

# CSci 127: Introduction to Computer Science



[hunter.cuny.edu/csci](http://hunter.cuny.edu/csci)

# Announcements



- Each lecture includes a survey of computing research and tech in NYC.

*Today: Keith Okrosy  
Career Development Services*

# Frequently Asked Questions

From lecture slips & recitation sections.

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  - ▶ *Always good to aim a bit higher!*

# Today's Topics



- More on Functions
- Recap: Open Data
- Top Down Design
- Github
- CS Survey: Career Services

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# Input Parameters & Return Values

- Functions can have **input parameters**.

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def totalWithTax(food,tip):  
    total = 0  
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    total = food + food * tax  
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    return(total)  
  
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# In Pairs or Triples:

- 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)
```

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

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

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

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

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(Demo with pythonTutor)



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Formal Parameters

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- All the commands inside the function are performed on the copies.
- The actual parameters do not change.

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

# Input Parameters: What about Lists?

- When called, the actual parameter values are copied to the formal parameters.

```
#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 )  
    else:  
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foo( [2, 4, 6, 8] )  
  
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- When called, the actual parameter values are copied to the formal parameters.
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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.

# Python Tutor

---

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(Demo with pythonTutor)

# In Pairs or Triples:

```
def bar(n):  
    if n <= 8:  
        return 1  
    else:  
        return 0  
  
def foo(l):  
    n = bar(l[-1])  
    return l[n]
```

- What are the formal parameters for the functions?

- What is the output of:

```
r = foo([1,2,3,4])  
print("Return: ", r)
```

- What is the output of:

```
r = foo([1024,512,256,128])  
print("Return: ", r)
```

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(Demo with pythonTutor)

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# In Pairs or Triples:

