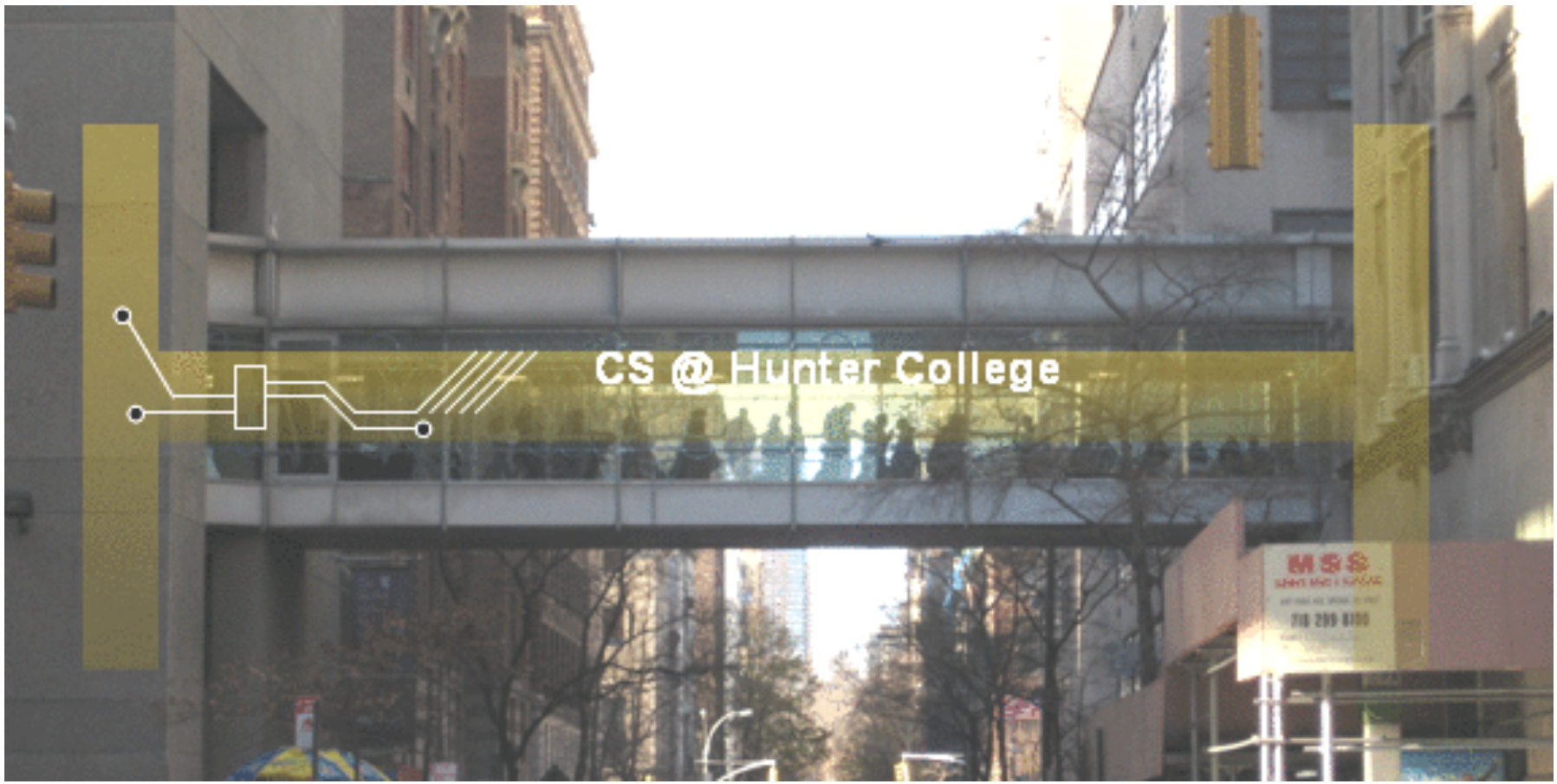
# CSci 127: Introduction to Computer Science

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From email

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- **Do I have to take the final?**
  *Yes, you must to pass the final (60 out of 100 points) to the pass the class. Please review the grading policy on the course syllabus:*
  

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  *Yes, you must to pass the final (60 out of 100 points) to the pass the class. Please review the grading policy on the course syllabus: https://huntercsci127.github.io/summer21/syl.html*
- **Can I take the course Credit/No Credit?**
  *Yes, but check with your advisor that it is possible with your major and standing. Learn more about it here: http://catalog.hunter.cuny.edu/content.php?catoid=43&navoid=13649*

# Today's Topics

- More on Functions
- Recap: Open Data
- Top Down Design
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# Recap: Input Parameters & Return Values

- Functions can have **input parameters**.

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- The ones in the function call: **actual parameters**.
- Functions can also **return values** to where it was called.

# Challenge:

- What are the formal parameters? What is returned?

```
def enigma1(x,y,z):
    if x == len(y):
        return(z)
    elif x < len(y):
        return(y[0:x])
    else:
        s = cont1(z)
        return(s+y)
```

```
def cont1(st):
    r = ""
    for i in range(len(st)-1,-1,-1):
        r = r + st[i]
    return(r)
```

(a) `enigma1(7,"caramel","dulce de leche")`

**Return:** _____

(b) `enigma1(3,"cupcake","vanilla")`

**Return:** _____

(c) `enigma1(10,"pie","nomel")`

**Return:** _____

# Python Tutor

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(Demo with pythonTutor)

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- The time a variable exists is called its **scope**.

