Second tutorial after midterm result release

Stand up and do something

That’s appropriate

Tutorial 08

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https://github.com/yxliang01/cs1010-fun-stuff

Adapted from Evan Tay's Slide

Today's plan

- Unit 20: C Pre-processor
  - *Problem Set 20.1, 20.2*
- Unit 21: Assert
  - *Problem Set 21.1*
- Unit 22: Efficiency
  - *Problem Set 22.1, 22.2*

UNIT 20
C PRE-PROCESSOR

Recap. PS 20.1. PS 20.2

Recap

- Preprocessor directive
  - *A directive which starts with* ***#***
  - *To* ***#include*** *a file or,*
  - *To* ***#define*** *a macro*

Recap - #include

- #include <stdbool.h>
- #include “cs1010.h”

Recap - #define macro

- **#define NAME EXPRESSION**
  - *Use it to define macros which are repeatedly used in code.*
  - *Whenever you use NAME in your code, it will be replaced with EXPRESSION*

Recap - #define macro

```
#define SQUARE(x) x*x
#define PI 3.1415926

int main() {

    double radius = 4.0;
cs1010_print_double(PI*SQUARE(radius));

}
```

Recap - #define macro

```
#define SQUARE(x) x*x
#define PI 3.1415926

int main() {

    double radius = 4.0;
cs1010_print_double(3.1415926*radius*radius);

}
```

Recap – Macro warnings

- Given:

```
#define SQUARE(x) x*x
```

- SQUARE(radius + 2) evaluates to:

radius + 2*radius + 2

Recap – Macro warnings

- Given:

```
#define SQUARE(x) ((x)*(x))
```

- SQUARE(radius + 2) evaluates to:

```
((radius + 2)*(radius + 2))
```

ENDING NOTE

ALWAYS USE UPPERCASE WHEN #define CONSTANTS and MACROS

UNIT 20
C PRE-PROCESSOR

Recap. PS 20.1. PS 20.2

Problem Set 20.1 a)

```
#define MIN(a,b) a < b ? a : b

long i = MIN(10, 20);
long j = MIN(10, 20) + 1;
```

- What are the values of **i** and **j**?

Problem Set 20.1 a)

```
#define MIN(a,b) a < b ? a : b

long i = MIN(10, 20);
long j = MIN(10, 20) + 1;
```

- What are the values of **i** and **j**?
  - *i = 10 < 20 ? 10 : 20 = 10*
  - *j = 10 < 20 ? 10 : **20 + 1***

    *j = 10 < 20 ? 10 : **21** = 10*

Problem Set 20.1 a)

```
#define MIN(a,b) (a < b ? a : b)

long i = MIN(10, 20);
long j = MIN(10, 20) + 1;
```

- What are the values of **i** and **j**?
  - *i = 10 < 20 ? 10 : 20 = 10*
  - *j = (10 < 20 ? 10 : 20) + 1*

    j = 10 + 1 = 11

Problem Set 20.1 b)

```
#define MIN(a,b) a < b ? a : b

long i = 10;
long j = 20;

long k = MIN(j, i++);
```

- What are the values of **i** and **k**?

  a) i = 11, k = 10 b) i = 11, k = 11

  c) i = 12, k = 10 d) i = 12, k = 11

Problem Set 20.1 b)

```
#define MIN(a,b) a < b ? a : b

long i = 10;
long j = 20;

long k = MIN(j, i++);
```

- What are the values of **i** and **k**?

  a) i = 11, k = 10 b) i = 11, k = 11

  *c) i = 12, k = 10 **d) i = 12, k = 11***

NANI?

Problem Set 20.1 b)

```
#define MIN(a,b) a < b ? a : b
long i = 10; long j = 20;
long k = MIN(j, i++);
```

- k = 20 < i++ ? 20 : i++
- k = 20 < **10**++ ? 20 : i++
- k = 20 < 10 ? 20 : **11**++
- k = **11**; i = **12**

UNIT 20
C PRE-PROCESSOR

Recap. PS 20.1. PS 20.2

Problem Set 20.2

- Original solution

```
#define SWAP(T, x, y) {\
    T temp;\
    temp = x;\
    x = y;\
    y = temp;\
}

int main() {

    long x = 3.0; long y = -1.0;
    SWAP(long, x, y);

}
```

- Modified version

```
#define SWAP(T, x, y) T temp = x;\
    x = y;\
    y = temp;

int main() {

    long x = 3.0; long y = -1.0;
    SWAP(long, x, y);

}
```

- What could go wrong?

