CS444/544
Operating Systems II

Lecture 7

4/24/2024

Quiz 1 Review + Lab 2 Tips

Acknowledgement: Slides drawn heavily from Yeongjin Jiang

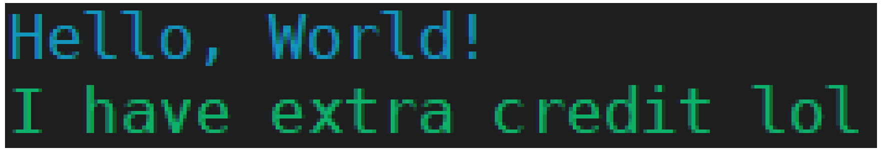
Oregon State University

Due Reminder

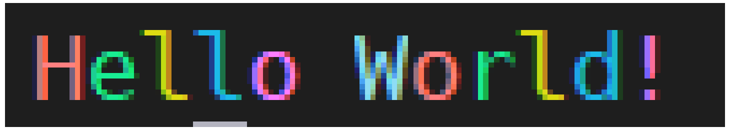
- Lab 2 due Monday 4/29 11:59 PM
  - Read document thoroughly and carefully
  - Read lab slides and watch lab tutorial videos!!!
  - Don't forget to submit written questions (name it: answers-lab2.txt)
  - Don't forget to update the student.info and tag!!!
    - Make sure your tag includes your code/implementation
    - Run `check_submission.sh`
    - To check: `git checkout tags/<tag_name>`
    - i.e., `git checkout tags/lab2-final`

Quiz 1…

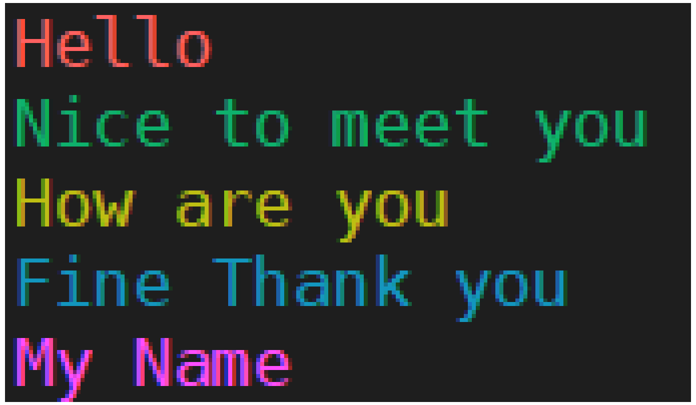
Lab 1 Extra Credit



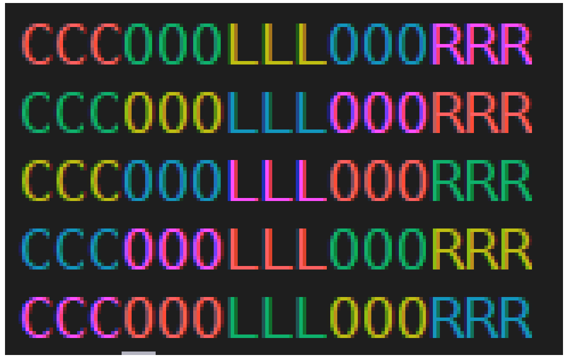
```
Hello, World!
I have extra credit lol
```



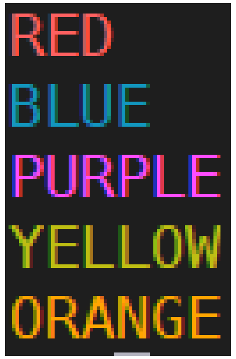
```
Hello World!
```



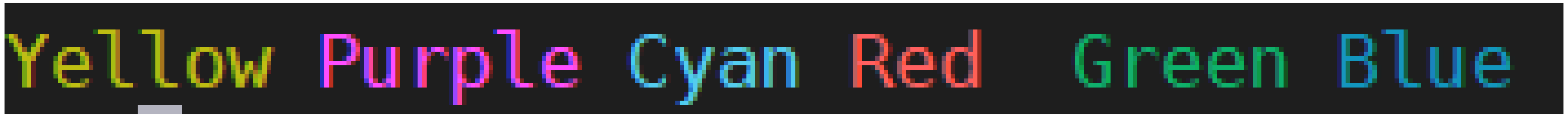
```
Hello
Nice to meet you
How are you
Fine Thank you
My Name
```



```
CCCOOOLLLOOORRR
CCCOOOLLLOOORRR
CCCOOOLLLOOORRR
CCCOOOLLLOOORRR
CCCOOOLLLOOORRR
```