# Input Parameters: What about Lists?

```
#Fall 2013 Final Exam, 5

def kuwae( inLst ):
    tot = 1
    for item in inLst:
        tot = tot * item
    return tot

def foo( inLst ):
    if ( inLst[-1] > inLst[0] ):
        return kuwae( inLst )
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        return -1

foo( [2, 4, 6, 8] )

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- The address of the list, but not the individual elements.
- The actual parameters do not change, but the inside elements might.
- Easier to see with a demo.

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(Demo with pythonTutor)

# Challenge:

*Predict what the code will do:*

```
#CSci 127 Teaching Staff
#Triangles two ways...
import turtle

def setUp(t, dist, col):
     t.penup()
     t.forward(dist)
     t.pendown()
     t.color(col)

def nestedTriangle(t, side):
     if side > 10:
          for i in range(3):
               t.forward(side)
               t.left(120)
          nestedTriangle(t, side/2)

def fractalTriangle(t, side):
     if side > 10:
          for i in range(3):
               t.forward(side)
               t.left(120)
               fractalTriangle(t, side/2)
```

```
def main():
     nessa = turtle.Turtle()
     setUp(nessa, 100, "violet")
     nestedTriangle(nessa, 160)

     frank = turtle.Turtle()
     setUp(frank, -100, "red")
     fractalTriangle(frank, 160)

