

**CMSC 110**  
**Introduction to Computing**  
 Section 01  
 David Cooper

## Who am I?

David G Cooper, PhD  
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 Computer Science Department  
 Bryn Mawr  
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 Interests: Emotions in Computing,  
 Computer Based Tutoring, Artificial Intelligence,  
 Machine Learning

CS110 Introduction 2

### Administrivia

## CMSC 110: Introduction to Computing

Fall 2015

**Course Website (Syllabus):** <http://cs.brynmawr.edu/cs110dc>  
**Assignment:** Read the Syllabus for Wednesday and ask questions  
**Instructor:**  
 David G Cooper, Ph.D. ([dgc@cs.brynmawr.edu](mailto:dgc@cs.brynmawr.edu))

<b>Lectures</b> MW 2:40PM-4:00PM in Park 338	<b>Grading</b> <ul style="list-style-type: none"> <li>• 7 Assignments      56%</li> <li>• Exam 1              18%</li> <li>• Exam 2              26%</li> <li style="border-top: 1px solid black;">Total                    100%</li> </ul>
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**TA-Support**  
>20 hrs/week in Park 231

**Open Labs (Optional)**  
(Tue Morning?) in Park 231

### Administrivia


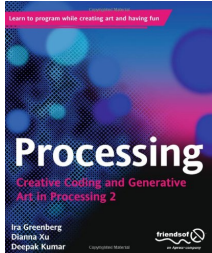
### Software

**Processing 2.X**

- Already installed in the CS Lab
- Also available for your own computer @ [www.processing.org](http://www.processing.org)
- Processing == Java

### Book

**Creative Coding & Generative Art in Processing 2**  
 by Ira Greenberg, Dianna Xu, Deepak Kumar,  
 friendsofEd/APress, 2013. Available at the  
 Campus Bookstore or amazon.com or other  
 vendors.

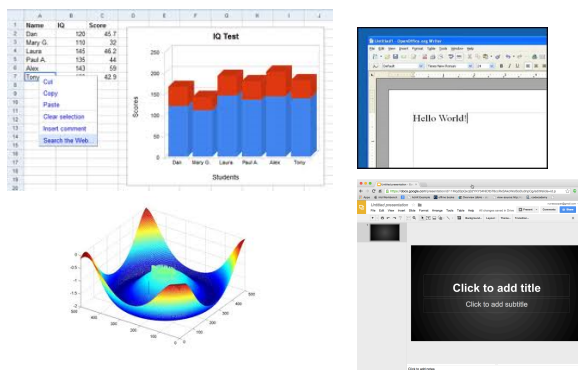



## Class Lottery

- Make sure to sign-in your name.
- If you are not “in” the lottery, indicate that. We will contact you by e-mail as soon as we have confirmation from other students.

## What is Computing?

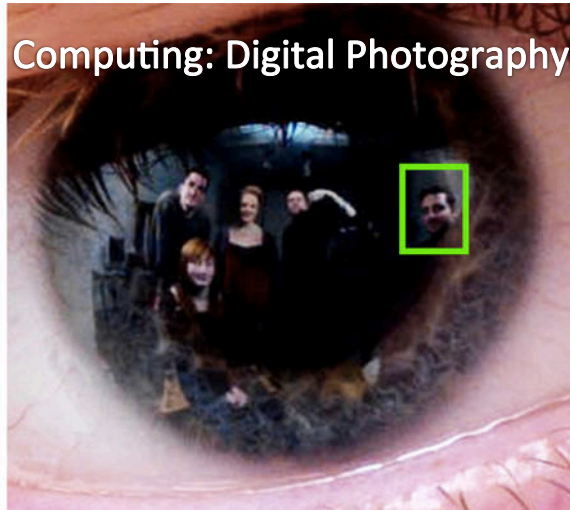
## Computing: Productivity...