Problem Set 20.2 - Original

- Original solution

```
#define SWAP(T, x, y) {\
    T temp;\
    temp = x;\
    x = y;\
    y = temp;\
}

int main() {

    long x = 3.0; long y = -1.0;
    SWAP(long, x, y);

}
```

- Becomes:

```
int main() {

    long x = 3.0; long y = -1.0;
    {
        long temp;
        temp = x;
        x = y;
        y = temp;

    };

}
```

Problem Set 20.2 - Original

- Modified version

```
#define SWAP(T, x, y) T temp = x;\
    x = y;\
    y = temp;

int main() {

    long x = 3.0; long y = -1.0;
    SWAP(long, x, y);

}
```

- Becomes:

```
int main() {

    long x = 3.0; long y = -1.0;
    long temp = x;
    x = y;
    y = temp;

}
```

- What could go wrong?

Problem Set 20.2 - Original

- Original becomes:

```
int main() {
    long x = 3.0; long y = -1.0;
    {
        long temp;
        temp = x;
        x = y;
        y = temp;
    };
}
```

- Second solution becomes:

```
int main() {
    long x = 3.0; long y = -1.0;
    long temp = x;
    x = y;
    y = temp;
}
```

- What could go wrong?

Problem Set 20.2 - Original

- Original becomes:

```
int main() {
    long temp = 5.0;
    long x = 3.0; long y = -1.0;
    {
        long temp;
        temp = x;
        x = y;
        y = temp;
    };
}
```

- Second solution becomes:

```
int main() {
    long temp = 5.0;
    long x = 3.0; long y = -1.0;
    long temp = x;
    x = y;
    y = temp;
}
```

- What could go wrong? This is what happens:
  - ***error: redefinition of 'temp'***

UNIT 21
C PRE-PROCESSOR

Recap. PS 21.1.

Recap

```
#include <stdio.h>
#include <assert.h>

int main(){

    char answer;
    printf("Is CS1010 hard? Enter Y/N: ");
    scanf("%c", &answer);
    assert(answer == 'N');
}
```

- If wrong answer is given: Assertion 'answer == 'Y'' failed.

UNIT 21
C PRE-PROCESSOR

Recap. PS 21.1.

Problem Set 21.1

```
void foo(long x) {
    if (x % 2 == 0) {
        …
    } else {
        assert(x % 2 == 1);
    }
}
```

- Would the assert in Line 5 above ever fail?

Problem Set 21.1

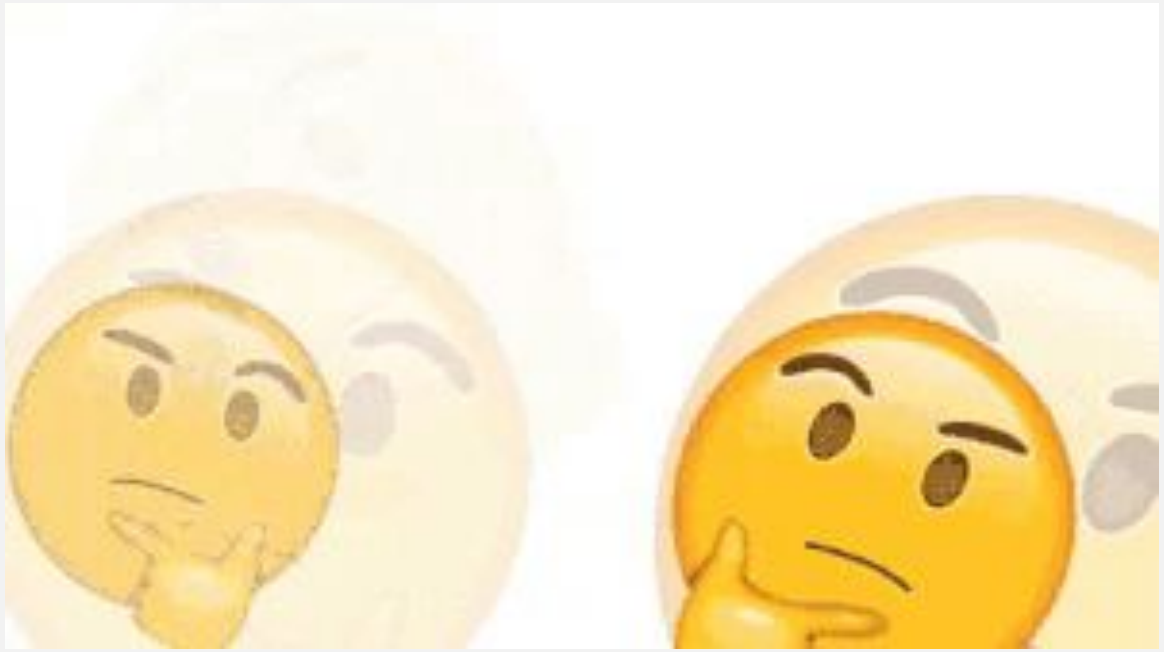
```
void foo(long x) {
    if (x % 2 == 0) {
        …
    } else {
        assert(x % 2 == 1);
    }
}
```