if __name__ == "__main__":
     main()
```

# IDLE

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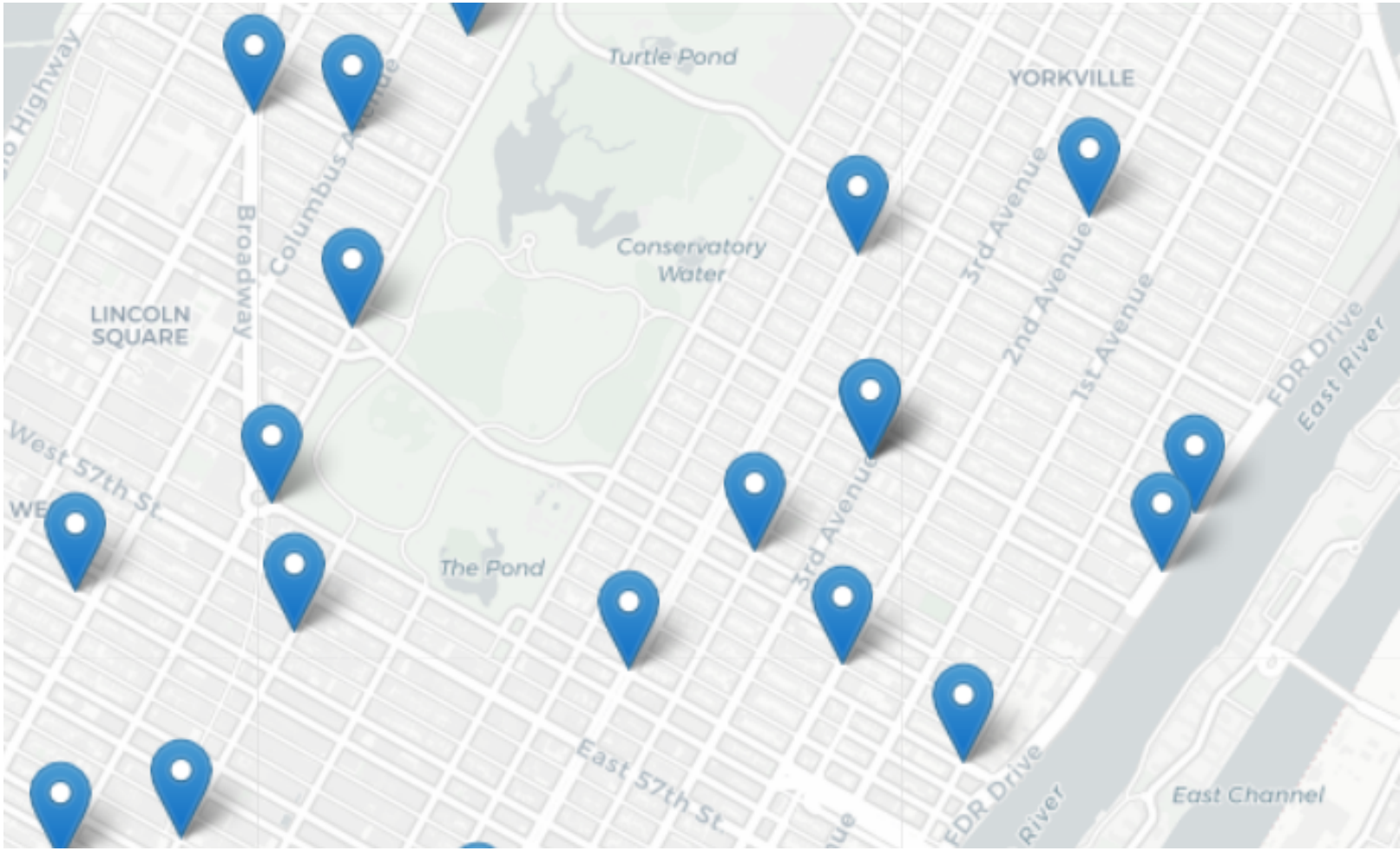
# OpenData Design Question




Design an algorithm that finds the closest collision.

# OpenData Design Question

Design an algorithm that uses NYC OpenData collision data and computes the closest collision to the location the user provides.

How to approach this:

- Create a "To Do" list of what your program has to accomplish.
- Read through the problem, and break it into "To Do" items.
- Don't worry if you don't know how to do all the items you write down.
- Example:
  1. Find data set (great place to look: NYC OpenData).
  2. Ask user for current location.
  3. Open up the CSV file.
  4. Check distance to each to user's location.
  5. Print the location with the smallest distance.

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- Let's use function names as placeholders for the ones we're unsure...

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```
print("The closest is at lat:", lat, "and lon:", lon)
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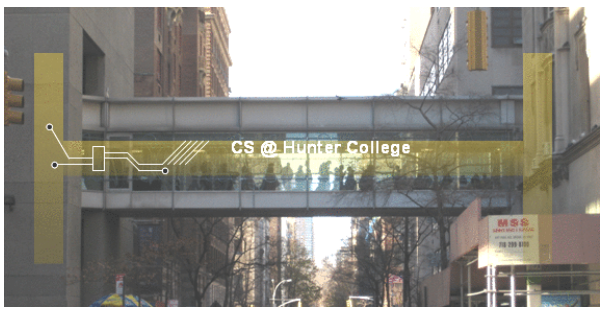
# Top-Down Design

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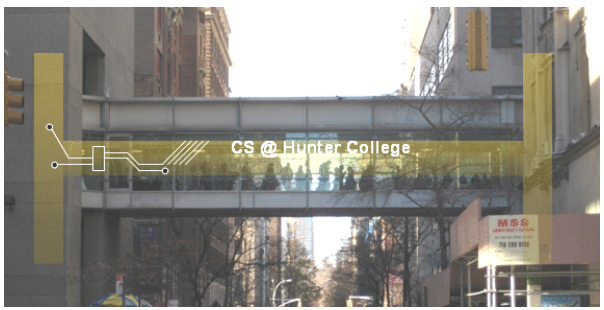