## Computing: internet, e-mail, network...



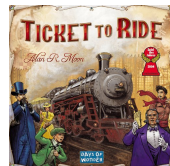
## Computing: Digital Photography



## Computing: Entertainment...



## Computing: Games...













## What is Computer Science?

- The study of computation
- We do this through
  - algorithms (theory/math)
  - applied algorithms (programming and hardware)
  - experimentation (running programs in different conditions)




“Computer science is no more about computers than astronomy is about telescopes”

- Edsger Dijkstra

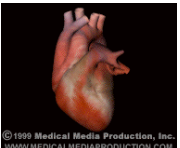

### Areas in Computer Science

 Artificial Intelligence	 Robotics	 Human-Computer Interaction	 Computer Graphics	 Computer Vision
 Operating Systems	 Computer Networking	 Databases	 Computer Security	 Ubiquitous Computing

### Artificial Intelligence

 <b>Roomba</b>	 <b>Google Autopilot car</b>
 <b>Mars Rover</b>	

### Graphics

 <small>© 1999 Medical Media Production, Inc. WWW.MEDICALMEDIAPRODUCTION.COM</small> <b>3D Representation of the Heart</b>	 <b>The Incredibles from Pixar</b>
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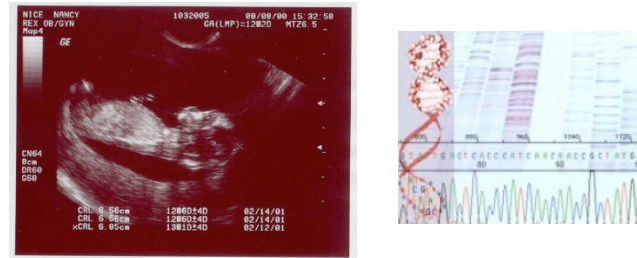


## Organization of Data, and Searching



17

## Medical, Genomics Applications



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## Educational Technology



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## What is Computer Science?

Computer science is the study of solving problems using computation

- Computers are part of it, but the emphasis is on the problem solving aspect



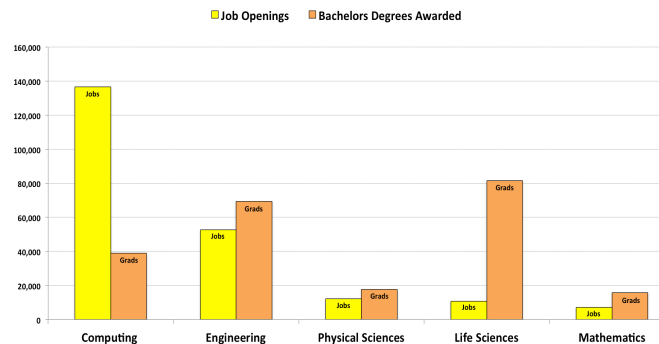
Computer scientists work across disciplines:

Mathematics	Geoscience	Medicine/Surgery
Biology (bioinformatics)	Archeology	Engineering
Chemistry	Psychology	Linguistics
Physics	Sociology	Art
Geology	Cognitive Science	...

Computing is important

## Huge Growth in Computing-Related Jobs

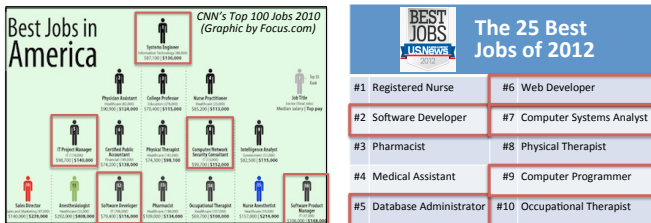
Total Annual U.S. STEM Jobs Thru 2020 vs College Grads