- Would the assert in Line 5 above ever fail? **Yes**
  - *Consider* ***x = -1***

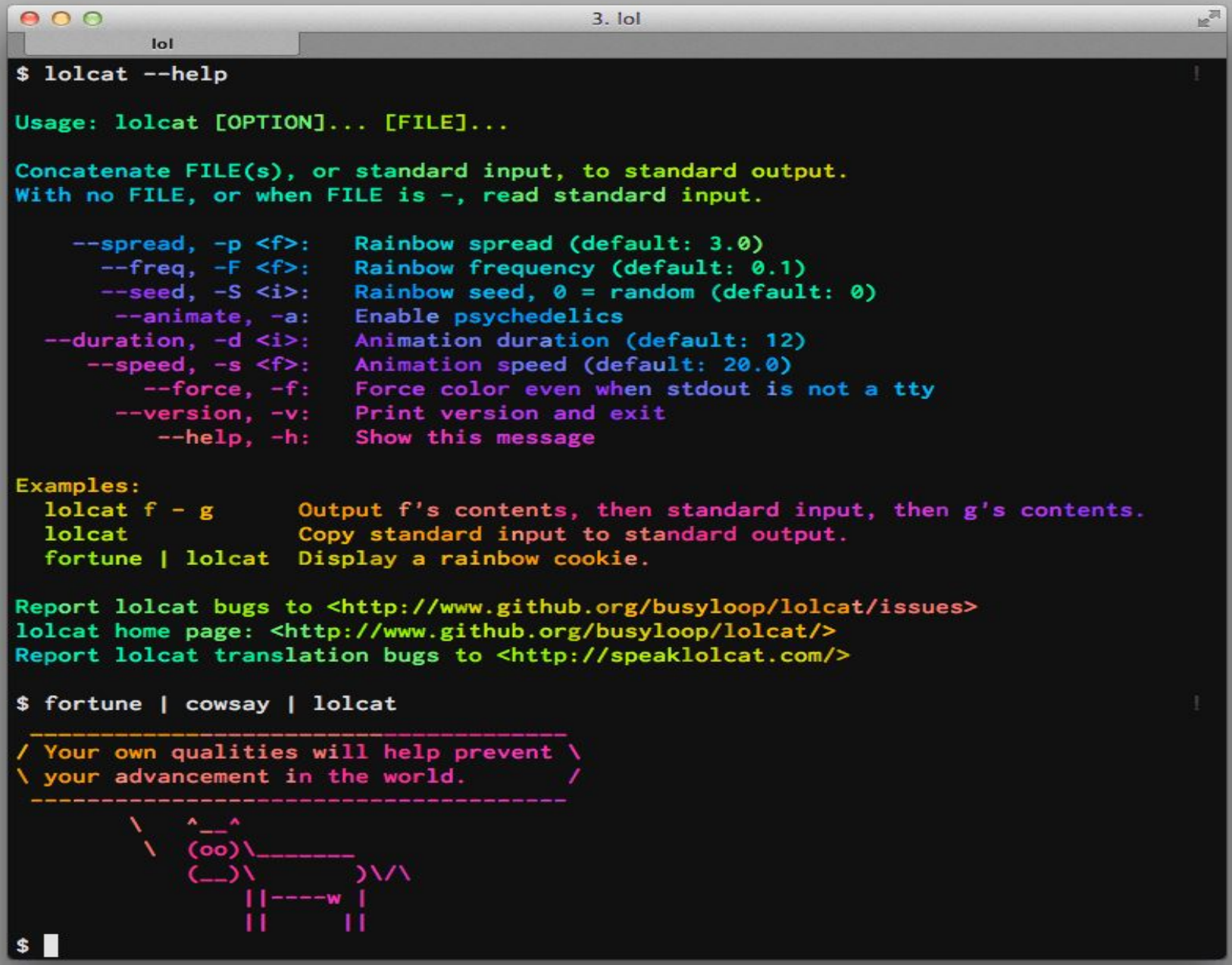
Problem Set 21.2

Pop quiz

What does `cat` do?



Fun stuff


3. lol
lol
$ lolcat --help
Usage: lolcat [OPTION]... [FILE]...
Concatenate FILE(s), or standard input, to standard output.
With no FILE, or when FILE is -, read standard input.
--spread, -p <f>: Rainbow spread (default: 3.0)
--freq, -F <f>: Rainbow frequency (default: 0.1)
--seed, -S <i>: Rainbow seed, 0 = random (default: 0)
--animate, -a: Enable psychedelics
--duration, -d <i>: Animation duration (default: 12)
--speed, -s <f>: Animation speed (default: 20.0)
--force, -f: Force color even when stdout is not a tty
--version, -v: Print version and exit
--help, -h: Show this message
Examples:
lolcat f - g Output f's contents, then standard input, then g's contents.
lolcat Copy standard input to standard output.
fortune | lolcat Display a rainbow cookie.
Report lolcat bugs to <http://www.github.org/busyloop/lolcat/issues>
lolcat home page: <http://www.github.org/busyloop/lolcat/>
Report lolcat translation bugs to <http://speaklolcat.com/>
$ fortune | cowsay | lolcat
/ Your own qualities will help prevent \
\ your advancement in the world. /
(oo)
(__)
||----w |
||
$

`sl | lolcat` on PE

Installing lolcat

C implementation: https://github.com/jaseg/lolcat

Just `make` and you will get `lolcat` on PE!

UNIT 22
EFFICIENCY

Recap. PS 22.1. PS 22.2

Recap

- In CS1010, we will focus on the efficiency of your code in two senses:
  - ***First, your code should not perform redundant work and it should not repeat itself unnecessarily.***
  - ***Second, your algorithm should run within a given Big-O running time.***