*Predict what the code will do:*

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#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:
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```

```
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()
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# IDLE

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(Demo with IDLE)

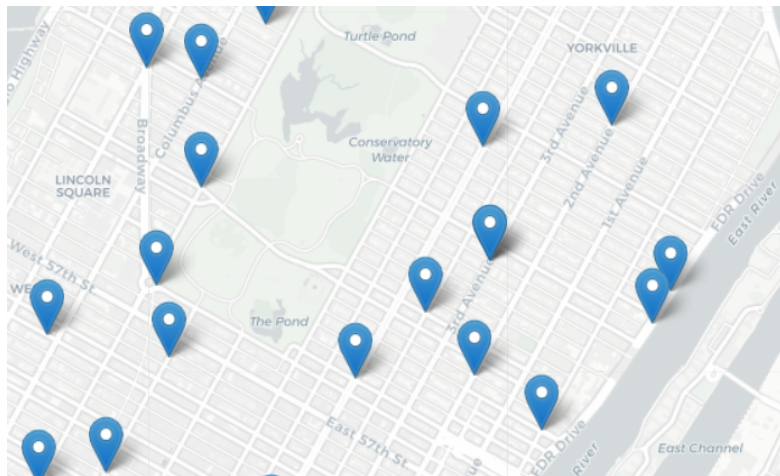
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# OpenData Design Question



Design an algorithm that finds the closest collision.

*(Sample NYC OpenData collision data file on back of lecture slip.)*

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

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  - 2 Ask user for current location.



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

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- 3 Open up the CSV file.

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collisions = pd.read_csv(inF)
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# Today's Topics



- More on Functions
- Recap: Open Data
- **Top Down Design**
- Github
- CS Survey: Career Services



# Top-Down Design

- The last example demonstrates **top-down design**: breaking into subproblems, and implementing each part separately.



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  - ▶ Translate list into function names & inputs/returns.
  - ▶ Implement the functions, one-by-one.

# Top-Down Design



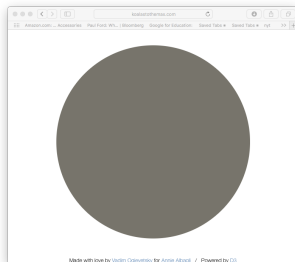
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# Top-Down Design



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  - ▶ 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.

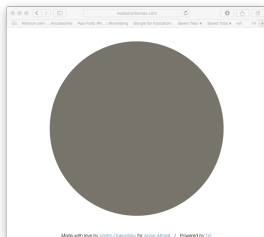
# In Pairs or Triples:



`http://koalastothemax.com`

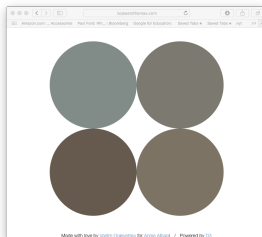
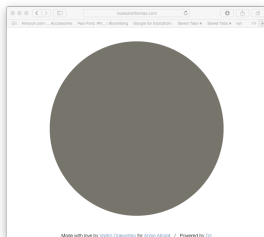
- Top-down design puzzle:
  - ▶ What does koalastomax do?
  - ▶ What does each circle represent?
- Write a high-level design for it.
- Translate into code with function calls.

# Demo

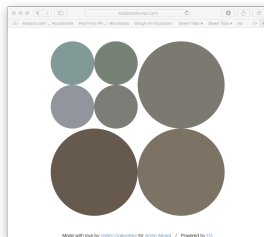
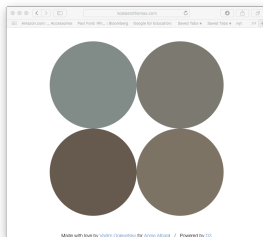
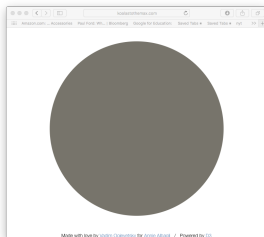




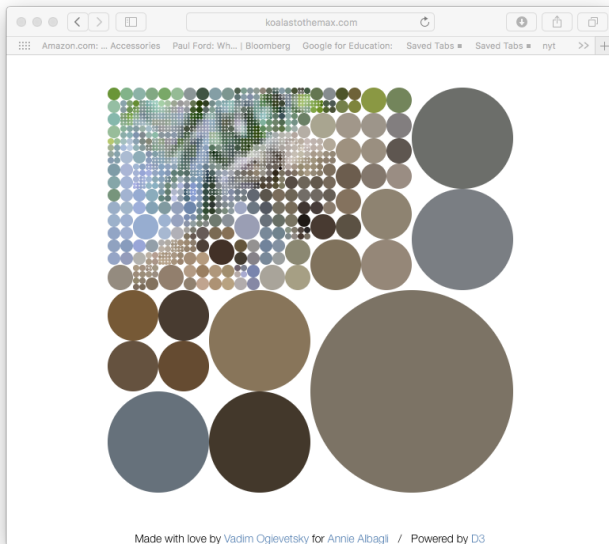
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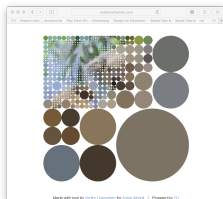


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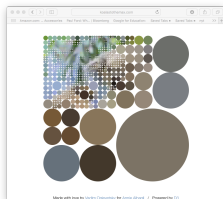
# Design: Koalas to the Max

- **Input:** Image & mouse movements

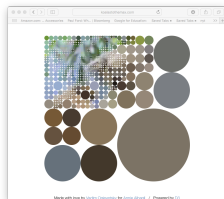


# Design: Koalas to the Max

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

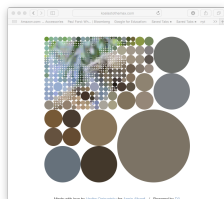


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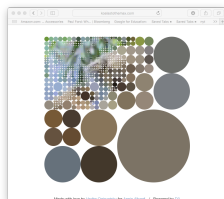
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# Design: Koalas to the Max



- **Input:** Image & mouse movements
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  - ▶ Every mouse movement,

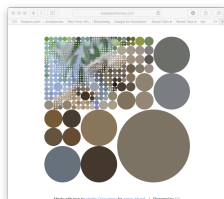
# Design: Koalas to the Max



- **Input:** Image & mouse movements
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- **Design:**