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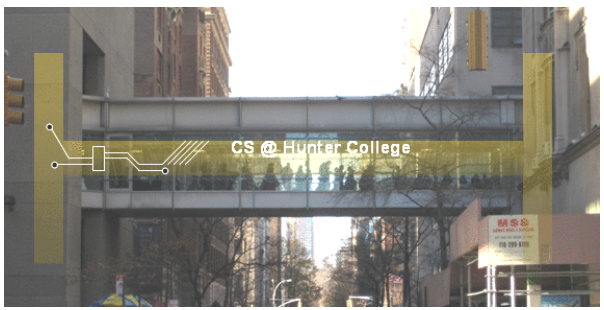


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  - Translate list into function names & inputs/returns.

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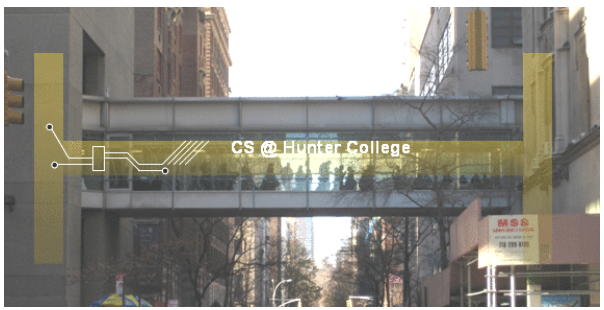


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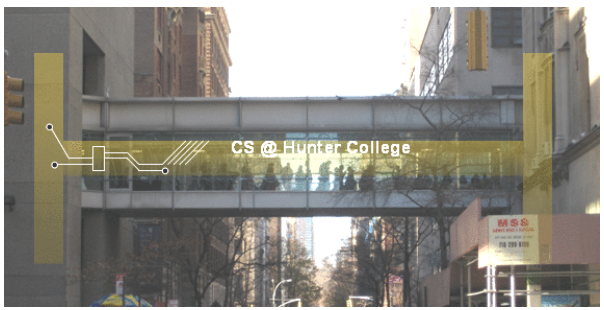


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  - Break the problem into tasks for a "To Do" list.
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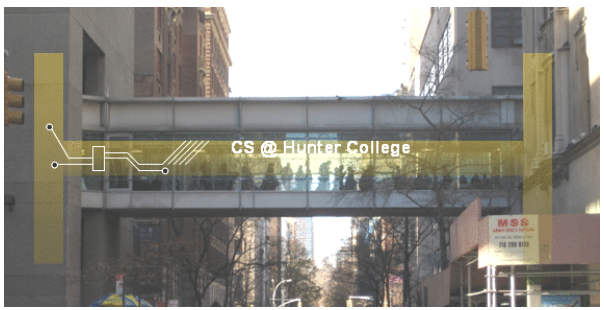
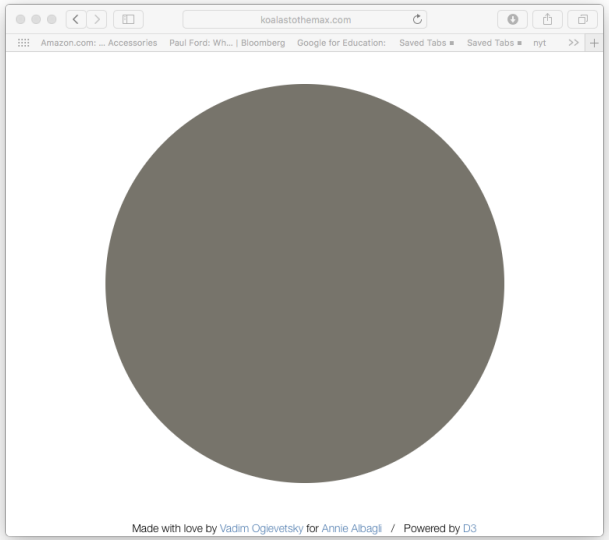
  - Implement the functions, one-by-one.
- Excellent approach since you can then test each part separately before adding it to a large program.

# Top-Down Design




- The last example demonstrates **top-down design**: breaking into subproblems, and implementing each part separately.
  - Break the problem into tasks for a "To Do" list.
  - Translate list into function names & inputs/returns.
  - Implement the functions, one-by-one.
- Excellent approach since you can then test each part separately before adding it to a large program.
- Very common when working with a team: each has their own functions to implement and maintain.

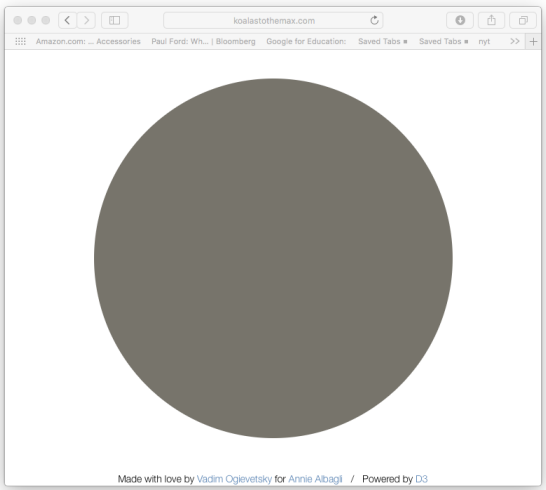
# Challenge:



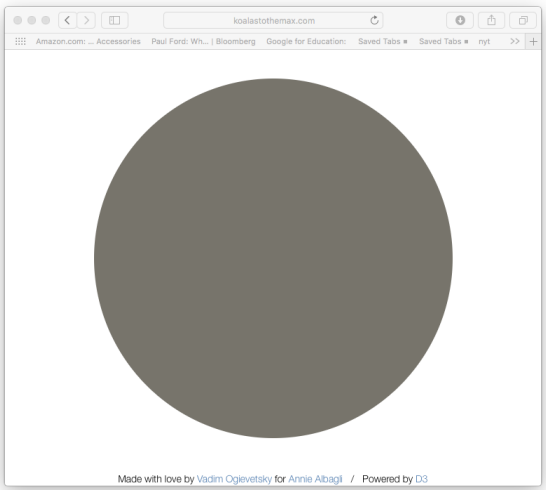