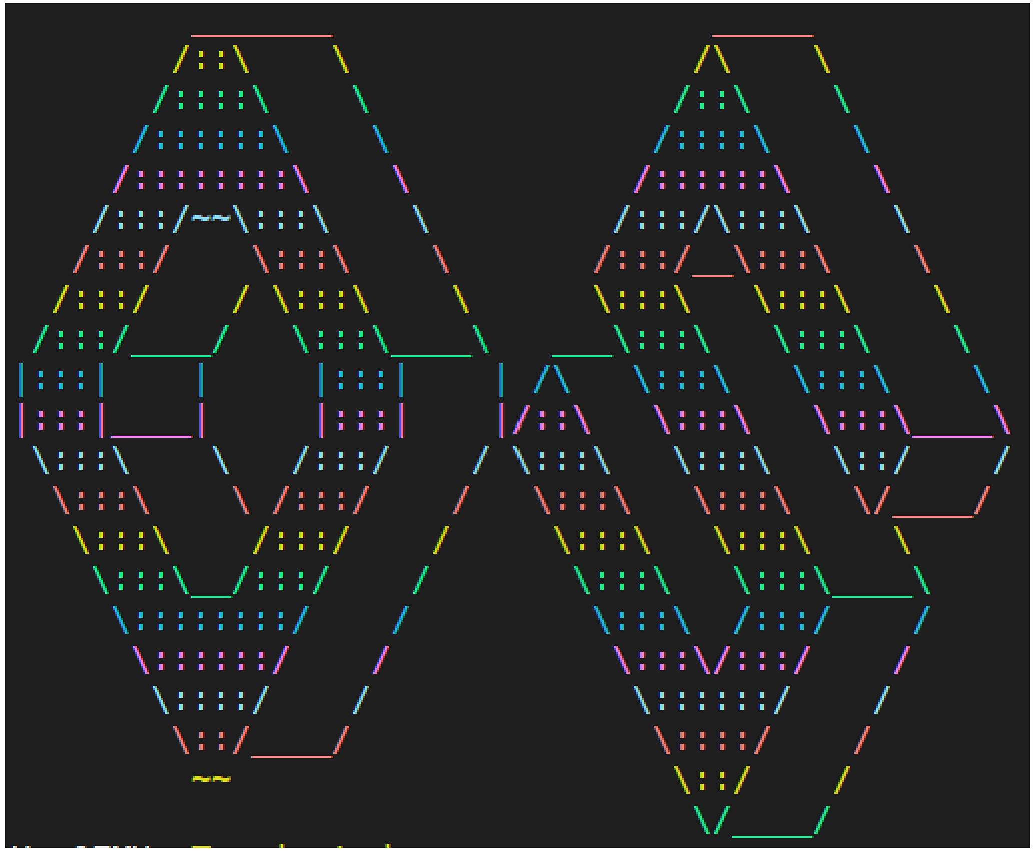


```
RED
BLUE
PURPLE
YELLOW
ORANGE
```



```
Yellow Purple Cyan Red  Green Blue
```

Lab 1 Extra Credit



```
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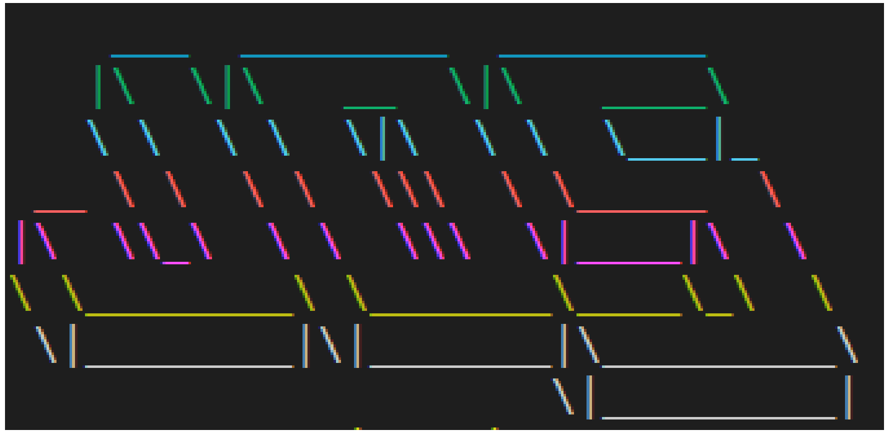
```



