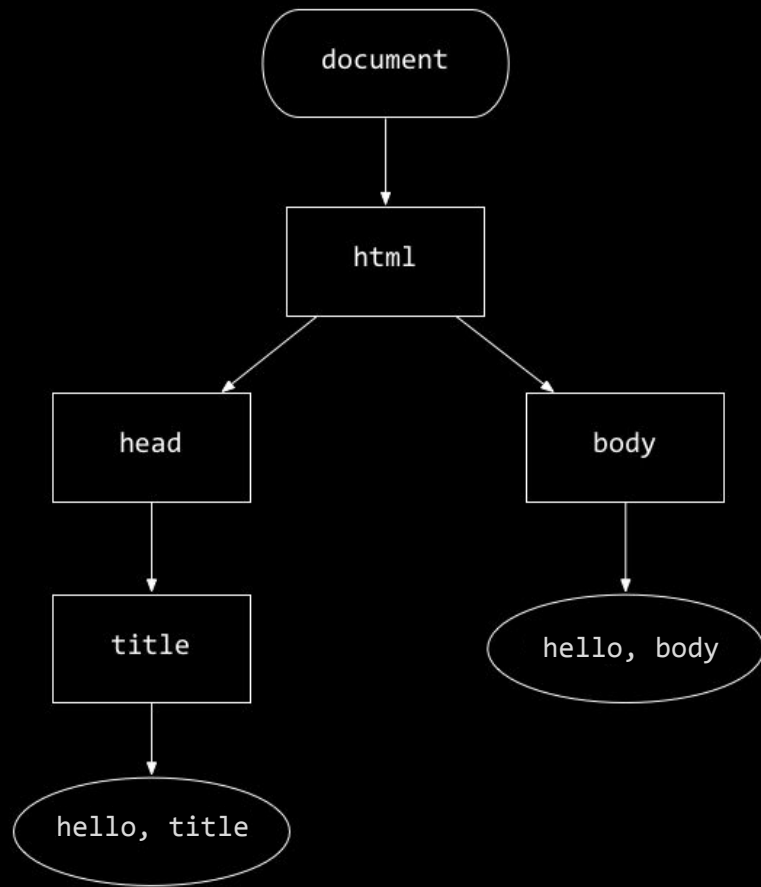
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<!DOCTYPE html>

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        </title>
    </head>
    <body>
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    </body>
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    <body>
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</html>
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<!DOCTYPE html>