`http://koalastothemax.com`

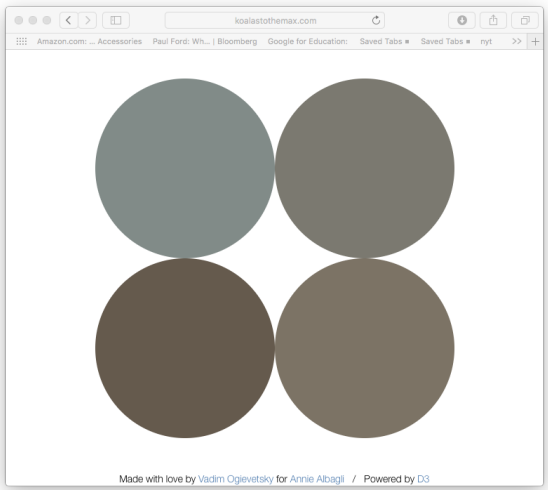
- Top-down design puzzle:
  - What does `koalastomax` do?
  - What does each circle represent?
- Write a high-level design for it.
- Translate into code with function calls.

# Demo


koalastothemax.com
Made with love by Vadim Ogievetsky for Annie Albagli / Powered by D3

# Demo


koalastothemax.com
Made with love by Vadim Ogievetsky for Annie Albagli / Powered by D3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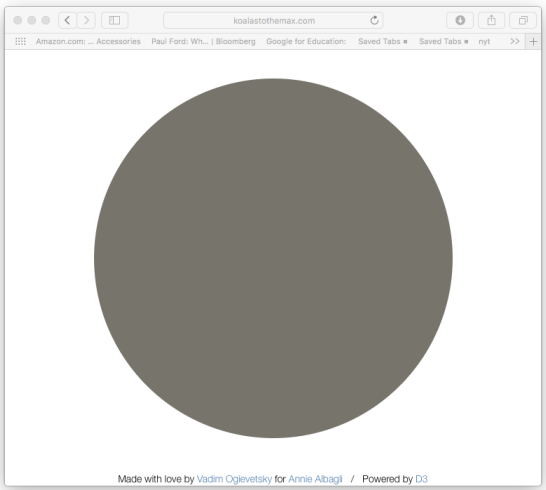
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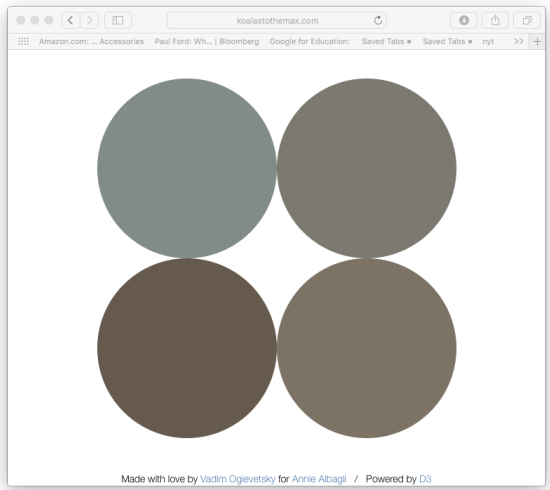
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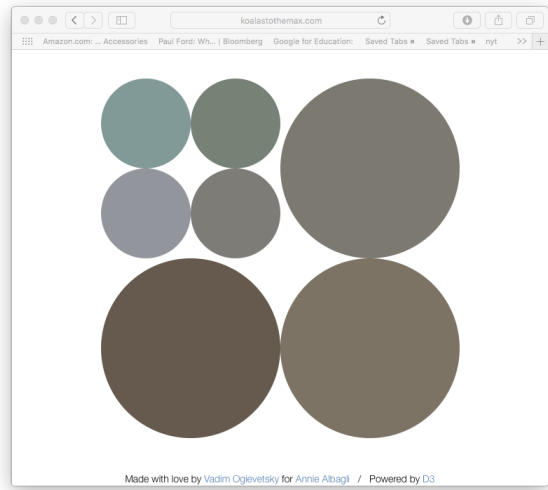
Made with love by Vadim Ogievetsky for Annie Albagli / Powered by D3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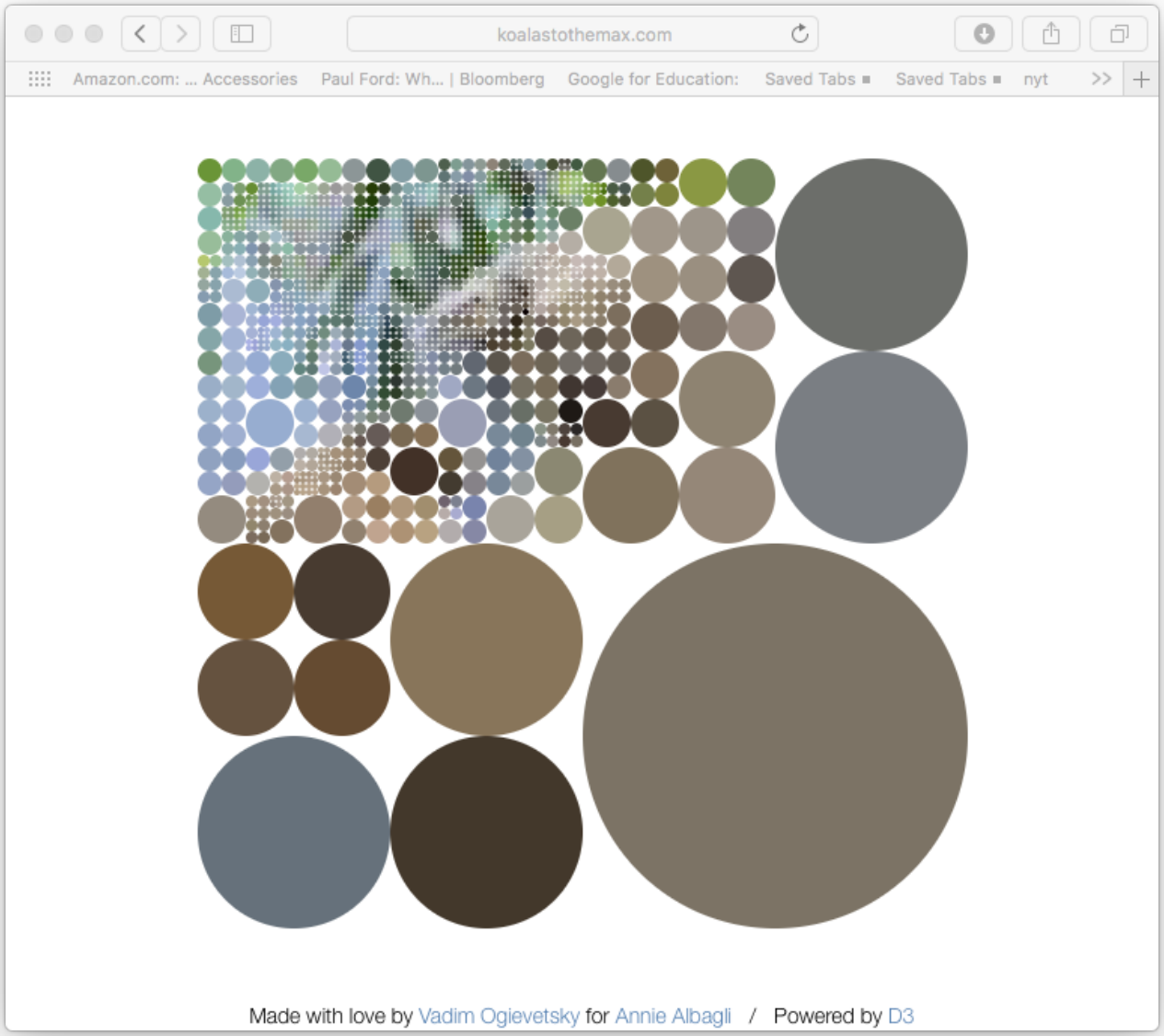
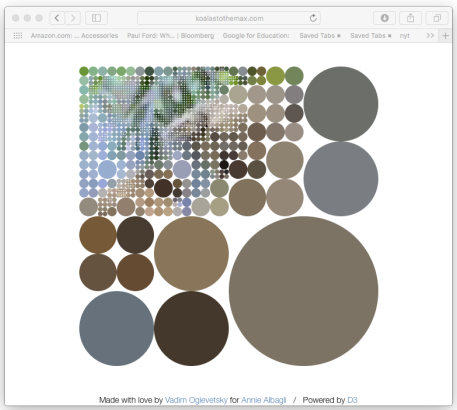
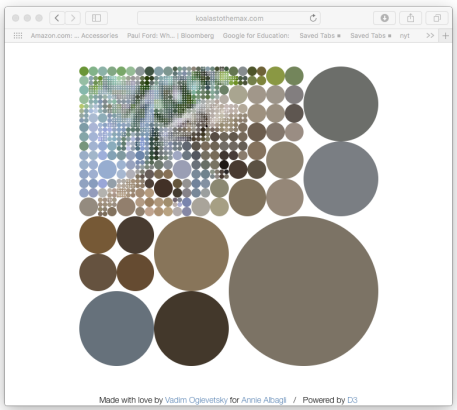

koalastothemax.com
Amazon.com: ... Accessories
Paul Ford: Wh... | Bloomberg
Google for Education:
Saved Tabs
Saved Tabs
nyt
Made with love by Vadim Ogievetsky for Annie Albagli / Powered by D3

# Design: Koalas to the Max




- **Input:** Image & mouse movements

# Design: Koalas to the Max




- **Input:** Image & mouse movements
