

CSci 127: Introduction to Computer Science



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.

- Can you go through the OpenData challenge from last week?

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Yes, you have to pass the final (60 out of 100 points) to pass the class.

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 - ▶ *You need to pass the final, which takes 60 out of 100 points.*

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 - ▶ *Final can replace missing lecture slips or quizzes. Programs are 30%.*
 - ▶ *You need to pass the final, which takes 60 out of 100 points.*
 - ▶ *If final counts 70%, that would be 60% of 70 = 42 points.*

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 - ▶ *If final counts 70%, that would be 60% of 70 = 42 points. Need $70 - 42 = 28$ points (of 30) on the programs (or 52 programs).*

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 - ▶ *With higher final score, you need fewer programs: Final: 80, Programs: 27.*

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 - ▶ *With higher final score, you need fewer programs: Final: 80, Programs: 27.*
 - ▶ *More lecture slips & quizzes help: 10 lectures slips (5%) and 5 quizzes (10%) leave 50% for the final. Passing final with 60% would need 46 programs for credit. 80% on final, need 28 programs...*

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 - ▶ *With higher final score, you need fewer programs: Final: 80, Programs: 27.*
 - ▶ *More lecture slips & quizzes help: 10 lectures slips (5%) and 5 quizzes (10%) leave 50% for the final. Passing final with 60% would need 46 programs for credit. 80% on final, need 28 programs...*
 - ▶ *Always good to aim a bit higher!*

Today's Topics



- More on Functions
- Top Down Design
- Github
- Career Services

In Pairs or Triples:

Review: predict what the code will do:

```
motto = "Mihi Cura Futuri"  
l = len(motto)  
for i in range(l):  
    print(motto[i])  
for j in range(l-1,-1,-1):  
    print(motto[j])
```

```
import matplotlib.pyplot as plt  
import numpy as np  
img = plt.imread('csBridge.png')  
plt.imshow(img)  
plt.show()  
height = img.shape[0]  
width = img.shape[1]  
img2 = img[:height/2, :width/2]  
plt.imshow(img2)  
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Python Tutor

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(Demo with pythonTutor)

Images

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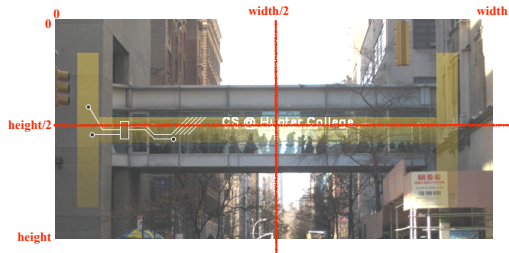
Challenge: Image

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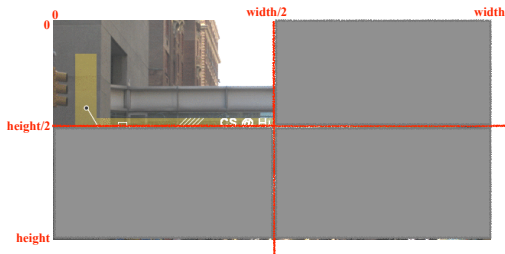
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Input Parameters & Return Values

- Functions can have **input parameters**.

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def totalWithTax(food,tip):  
    total = 0  
    tax = 0.0875  
    total = food + food * tax  
    total = total + tip  
    return(total)  
  
lunch = float(input('Enter lunch total: '))  
lTip = float(input('Enter lunch tip: ' ))  
lTotal = totalWithTax(lunch, lTip)  
print('Lunch total is', lTotal)  
  
dinner= float(input('Enter dinner total: '))  
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Input Parameters & Return Values

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- Functions can also **return values** to where it was called.

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")`

```
def cont1(st):  
    r = ""  
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Python Tutor

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(Demo with pythonTutor)

Input Parameters

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

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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.