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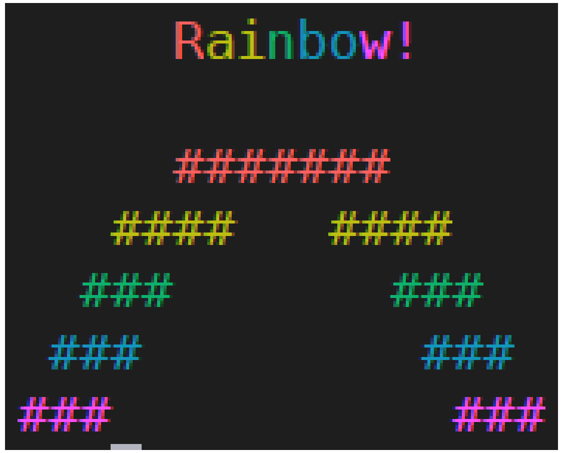
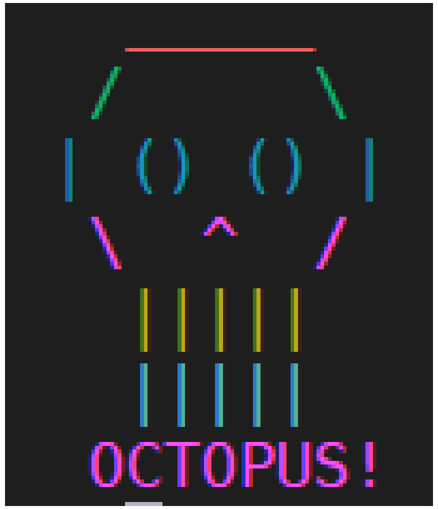
```

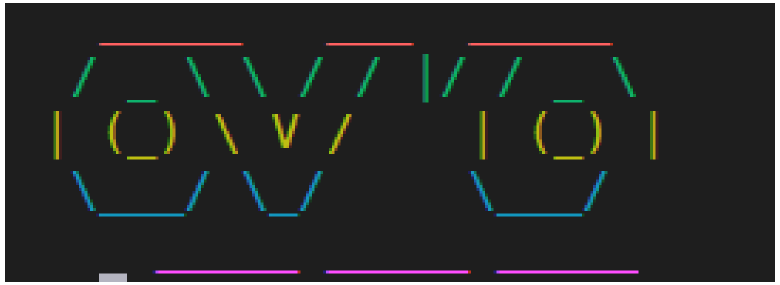


```
     Rainbow!