UNIT 22
EFFICIENCY

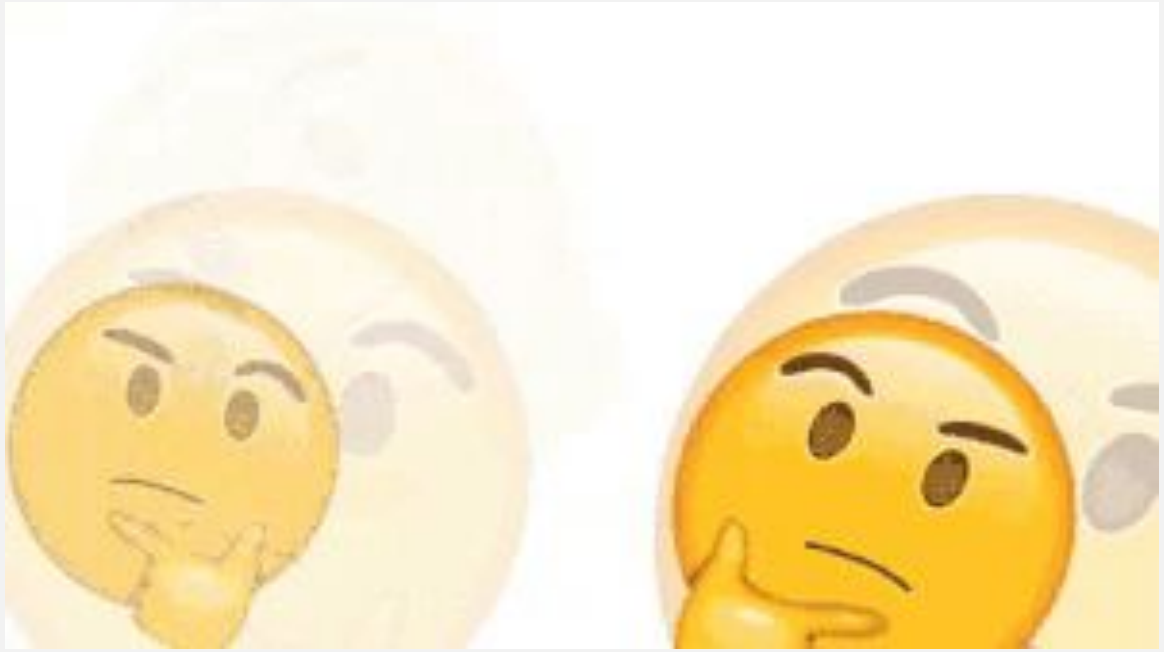
PS 22.1. PS 22.2

Problem Set 22.1

- Order the following functions in increasing rate of growth:

1. $Log_{10} n$	*2. ln n*
3. $\sqrt{n}$	*4. n*
5. n ln n	*6. n^2*
7. n ^ 4	*8. 2^n*
9. e^n	*10. n!*

How about when it is w.r.t Big-O?



Problem Set 22.1

$$O(\ln n) == O(\log_{10} n) << O(\sqrt{n}) << O(n) << O(n \ln n) << O(n^2) << O(n^4) << O(2^n) << O(e^n) << O(n!)$$

UNIT 22
EFFICIENCY

Recap. PS 22.1. PS 22.2

Problem Set 22.2 a)

```
for (long i = 0; i < n; i += 1) {
    for (long j = 0; j < n; j += 2) {
        cs1010_println_long(i + j);
    }
}
```

- What is the Big-O running time of the following code, in terms of n?

Problem Set 22.2 a)

```
for (long i = 0; i < n; i += 1) {
    for (long j = 0; j < n; j += 2) {
        cs1010_println_long(i + j);
    }
}
```

- What is the Big-O running time of the following code, in terms of n? **n^2**

Problem Set 22.2 b)

```
for (long i = 0; i < n; i *= 2) {
    for (long j = 0; j < n; j *= 2) {
        cs1010_println_long(i + j);
    }
}
```

- What is the Big-O running time of the following code, in terms of n?

Problem Set 22.2 b)

```
for (long i = 0; i < n; i *= 2) {
    for (long j = 0; j < n; j *= 2) {
        cs1010_println_long(i + j);
    }
}
```

- What is the Big-O running time of the following code, in terms of n? **It simply won't terminate :P**

Problem Set 22.2 b)

```
for (long i = 1; i < n; i *= 2) {
    for (long j = 1; j < n; j *= 2) {
        cs1010_println_long(i + j);
    }
}
```

- What is the Big-O running time of the following code, in terms of n?

Problem Set 22.2 b)

```
for (long i = 1; i < n; i *= 2) {
    for (long j = 1; j < n; j *= 2) {
        cs1010_println_long(i + j);
    }
}
```

- What is the Big-O running time of the following code, in terms of n? **$(\log_2 n)^2$**

Problem Set 22.2 c)

```
long k = 1;
for (long j = 0; j < n; j += 1) {
    k *= 2;
    for (long i = 0; i < k; i += 1) {
        cs1010_println_long(i + j);
    }
}
```

- What is the Big-O running time of the following code, in terms of n?

Problem Set 22.2 c)

```
long k = 1;
for (long j = 0; j < n; j += 1) {
    k *= 2;
    for (long i = 0; i < k; i += 1) {
        cs1010_println_long(i + j);
    }
}
```

- What is the Big-O running time of the following code, in terms of n? **2 ^ n**

Text version solution

This one got detailed working and explanation

https://github.com/yxliang01/cs1010-fun-stuff/blob/master/tutorial/08/Tut08.pdf

Assignment 4

Guys, pls remember to free the memory... I wasted 7+ hrs just because someone didn't free the resource... And, that's y I'm still awake!!!