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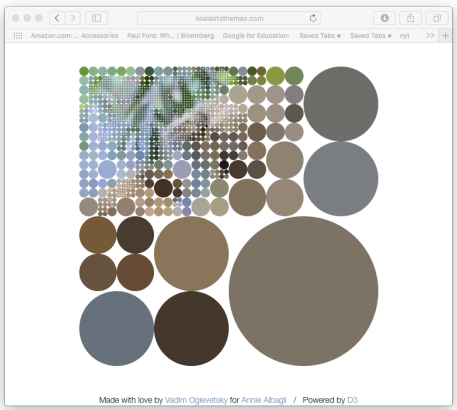
# Design: Koalas to the Max




- **Input:** Image & mouse movements
- **Output:** Completed image
- **Design:**

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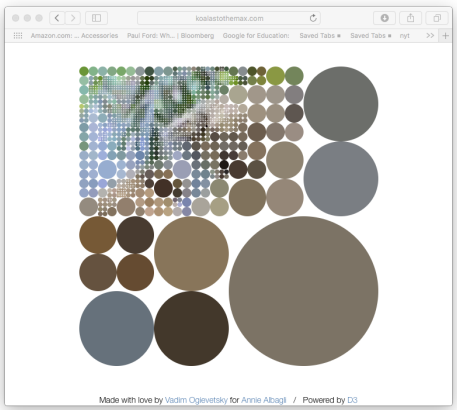
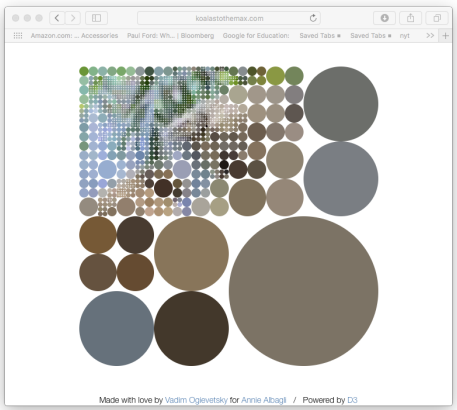



- **Input:** Image & mouse movements
- **Output:** Completed image
- **Design:**
  - Every mouse movement,

# Design: Koalas to the Max

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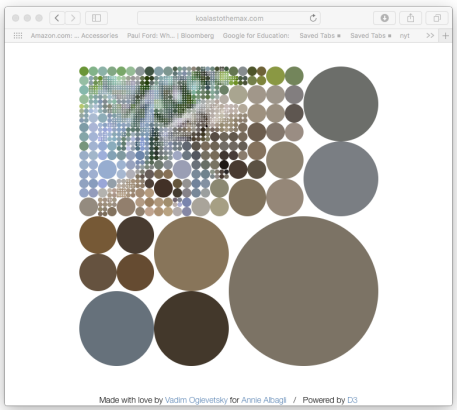
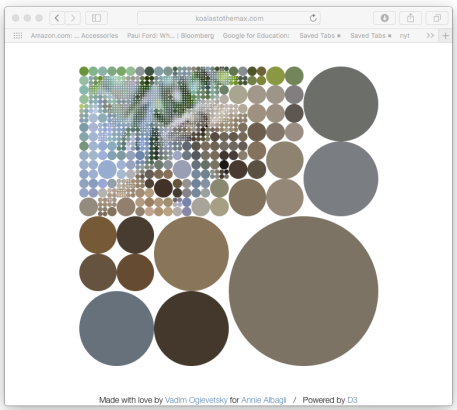
# Design: Koalas to the Max




- **Input:** Image & mouse movements
- **Output:** Completed image
- **Design:**
  - Every mouse movement,
  - Divide the region into 4 quarters.
  - Average the color of each quarter.

# Design: Koalas to the Max




- **Input:** Image & mouse movements
- **Output:** Completed image
- **Design:**
  - Every mouse movement,
  - Divide the region into 4 quarters.
  - Average the color of each quarter.
  - Set each quarter to its average.

# Averaging `numpy` arrays

- Average each color channel of the image:

# Averaging `numpy` arrays

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# Averaging numpy arrays

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```
redAve = np.average(region[:,:,0])
```