     #######
   ####   ####
  ###       ###
 ###         ###
###           ###
```



```
  _____
 /     \
| () () |
 \  ^  /
  |||||
  |||||
 OCTOPUS!
```



```
  _____   ___  _____
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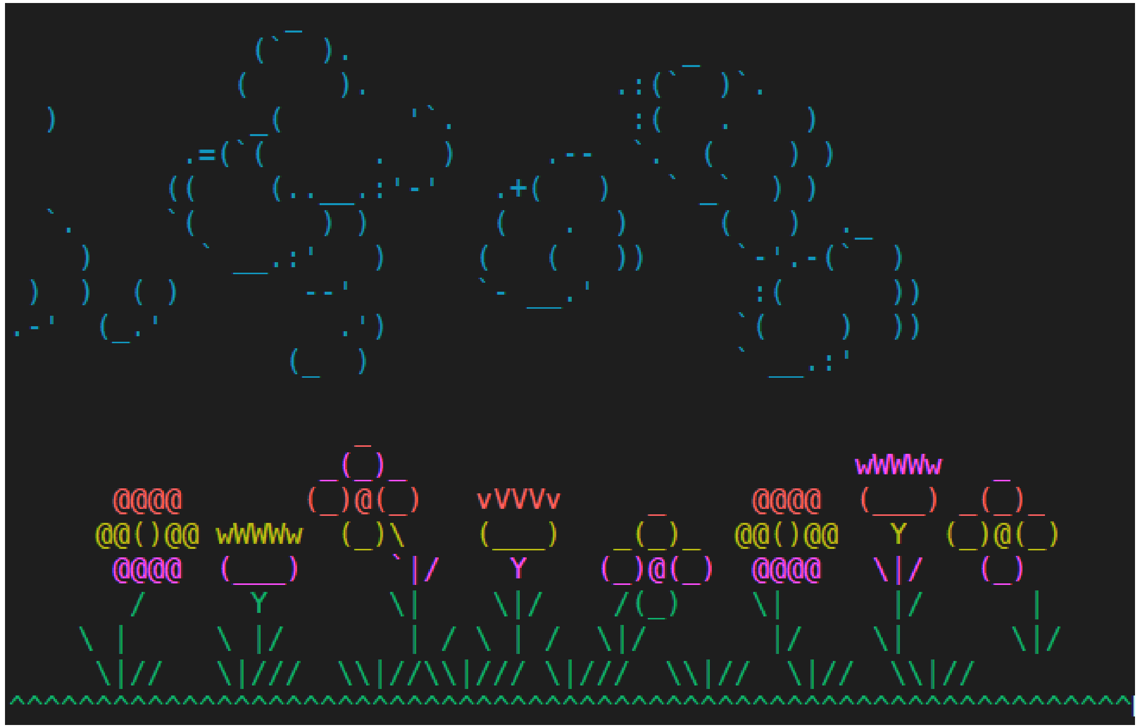
| (_) \ V /    | (_) |
 \___/ \_/     \___/

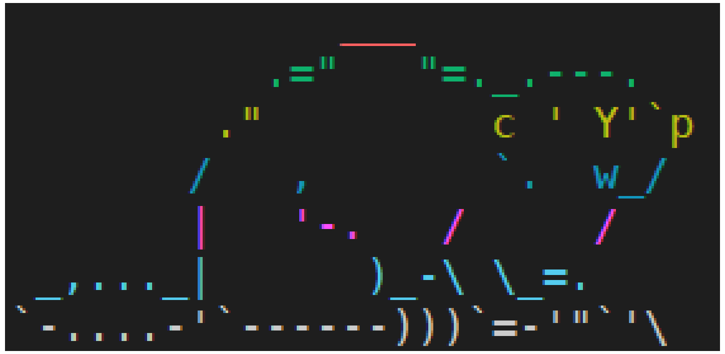
    _____ _____ _____
```

Lab 1 Extra Credit

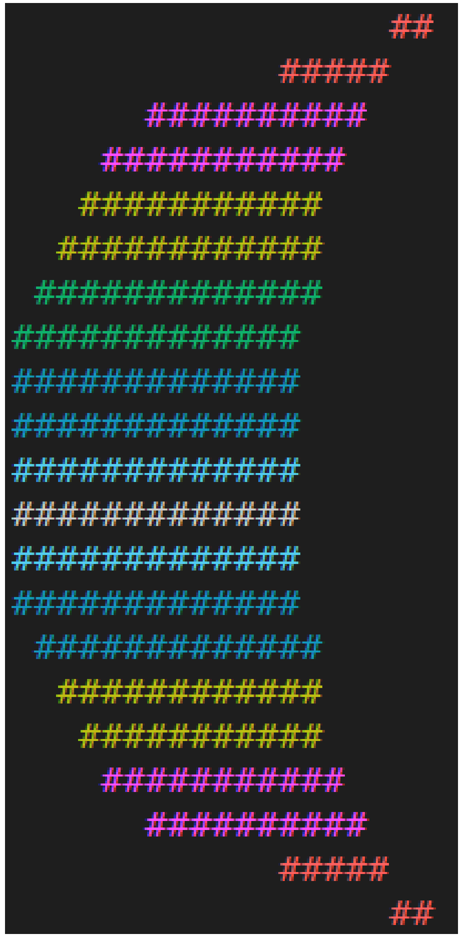