Data Sources: US-BLS Employment Projections, 2010-2020 ([http://www.bls.gov/emp/rep\\_table\\_302.htm](http://www.bls.gov/emp/rep_table_302.htm)), National Science Foundation Division of Science Resource Statistics (<http://www.nsf.gov/statistics/inf1131a/pdf/tab28.pdf, tab33.pdf, tab34.pdf, tab35.pdf, tab46.pdf>)

## Computing is Consistently Ranked Among the Best Occupations

CS-Related Jobs Highlighted in Red

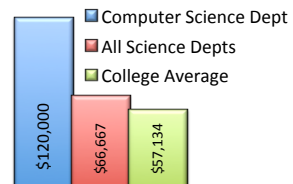


### CS Careers Rank Highly In:

- Job satisfaction
- Salary
- Work/life balance
- Growth potential
- Employment rate
- Work environment

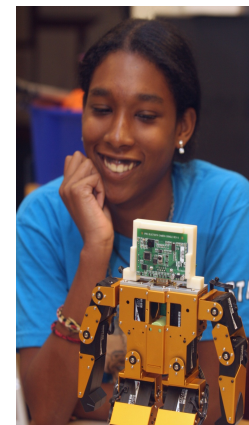
## Strong Earnings Potential

Salaries of Bryn Mawr Graduates



Average Individual Annual Income

Office of Institutional Research, Planning, and Assessment  
Bryn Mawr College



www.sdtimes.com | August 2011 | 50 Times | NEWS | 21

### Computer science tops list of best major for jobs

BY RACHEL GOTTFRIED

Computer science graduates not get more offers of employment than any other major. This is the first time since 2005 that computer science has topped the list, previously accounting majors had the highest offer rate.

In 2011, 56.2% of computer science majors received job offers, compared to only 35.5% of accounting majors. The offer rate for computer science majors increased 13.9% this year from the previous year.

Computer science and accounting majors are in high demand because both are needed in a wide range of industries.

"There are many different companies that need to hire computer scientists," said Mini Collins, director of communications at the National Association of Colleges and Employers.

"They aren't tied to one particular industry—majors like nursing do not enjoy that benefit."

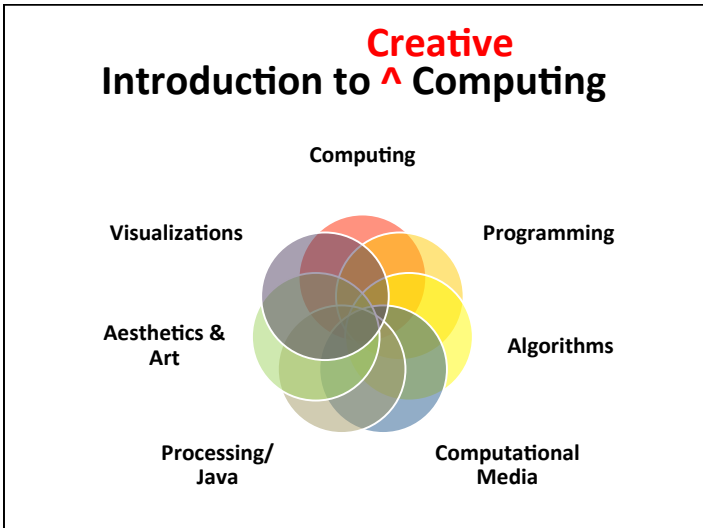
Although this is good news for computer science grads, it might not be for the computer industry. According to Collins, "One computer science graduate may have 10 offers as opposed to one accounting graduate that's getting five offers." So, computer science majors may be getting more offers, but this is only because there is a shortage of people who graduate with such a degree.

According to Collins, companies like to hire recent graduates because they have the latest skills.

"Things change very quickly, especially in computer science," said Collins. "Many organizations have a formal track when they want to bring in new college graduates and train them the way they want them to be trained."