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```

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```

# Averaging numpy arrays

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```

- Set each pixel to the average value:

# Averaging numpy arrays

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```

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```
region[:,:,0] = redAve
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# Today's Topics

- More on Functions
- Recap: Open Data
- Top Down Design
- **Design Challenge**

# Design Challenge

| Job ID | Agency | Posting T | # O | Business Title | Civil Service | Title Cod | Level | Job Category | Full- | Sal |
|---|---|---|---|---|---|---|---|---|---|---|
| 246814 | DEPT OF INFO | External | 1 | Senior Architect Cloud Infrastructure D | SENIOR IT AF | 6800 | 0 | Information | F | |
| 246814 | DEPT OF INFO | Internal | 1 | Senior Architect Cloud Infrastructure D | SENIOR IT AF | 6800 | 0 | Information | F | |
| 247320 | DEPT OF ENVI | Internal | 2 | MECHANICAL ENGINEERING INTERN | MECHANICA | 20403 | 0 | Engineering, | F | |
| 247320 | DEPT OF ENVI | External | 2 | MECHANICAL ENGINEERING INTERN | MECHANICA | 20403 | 0 | Engineering, | F | |
| 269885 | DEPT OF ENVI | External | 1 | MECHANICAL ENGINEERING INTERN | MECHANICA | 20403 | 0 | Engineering, | F | |
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| 285120 | NYC HOUSING | External | 1 | Deputy Director for Engineering | ADMINISTRA | 10015 | M3 | Engineering, | P | |
| 285120 | NYC HOUSING | Internal | 1 | Deputy Director for Engineering | ADMINISTRA | 10015 | M3 | Engineering, | P | |
| 287202 | DEPT OF ENVI | External | 4 | MECHANICAL ENGINEERING INTERN | MECHANICA | 20403 | 0 | Engineering, | F | |
| 287202 | DEPT OF ENVI | Internal | 4 | MECHANICAL ENGINEERING INTERN | MECHANICA | 20403 | 0 | Engineering, | F | |

(data.cityofnewyork.us/City-Government/NYC-Jobs/kpav-sd4t)

Find all current city job postings for internship positions.

# Design Challenge

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(`data.cityofnewyork.us/City-Government/NYC-Jobs/kpav-sd4t`)

- **Input:** CSV file from NYC OpenData.

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`(data.cityofnewyork.us/City-Government/NYC-Jobs/kpav-sd4t)`

- **Input:** CSV file from NYC OpenData.
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`(data.cityofnewyork.us/City-Government/NYC-Jobs/kpav-sd4t)`

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- **Input:** CSV file from NYC OpenData.
- **Output:** A list of internships offered by the city.
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  1. Open the file.

# Design Challenge

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`(data.cityofnewyork.us/City-Government/NYC-Jobs/kpav-sd4t)`

- **Input:** CSV file from NYC OpenData.
- **Output:** A list of internships offered by the city.
- **Process:**
  1. Open the file.
  2. Select the rows that have "intern" in the business title.

# Design Challenge

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`(data.cityofnewyork.us/City-Government/NYC-Jobs/kpav-sd4t)`

- **Input:** CSV file from NYC OpenData.
- **Output:** A list of internships offered by the city.
- **Process:**
  1. Open the file.
  2. Select the rows that have "intern" in the business title.
  3. Print out those rows.

# Recap

- Functions are a way to break code into pieces, that can be easily reused.

```
#Name:  your name here
#Date:  October 2017
#This program, uses functions,
#     says hello to the world!

def main():
     print("Hello, World!")

if __name__ == "__main__":
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- Functions are a way to break code into pieces, that can be easily reused.
- Functions can have **input parameters** that bring information into the function,
- And **return values** that send information back.

# Recap

```
#Name:  your name here
#Date:  October 2017
#This program, uses functions,
#     says hello to the world!

def main():
     print("Hello, World!")