  - ▶ Every mouse movement,
  - ▶ Divide the region into 4 quarters.

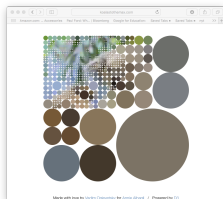


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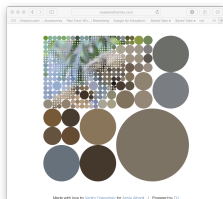
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(Demo program from github.)

# Today's Topics



- More on Functions
- Recap: Open Data
- Top Down Design
- **Github**
- CS Survey: Career Services

# Github

- Like Google docs for code...



Octocat

# Github

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- Used to share code, documents, etc.



Octocat

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- More formally: `git` is a version control protocol for tracking changes and versions of documents.

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- Also convenient place to host websites (i.e. `stjohn.github.io`).

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- More formally: `git` is a version control protocol for tracking changes and versions of documents.
- Github provides hosting for repositories (**'repos'**) of code.
- Also convenient place to host websites (i.e. `stjohn.github.io`).
- In lab, we will set up github accounts and copy (**'clone'**) documents from the class repo. (More in future courses.)

# Today's Topics



- More on Functions
- Recap: Open Data
- Top Down Design
- Github
- **CS Survey: Career Services**

# CS Survey Talk



Keith Okrosy  
Career Development Services

# Design Challenge

## NYC Jobs

This dataset contains current job postings available on the City of New York's official jobs site >  
(<https://www.nyc.gov/html/nyopendata/html/jobssearch/jobssearch.html>). Internal positions available to city employees and external

Manage More Views Filter Visualiz

Job ID	Agency	Posting Type	# Of Positions	Business Title	Civil Service Title	Title Code No	Level	Job Ca
289990	DEPARTMENT OF TRANSPORTATION	Internal	1	Asst Highway Transportation Specialist	ASSISTANT HIGHWAY TRANSPORTATI	22305	0	Engine
289990	DEPARTMENT OF TRANSPORTATION	External	1	Asst Highway Transportation Specialist	ASSISTANT HIGHWAY TRANSPORTATI	22305	0	Engine
358790	DEPT OF HEALTH/MENTAL HYGIENE	External	1	Buprenorphine Project Coordinator, Bureau of Alcoho...	CITY RESEARCH SCIENTIST	21744	1	Health
358788	DEPT OF ENVIRONMENT PROTECTION	External	1	Mechanical Engineering Intern	MECHANICAL ENGINEERING INTERN	20403	0	Engine
358788	DEPT OF ENVIRONMENT PROTECTION	Internal	1	Mechanical Engineering Intern	MECHANICAL ENGINEERING INTERN	20403	0	Engine
357626	DEPT OF ENVIRONMENT PROTECTION	Internal	1	Project Manager	PROJECT MANAGER	22426	0	Engine
357626	DEPT OF ENVIRONMENT PROTECTION	External	1	Project Manager	PROJECT MANAGER	22426	0	Engine
358769	DEPT OF ENVIRONMENT PROTECTION	External	1	Assistant Chemical Engineer	ASSISTANT CHEMICAL ENGINEER (C	20510	0	Engine
357769	DEPT OF HEALTH/MENTAL HYGIENE	Internal	1	.Net Developer, Bureau of IT Strategy and Project Man...	COMPUTER SPECIALIST (SOFTWARE)	13632	3	Techno
357769	DEPT OF HEALTH/MENTAL HYGIENE	External	1	.Net Developer, Bureau of IT Strategy and Project Man...	COMPUTER SPECIALIST (SOFTWARE)	13632	3	Techno