Input Parameters

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- All the commands inside the function are performed on the copies.
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- The copies are discarded when the function is done.
- 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:  
        return -1  
  
foo( [2, 4, 6, 8] )  
  
foo( [4002, 328, 457, 1] )
```

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- What is copied with a list?

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- When called, the actual parameter values are copied to the formal parameters.
- What is copied with a list?
- The address of the list, but not the individual elements.

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- When called, the actual parameter values are copied to the formal parameters.
- What is copied with a list?
- 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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foo( [2, 4, 6, 8] )

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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)
```

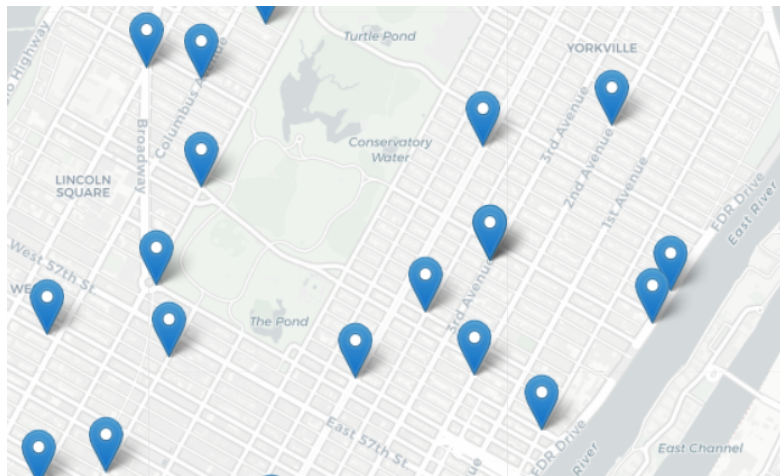
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def bar(n):  
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(Demo with pythonTutor)

```
def foo(l):  
    n = bar(l[-1])  
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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.)

OpenData Design Question

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

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How to approach this:

- Create a “To Do” list of what your program has to accomplish.

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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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- Don’t worry if you don’t know how to do all the items you write down.

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- Example:

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- 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).

OpenData Design Question

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

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closestLat, closestLon = findClosest(collisions, lat, lon)
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Top-Down Design

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Top-Down Design



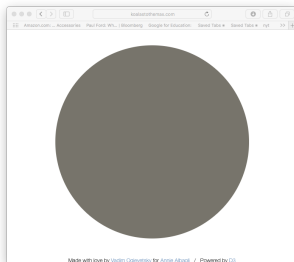
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- Excellent approach since you can then test each part separately before adding it to a large program.
- Very common when working with a team: each has their own functions to implement and maintain.

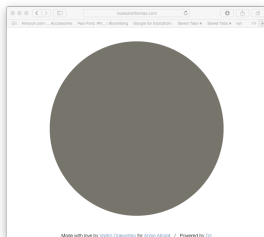
In Pairs or Triples:



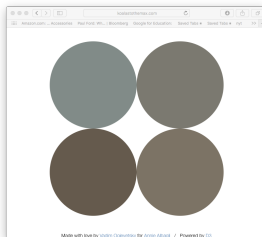
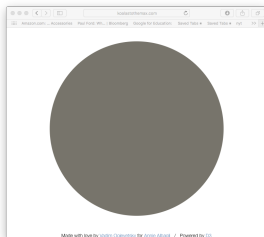
`http://koalastothemax.com`

- 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.

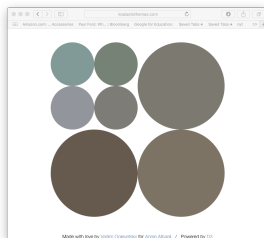
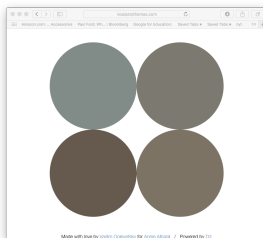
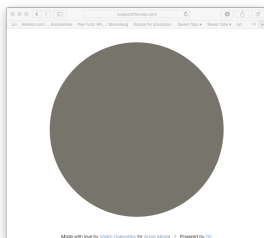
Demo



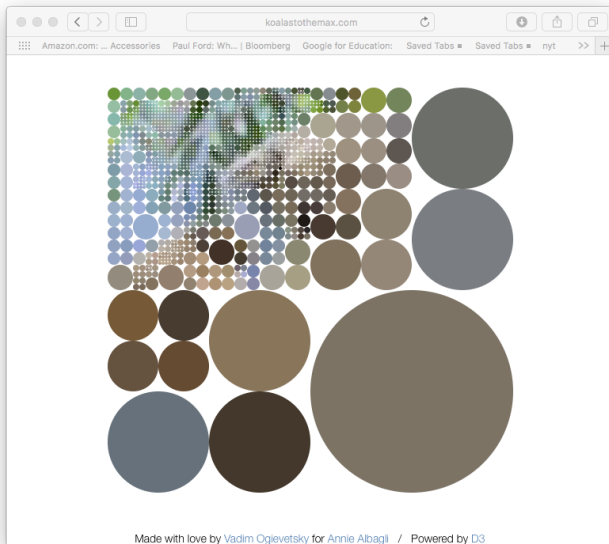
Demo



Demo

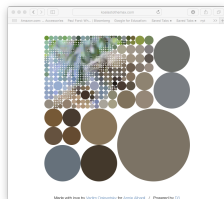


Demo



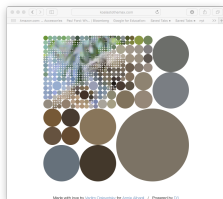
Design: Koalas to the Max

- **Input:** Image & mouse movements

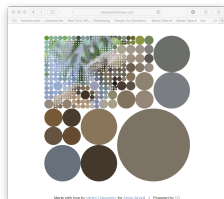


Design: Koalas to the Max

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- **Output:** Completed image

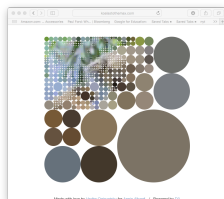


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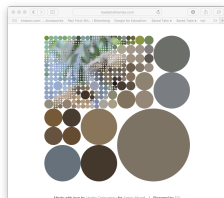
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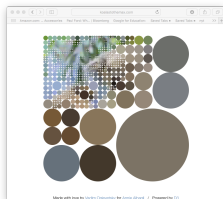