if __name__ == "__main__":
     main()
```

- Functions are a way to break code into pieces, that can be easily reused.
- Functions can have **input parameters** that bring information into the function,
- And **return values** that send information back.
- Top-down design: breaking into subproblems, and implementing each part separately.

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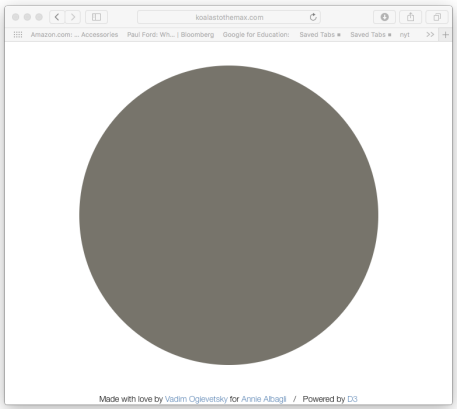
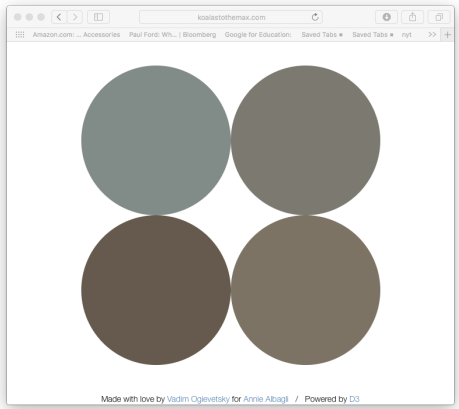
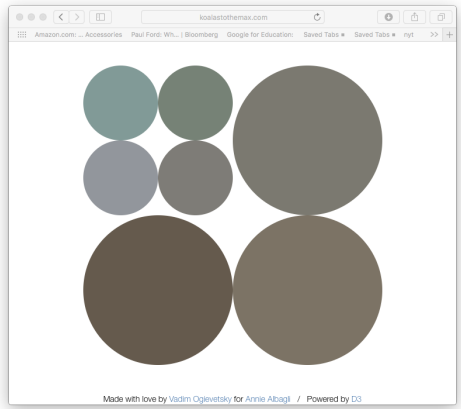
- Functions are a way to break code into pieces, that can be easily reused.
- Functions can have **input parameters** that bring information into the function,
- And **return values** that send information back.
- Top-down design: breaking into subproblems, and implementing each part separately.
- Excellent approach: can then test each part separately before adding it to a large program.

# Practice Quiz & Final Questions




- Since you must pass the final exam to pass the course, we end every lecture with final exam review.
- Pull out something to write on (not to be turned in).
- Lightning rounds:
  - write as much you can for 60 seconds;
  - followed by answer; and
  - repeat.
- Past exams are on the webpage (under Final Exam Information).
- Theme: Functions! Starting with S18, V1, #4a and #4b.

# Final Exam: Spring 2018, Version 1, #4a

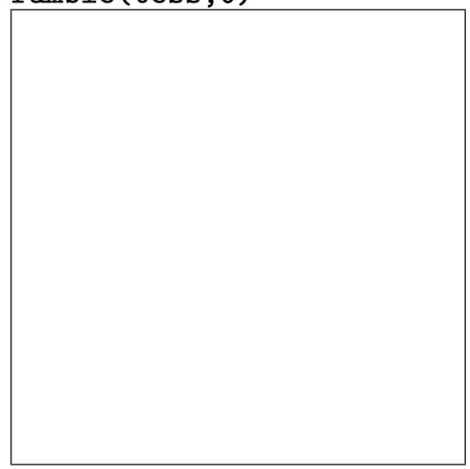
**Name:** **EmpID:** CSci 127 Final, S18, V1

4. (a) Draw the output for the function calls:

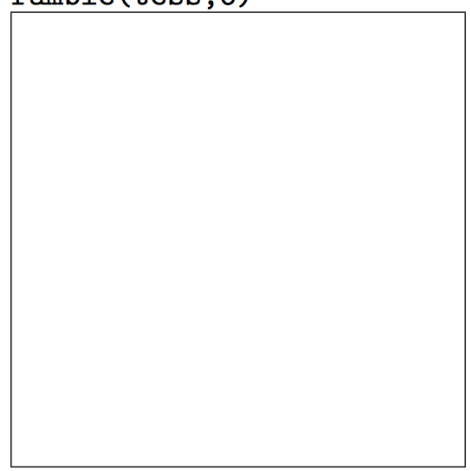
```
import turtle
tess = turtle.Turtle()
tess.shape("turtle")

def ramble(t,side):
    if side == 0:
        t.stamp()
    else:
        for i in range(side):
            t.forward(50)
            t.left(360/side)
```

i. `ramble(tess,0)`



ii. `ramble(tess,6)`



# Final Exam: Spring 2018, Version 1, #4a

**Name:** **EmpID:** CSci 127 Final, S18, V1

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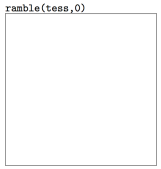

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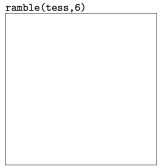

(Demo with `trinket`)

# Final Exam: Spring 2018, Version 1, #4b

(b) For the following code:

```
def v1(vincent, munem):
    if vincent + munem > 0:
        return vincent
    else:
        return -1
```

```
def start():
    panda = 20
    minh = -30
    qiuqun = v1(panda,minh)
    return qiuqun
```

i. What are the formal parameters for `v1()`:

ii. What are the formal parameters for `start()`:

iii. What does `start()` return:

# Reminders!


Before next lecture, don't forget to:

- Review this class's Lecture and Lab

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- Review this class's Lecture and Lab
- Take the Lab Quiz [redacted]

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Before next lecture, don't forget to:

- Review this class's Lecture and Lab
- Take the Lab Quiz [redacted]y
- Submit this class's 5 programming assignments (programs 36-40)