At 5:38AM

Still affecting my project(s) at the moment...

question

187 views

I hope everyone is having a good day today

mp4

edit · good question | 11

Updated 1 day ago by Anonymous

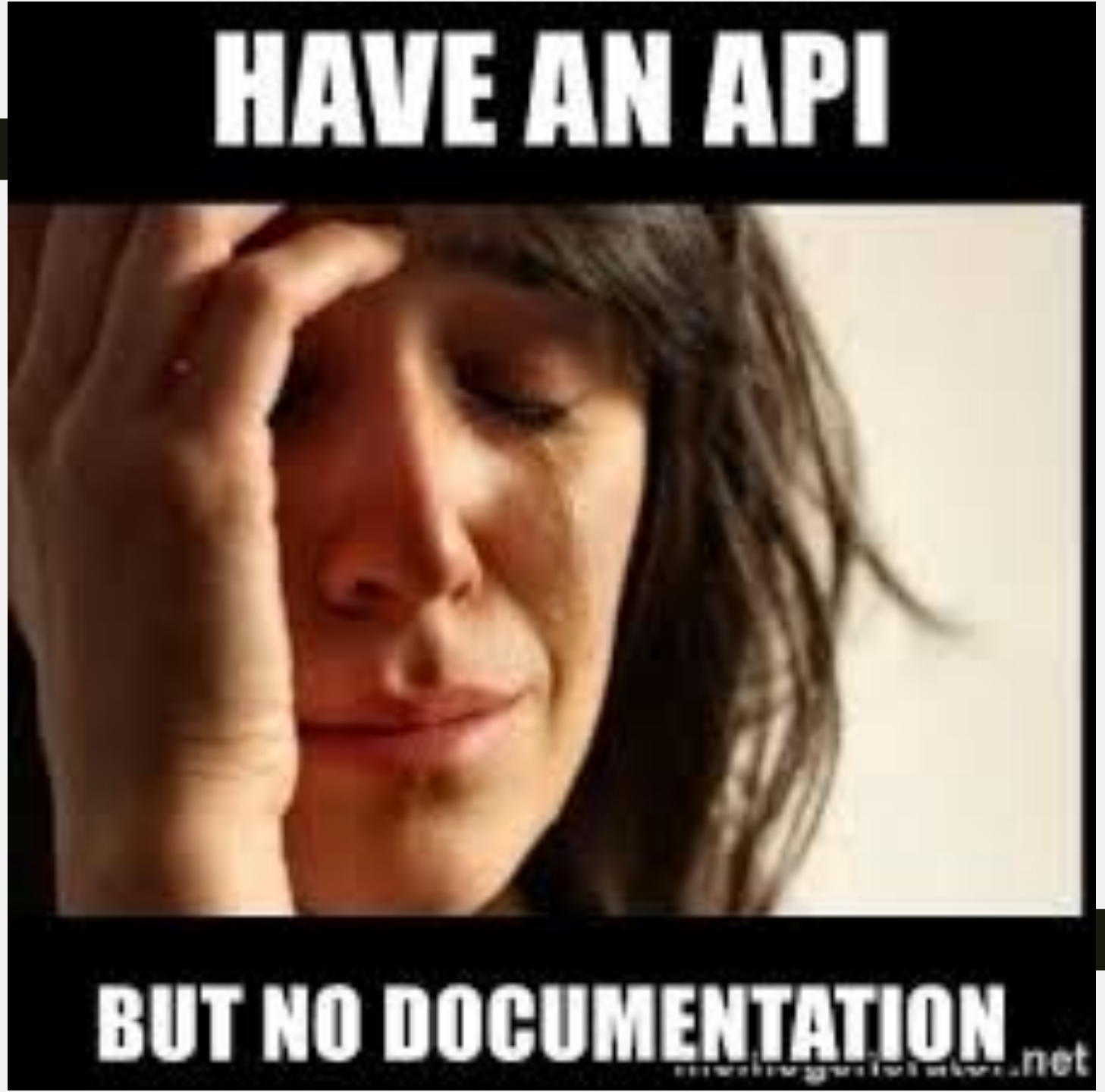
S **the students' answer,** *where students collectively construct a single answer*

Segmentation Fault

edit · undo thanks | 13

Updated 1 day ago by Anonymous


Vampire
Sunlight
Superman
@NPCompleteTeens
Kryptonite
software engineers
Writing proper documentation


HAVE AN API
BUT NO DOCUMENTATION
.net

Assignment 5

Q & A

THE END

https://github.com/yxliang01/cs1010-fun-stuff/blob/master/tutorial-slides/tut08.pptx

PDF version at

https://github.com/yxliang01/cs1010-fun-stuff/blob/master/tutorial-slides/tut08.pdf