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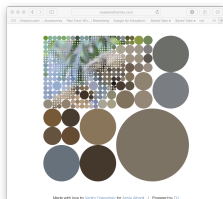
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Design: Koalas to the Max



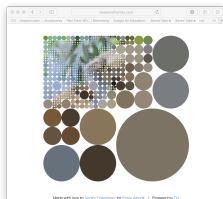
- **Input:** Image & mouse movements
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- **Design:**
 - ▶ Every mouse movement,
 - ▶ Divide the region into 4 quarters.
 - ▶ Average the color of each region.

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 region.
 - ▶ Set each region to its average.

Design: Koalas to the Max



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(Demo program from github.)

Github

- Like Google docs for code...



Octocat

Github

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- Used to share code, documents, etc.



Octocat

Github



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

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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.)

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
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357769	DEPT OF HEALTH/MENTAL HYGIENE	Internal	1	.Net Developer, Bureau of IT Strategy and Project Man...	COMPUTER SPECIALIST (SOFTWARE)	13632	3	Techno
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(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

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Manage More Views Filter Visualize Export Discuss Created About

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289995	DEPARTMENT OF TRANSPORTATION	External	1	Asst Highway Transportation Specialist	ASSISTANT HIGHWAY TRANSPORTATI	22305	8	Engineering...	F	45919
368796	DOPT OF HEALTHMENTAL 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 INTERN	20433	8	Engineering...	F	52300
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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

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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- **Process:**

Design Challenge

NYC OpenData

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NYC Jobs

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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 job site.

Manage More Views Filter Visualize Export Discuss Credits 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
368796	DOH OF HEALTHMENTAL HYGIENE	External	1	Supersophone Project Coordinator, Bureau of Alcohol...	CITY RESEARCH SCIENTIST	21344	1	Health Policy...	F	59768
358788	DOEP OF ENVIRONMENT PROTECTION	External	1	Mechanical Engineering Intern	MECHANICAL ENGINEERING INTERN	20433	8	Engineering...	F	52300
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357626	DOEP OF ENVIRONMENT PROTECTION	Internal	1	Project Manager	PROJECT MANAGER	22436	8	Engineering...	F	53734
357626	DOEP OF ENVIRONMENT PROTECTION	External	1	Project Manager	PROJECT MANAGER	22436	8	Engineering...	F	53734
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- **Input:** CSV file from NYC OpenData.
- **Output:** A list of internships offered by the city.
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 - ② Select the rows that have “intern” in the business title.

Design Challenge

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357758	DOFP OF HEALTHMENTAL HYGIENE	Internal	1	Jr. Developer, Bureau of IT Strategy and Project Man...	COMPUTER SPECIALIST (SOFTWARE)	13632	3	Technology...	P	46,9748
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 - ① Open the file.
 - ② Select the rows that have “intern” in the business title.
 - ③ Print out those rows.

Recap

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