```
                _
              (`  ).                   _
             (     ).              .:(`  )`.
  )           _(       '`.            :(   .    )
          .=(`(      .   )     .--  `.  (    ) )
         ((    (..__.:'-'   .+(   )   ` _`  ) )
  `.     `(       ) )       (   .  )     (   )  ._
    )      `__.:'   )      (   (   ))     `-'.-(`  )
 )  )  ( )       --'       `- __.'         :(      ))
.-'  (_.'          .')                    `(    )  ))
                (_  )                     ` __.:'

                    _
                  _(_)_                          wWWWw   _
      @@@@       (_)@(_)   vVVVv     _     @@@@  (___) _(_)_
     @@()@@ wWWWw  (_)\    (___)   _(_)_  @@()@@   Y  (_)@(_)
      @@@@  (___)     `|/    Y    (_)@(_)  @@@@   \|/   (_)
       /      Y       \|    \|/    /(_)    \|      |/      |
    \ |     \ |/       | / \ | /  \|/       |/    \|      \|/
     \|//   \|///  \\|//\\|/// \|///  \\|//  \|//  \\|//
^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
```



```
             ___
          .="   "=._.---.
        ."         c ' Y'`p
       /   ,       `.  w_/
       |   '-.   /     /
 _,..._|      )_-\ \_=.
`-....-'`------)))`=-'"`'\
```



```
                 ##
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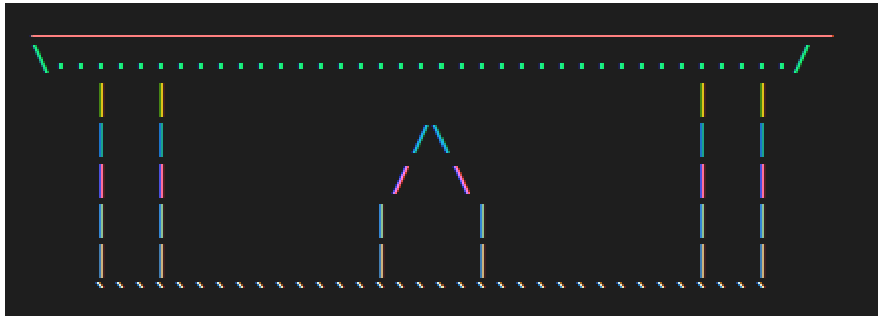
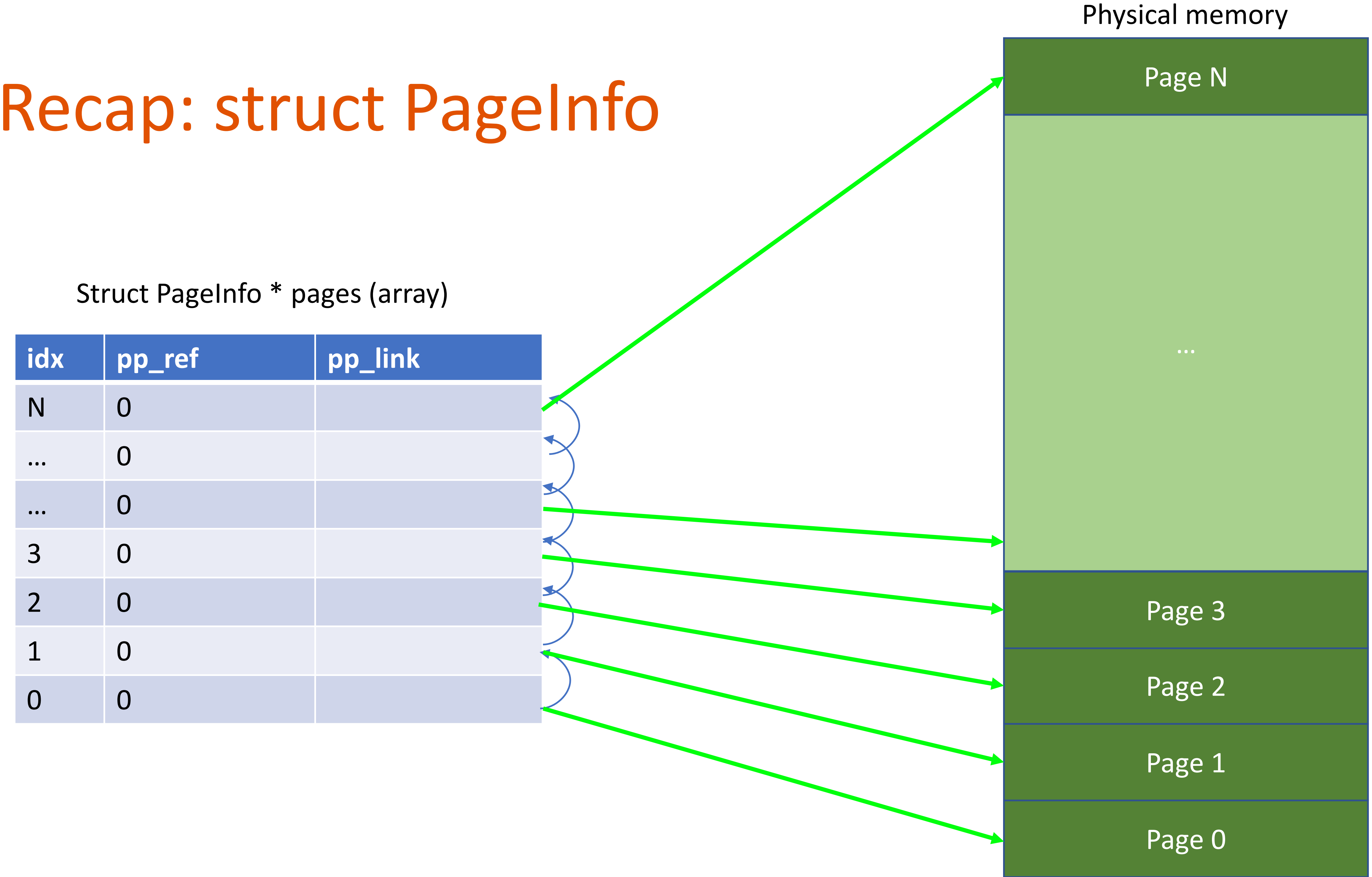
                 ##
```