([data.cityofnewyork.us/City-Government/NYC-Jobs/kpav-sd4t](https://data.cityofnewyork.us/City-Government/NYC-Jobs/kpav-sd4t))

Find all current city job postings for internship positions.

# Design Challenge

NYC OpenData

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NYC Jobs

This dataset contains current job postings available on the City of New York's official jobs site.

Manage More Views Filter Visualize Export Discuss Created About

Job ID	Agency	Posting Type	# Of Positions	Business Title	Civil Service Title	Title Code No.	Level	Job Cate...	Full-Tim...	Salary Range
289996	DEPARTMENT OF TRANSPORTATION	Internal	1	Asst Highway Transportation Specialist	ASSISTANT HIGHWAY TRANSPORTATI	22305	8	Engineering...	F	45919
289995	DEPARTMENT OF TRANSPORTATION	Internal	1	Asst Highway Transportation Specialist	ASSISTANT HIGHWAY TRANSPORTATI	22305	8	Engineering...	F	45919
168796	DOPT OF HEALTH/MENTAL HYGIENE	External	1	Supernurse Project Coordinator, Bureau of Alcohol...	CITY RESEARCH SCIENTIST	21344	1	Health Policy...	F	59768
358788	DOPT OF ENVIRONMENT PROTECTION	External	1	Mechanical Engineering Intern	MECHANICAL ENGINEERING/INTER	20433	8	Engineering...	F	52300
358788	DOPT OF ENVIRONMENT PROTECTION	Internal	1	Mechanical Engineering Intern	MECHANICAL ENGINEERING/INTER	20433	8	Engineering...	F	52300
357626	DOPT OF ENVIRONMENT PROTECTION	Internal	1	Project Manager	PROJECT MANAGER	22436	8	Engineering...	F	53734
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358294	DOPT OF ENVIRONMENT PROTECTION	Internal	1	Assistant Chemical Engineer	ASSISTANT CHEMICAL ENGINEER/C	20910	8	Engineering...	F	53734
357768	DOPT OF HEALTH/MENTAL HYGIENE	Internal	1	Jr. Developer, Bureau of IT Strategy and Project Man...	COMPUTER SPECIALIST (SOFTWARE)	13632	3	Technology...	P	463748
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(data.cityofnewyork.us/City-Government/NYC-Jobs/kpav-sd4t)

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

# 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.

# 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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- **Process:**



# Design Challenge

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Job ID	Agency	Posting Type	# Of Positions	Business Title	Civil Service Title	Title Code No	Level	Job Cate...	Full-Tim...	Salary Range
249996	DEPARTMENT OF TRANSPORTATION	Internal	1	Asst Highway Transportation Specialist	ASSISTANT HIGHWAY TRANSPORTXT	22305	8	Engineering...	F	45919
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368796	DOFP OF HEALTHMENTAL HYGIENE	External	1	Supernurse Project Coordinator, Bureau of Alcohol...	CITY RESEARCH SCIENTIST	21344	1	Health Policy...	F	59768
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358788	DOFP OF ENVIRONMENT PROTECTION	Internal	1	Mechanical Engineering Intern	MECHANICAL ENGINEERING INTERN	20433	8	Engineering...	F	52300
357626	DOFP OF ENVIRONMENT PROTECTION	Internal	1	Project Manager	PROJECT MANAGER	22436	8	Engineering...	F	53734
357626	DOFP OF ENVIRONMENT PROTECTION	External	1	Project Manager	PROJECT MANAGER	22436	8	Engineering...	F	53734