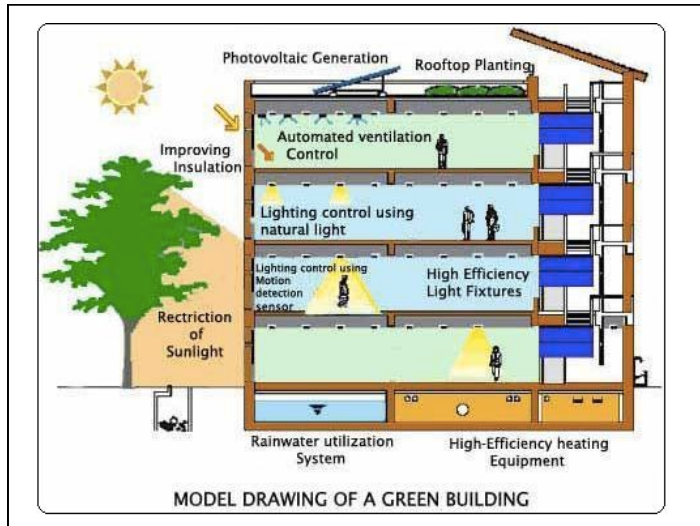
Annabelle Evans graduated as a computer science major from the University of Southern California in 2008. "When I picked my major, I knew there wouldn't be a lack of jobs as a computer scientist,

...many different companies ... need to hire computer scientists. They aren't tied to one particular industry.

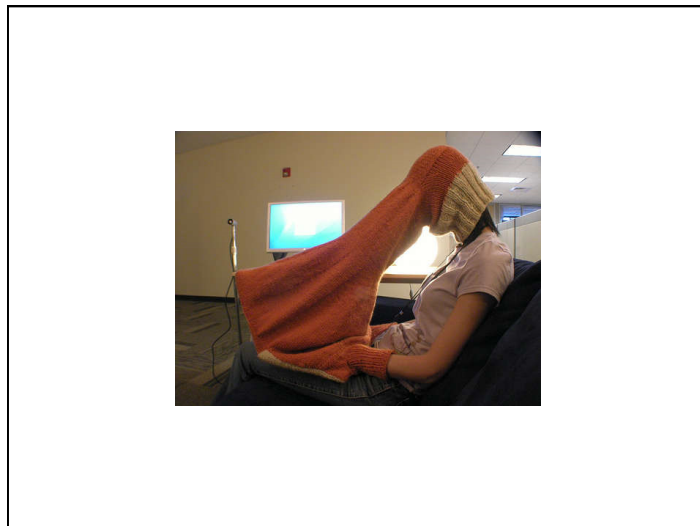


# What can be programmed?





How do you program?



**What is a Computer Program?**

A collection of human readable statements that can be translated to machine instructions and executed by a computing device.

## Algorithms

An **algorithm** is an effective method for solving a problem expressed as a finite sequence of instructions. For example,

### Put on shoes

left sock  
right sock  
left shoe  
right shoe



## Programming = Writing Apps

**Programming** is the process of designing, writing, testing, debugging / troubleshooting, and maintaining the source code of computer programs. This source code is written in a programming language.

## Computer Programs

Plain English:	Pseudo-code:	Processing Code:
Display text "Hello, World!" on the console.	print "Hello, World!"	println("Hello, World!");

- Note that processing uses a semi-colon (;) instead of a period.
- Also note that parameters to functions are always in parentheses

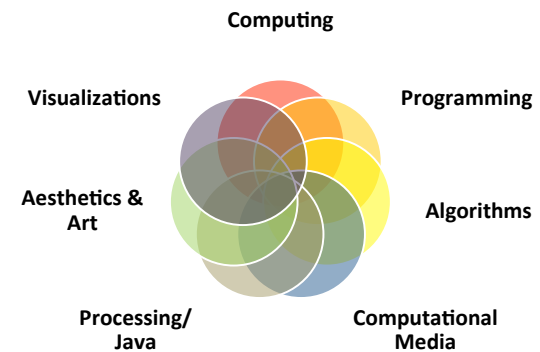
## A program

```
int areaOfCircle(int radius) {  
    return PI*radius*radius;  
}  
  
r = 10;  
area = areaOfCircle(r);
```

## Our Goal

- Use computing to realize works of art
- Explore new metaphors from computing: images, animation, interactivity, visualizations
- Learn the basics of computing
- Have fun doing all of the above!