```
________________________________________
\...................................../
   |  |                          |  |
   |  |            /\            |  |
   |  |           /  \           |  |
   |  |          |    |          |  |
   |  |          |    |          |  |
   ``````````````````````````````````
```
```

Recap: struct PageInfo



Struct PageInfo * pages (array)

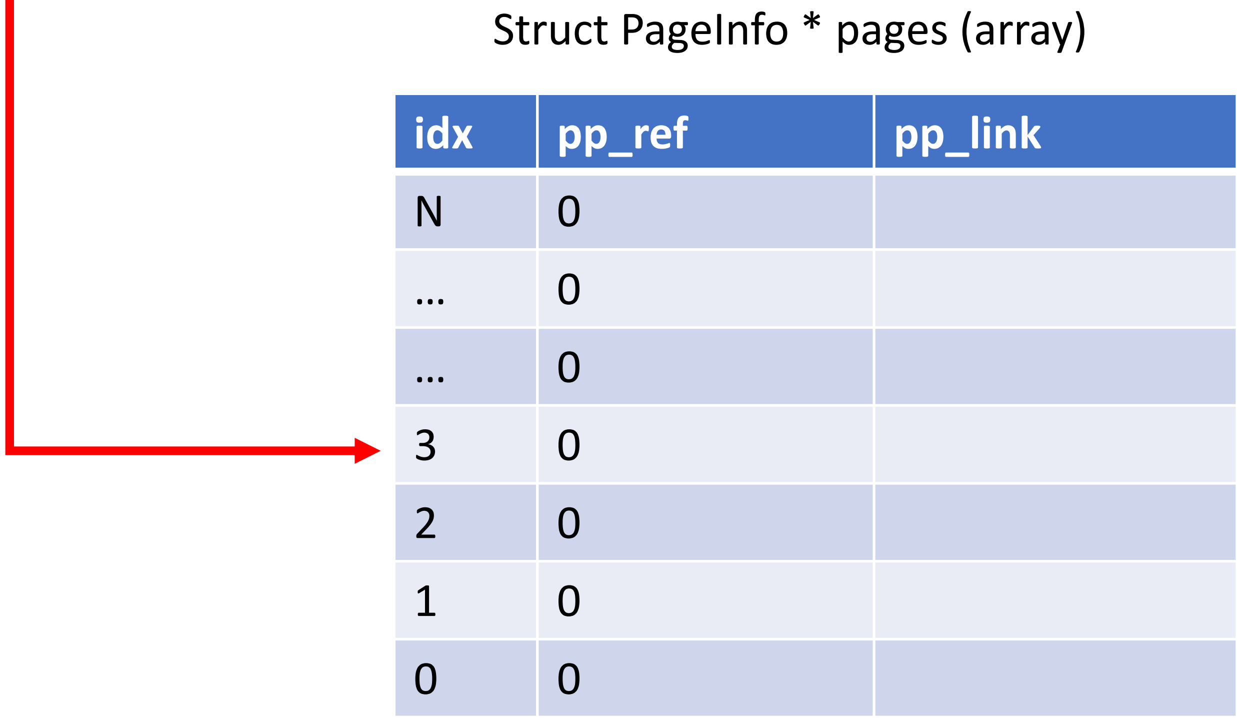
idx	pp_ref	pp_link
N	0	
…	0	
…	0	
3	0	
2	0	
1	0	
0	0	

Recap: struct PageInfo

- struct PageInfo *pp
  - The variable typed as struct PageInfo* will point to a struct PageInfo object in pages array

- You can access
  - pp->pp_ref
  - pp->pp_link

- But you cannot access
  - Physical page via pp



Struct PageInfo * pages (array)

idx	pp_ref	pp_link
N	0	
…	0	
…	0	
3	0	
2	0	
1	0	
0	0	

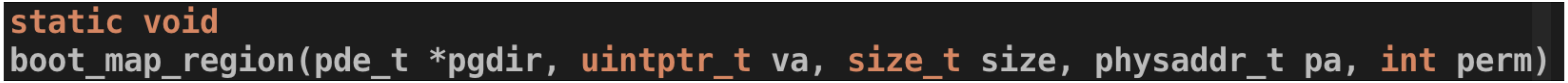
Recap: struct PageInfo