368948	DOFP OF ENVIRONMENT PROTECTION	External	1	Assistant Chemical Engineer	ASSISTANT CHEMICAL ENGINEER	20910	8	Engineering...	F	53734
357768	DOFP OF HEALTHMENTAL HYGIENE	Internal	1	Jr. Developer, Bureau of IT Strategy and Project Man...	COMPUTER SPECIALIST (SOFTWARE)	13632	3	Technology...	P	463748
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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.

# Design Challenge

NYC OpenData

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NYC Jobs

This dataset contains current job postings available on the City of New York's official jobs site.

Manage More Views Filter Visualize Export Discuss Created About

Job ID	Agency	Posting Type	# Of Positions	Business Title	Civil Service Title	Title Code No	Level	Job Cate...	Full-Tim...	Salary Range
289996	DEPARTMENT OF TRANSPORTATION	Internal	1	Asst Highway Transportation Specialist	ASSISTANT HIGHWAY TRANSPORTS	22305	8	Engineering...	F	45919
289995	DEPARTMENT OF TRANSPORTATION	External	1	Asst Highway Transportation Specialist	ASSISTANT HIGHWAY TRANSPORTS	22305	8	Engineering...	F	45919
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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.

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  - ③ Print out those rows.

# Recap

- On lecture slip, write down a topic you wish we had spent more time (and why).

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

def main():
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- Github provides a platform for sharing work that allows collaboration (and version control).

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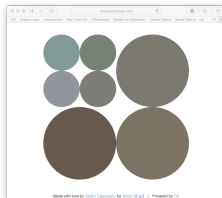
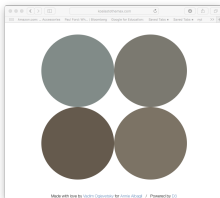
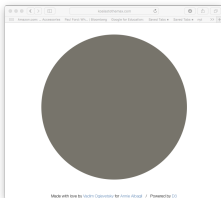
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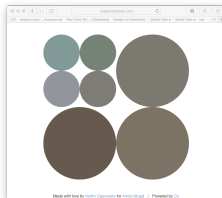
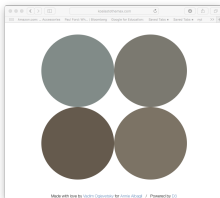
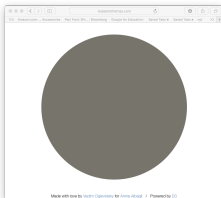
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# Practice Quiz & Final Questions



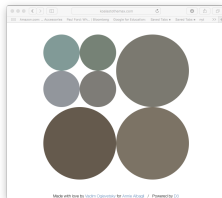
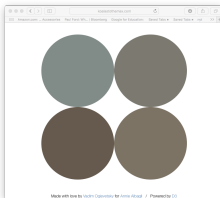
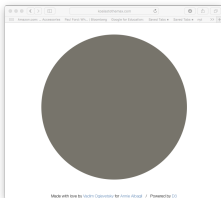
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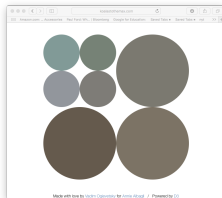
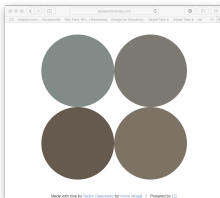
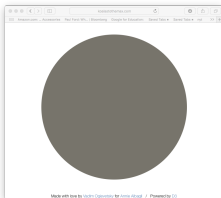
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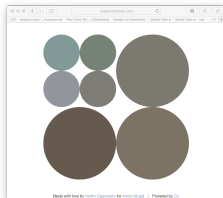
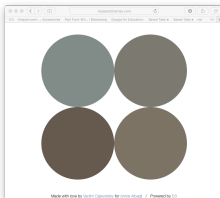
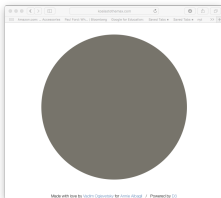
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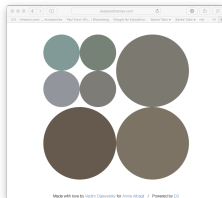
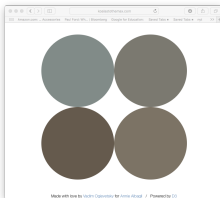
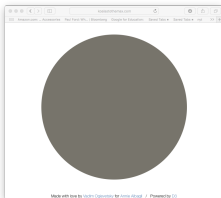
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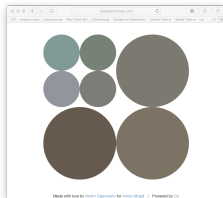
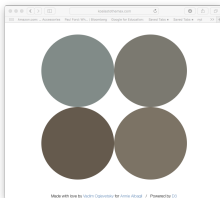
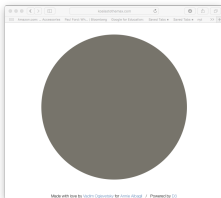


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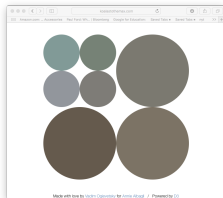
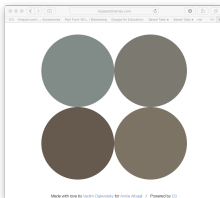
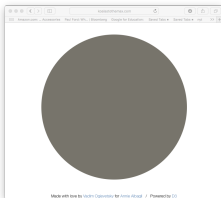
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- Theme: Functions! Starting with S18, V1, #4 and #7.

# Writing Boards



- Return writing boards as you leave...