```
#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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Recap

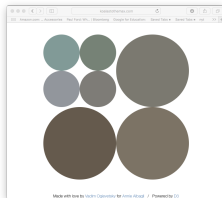
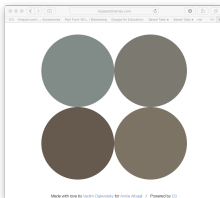
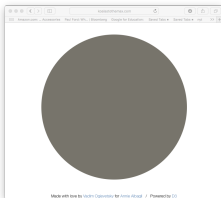
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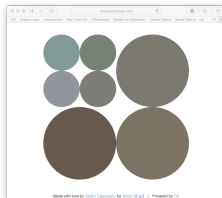
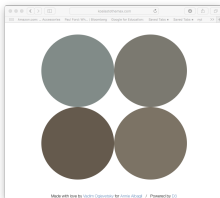
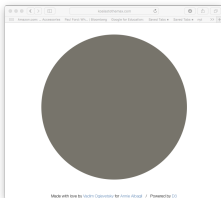
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Practice Quiz & Final Questions



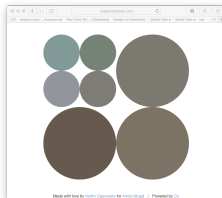
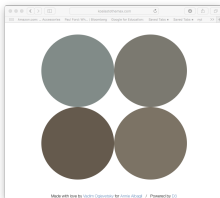
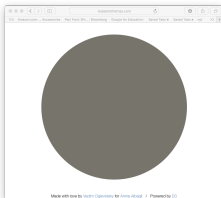
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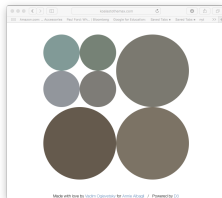
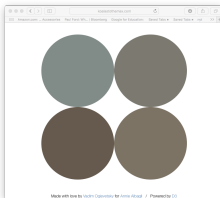
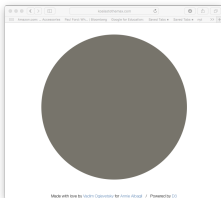
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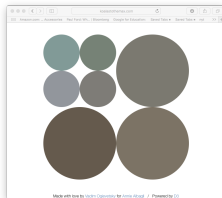
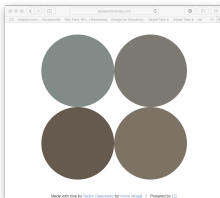
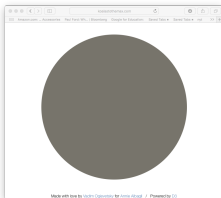
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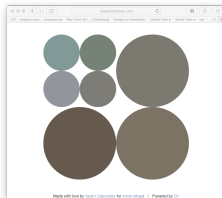
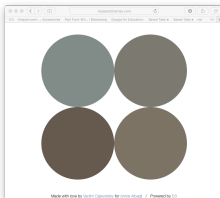
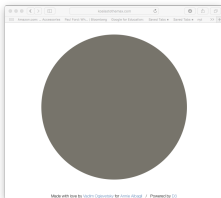
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 - ▶ write as much you can for 60 seconds;

Practice Quiz & Final Questions



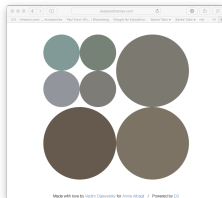
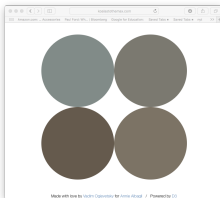
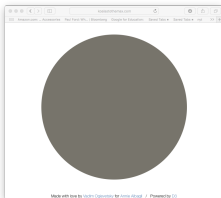
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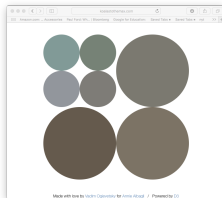
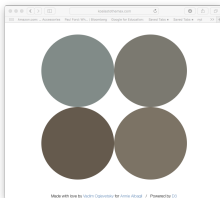
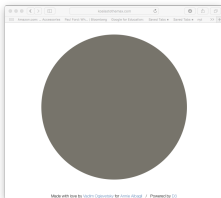
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- Theme: Functions! Starting with S18, V1, #4 and #7.

Writing Boards



- Return writing boards as you leave...