- How to get the physical address that
  - is represented by a struct PageInfo *pp?
- page2pa(pp)
- page2kva(pp)
  - Take a look at the implementation of those functions!!!
  - e.g., (pp – pages) << PGSHIFT ← why is this the physical address??
  - Physical page number = (pp-pages)
- ✓ memset(page2kva(pp), 0, PGSIZE)
  - This will zero out the corresponding physical page of pp..

CAVEAT for Lab 2

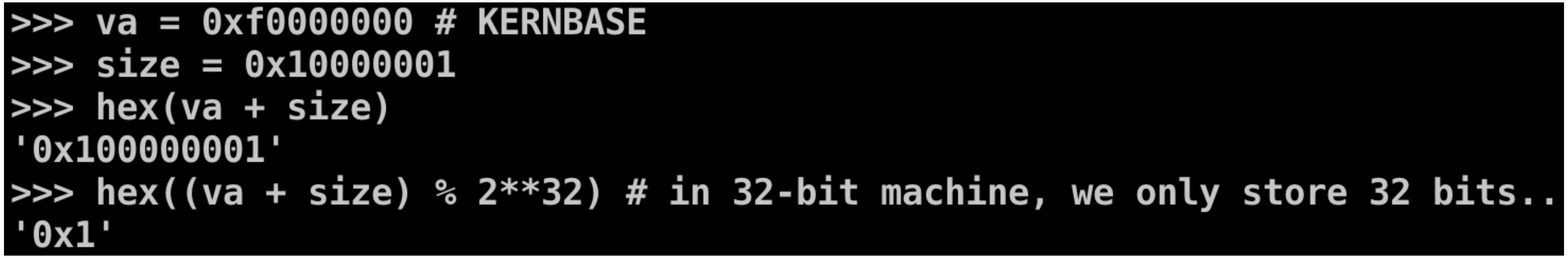
[va, va+size] ⇒ [pa, pa+size]

- Boot_map_region()



```
static void
boot_map_region(pde_t *pgdir, uintptr_t va, size_t size, physaddr_t pa, int perm)
```

- Make sure that va + size do not overflow the 32-bit limit
- E.g.,
  - va = 0xf0000000, size = 0x10000001
- Then, va + size = 1



```
>>> va = 0xf0000000 # KERNBASE
>>> size = 0x10000001
>>> hex(va + size)
'0x100000001'
>>> hex((va + size) % 2**32) # in 32-bit machine, we only store 32 bits..
'0x1'
```