<html lang="en">
    <head>
        <title>
            hello, title
        </title>
    </head>
    <body>
        hello, body
    </body>
</html>
```

https://www.example.com

https://www.example.com/path?key=value

https://www.example.com/path?key=value&key=value

break

A CS50 bingo card with a 5×5 grid of squares:

"GERMANE"	"ABSTRACT THAT AWAY"	"WHEREBY"	"LET ME PROPOSE"	"I CLAIM"
"SWEEP UNDER THE RUG"	"DELIBERATELY"	"MOREOVER"	"BY CONTRAST"	SOMEONE AT HARVARD ASKS A QUESTION YOU CAN'T HEAR
"HUMANS" (as opposed to technology)	MALAN MOVES WEIRDLY TO MAKE THE LECTURE LOOK GOOD	FREE SPACE (CS50 duck)	"HOPEFULLY BY NOW YOU UNDERSTAND [SOMETHING YOU DO NOT UNDERSTAND]"	"UNDERNEATH THE HOOD"
"IT TURNS OUT THAT..."	"MORE ON THAT LATER"	"PHEW!"	"SHORT ANSWER / LONG ANSWER"	"LET ME ACTUALLY GO AHEAD AND..."
"SO TO SPEAK"	YALE SLANDER	"FOR ALL INTENTS AND PURPOSES"	"ADMITTEDLY"	YOU GET JEALOUS OF THE HARVARD KIDS' SNACK

"GERMANE"	"ABSTRACT THAT AWAY"	"WHEREBY"	"LET ME PROPOSE"	"I CLAIM"
"SWEEP UNDER THE RUG"	"DELIBERATELY"	"MOREOVER"	"BY CONTRAST"	SOMEONE AT HARVARD ASKS A QUESTION YOU CAN'T HEAR
"HUMANS" (as opposed to technology)	MALAN MOVES WEIRDLY TO MAKE THE LECTURE LOOK GOOD	FREE SPACE	"HOPEFULLY BY NOW YOU UNDERSTAND [SOMETHING YOU DO NOT UNDERSTAND]"	"UNDERNEATH THE HOOD"
"IT TURNS OUT THAT…"	"MORE ON THAT LATER"	"PHEW!"	"SHORT ANSWER / LONG ANSWER"	"LET ME ACTUALLY GO AHEAD AND…"
"SO TO SPEAK"	YALE SLANDER	"FOR ALL INTENTS AND PURPOSES"	"ADMITTEDLY"	YOU GET JEALOUS OF THE HARVARD KIDS' SNACK

"GERMANE"	"ABSTRACT THAT AWAY"	"WHEREBY"	"LET ME PROPOSE"	"I CLAIM"
"SWEEP UNDER THE RUG"	"DELIBERATELY"	"MOREOVER"	"BY CONTRAST"	SOMEONE AT HARVARD ASKS A QUESTION YOU CAN'T HEAR
"HUMANS" (as opposed to technology)	MALAN MOVES WEIRDLY TO MAKE THE LECTURE LOOK GOOD	CS50 FREE SPACE	"HOPEFULLY BY NOW YOU UNDERSTAND [SOMETHING YOU DO NOT UNDERSTAND]"	"UNDERNEATH THE HOOD"
"IT TURNS OUT THAT..."	"MORE ON THAT LATER"	"PHEW!"	"SHORT ANSWER / LONG ANSWER"	"LET ME ACTUALLY GO AHEAD AND..."
"SO TO SPEAK"	YALE SLANDER	"FOR ALL INTENTS AND PURPOSES"	"ADMITTEDLY"	YOU GET JEALOUS OF THE HARVARD KIDS' SNACK

"GERMANE"	"ABSTRACT THAT AWAY"	"WHEREBY"	"LET ME PROPOSE"	"I CLAIM"
"SWEEP UNDER THE RUG"	"DELIBERATELY"	"MOREOVER"	"BY CONTRAST"	SOMEONE AT HARVARD ASKS A QUESTION YOU CAN'T HEAR
"HUMANS" (as opposed to technology)	MALAN MOVES WEIRDLY TO MAKE THE LECTURE LOOK GOOD	FREE SPACE	"HOPEFULLY BY NOW YOU UNDERSTAND [SOMETHING YOU DO NOT UNDERSTAND]"	"UNDERNEATH THE HOOD"
"IT TURNS OUT THAT…"	"MORE ON THAT LATER"	"PHEW!"	"SHORT ANSWER / LONG ANSWER"	"LET ME ACTUALLY GO AHEAD AND…"
"SO TO SPEAK"	ALE SLANDER	"FOR ALL INTENTS AND PURPOSES"	"ADMITTEDLY"	YOU GET JEALOUS OF THE HARVARD KIDS' SNACK

"What do you think of Yale?"

regular expressions

regexes

developer.mozilla.org/en-US/docs/Web/JavaScript/Guide/Regular_expressions

```
.        any single character (except line terminators)

*        zero or more times

+        one or more times

?        0 or 1 time

{n}      n occurrences

{n,m}    at least n occurrences, at most m occurrences

…
```

```
[0123456789]    any one of the enclosed characters

[0-9]           any one of the range of characters

\d              any digit

\D              any character that is not a digit

...
```

```
^[a-zA-Z0-9.!#$%&'*+\/=?^_`{|}~-]+@[a-zA-Z0-9](?:[a-zA-Z0-9-]{0,61}[a-zA-Z0-9])?(?:\.[a-zA-Z0-9](?:[a-zA-Z0-9-]{0,61}[a-zA-Z0-9])?)*$
```

developer tools

validator.w3.org

CSS

properties

type selector

class selector

ID selector

attribute selector

...

```html
<!DOCTYPE html>

<html lang="en">
    <head>
        <title>
            hello, title
        </title>
    </head>
    <body>
        hello, body
    </body>
</html>
```

```
<!DOCTYPE html>

<html lang="en">
    <head>
        <style>

        </style>
        <title>
            hello, title
        </title>
    </head>
    <body>
        hello, body
    </body>
</html>
```

```html
<!DOCTYPE html>

<html lang="en">
    <head>
        <link href="styles.css" rel="stylesheet">
        <title>
            hello, title
        </title>
    </head>
    <body>
        hello, body
    </body>
</html>
```

frameworks

Bootstrap

getbootstrap.com

developer tools

JavaScript

```
blur
change
click
drag
focus
keyup
load
mousedown
mouseover
mouseup
submit
touchmove
unload
...
```

This is CS50