## Introduction to <sup>Creative</sup> Computing

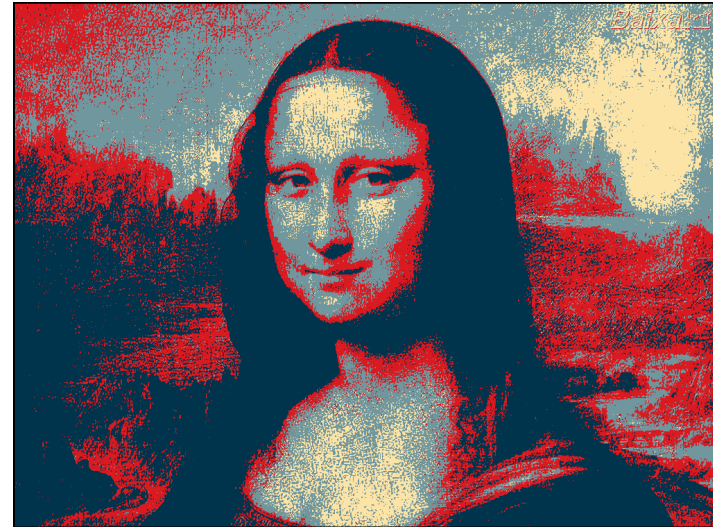



# Examples

## Shepard Fairey










# Abstract Art



## Summertime

Summertime,  
And the livin' is easy  
Fish are jumpin'  
And the cotton is high

Your daddy's rich  
And your mamma's good lookin'  
So hush little baby  
Don't you cry

One of these mornings  
You're going to rise up singing  
Then you'll spread your wings  
And you'll take to the sky

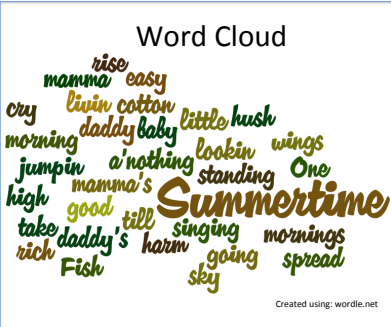
But till that morning  
There's a'nothing can harm you  
With daddy and mamma standing by

Summertime,  
And the livin' is easy  
Fish are jumpin'  
And the cotton is high

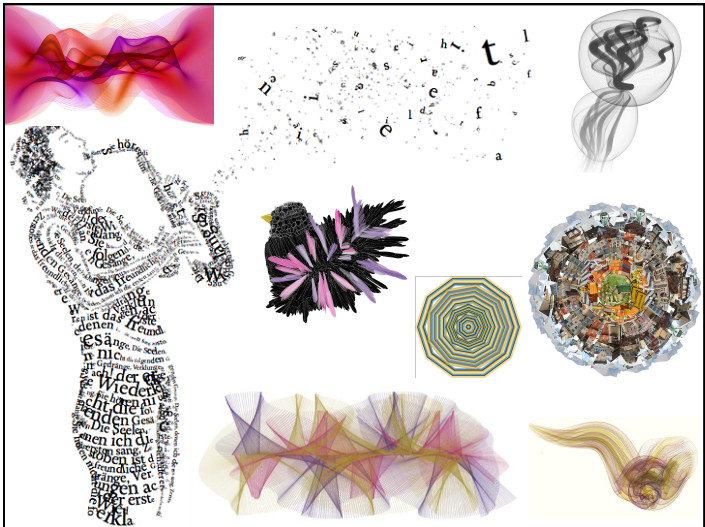
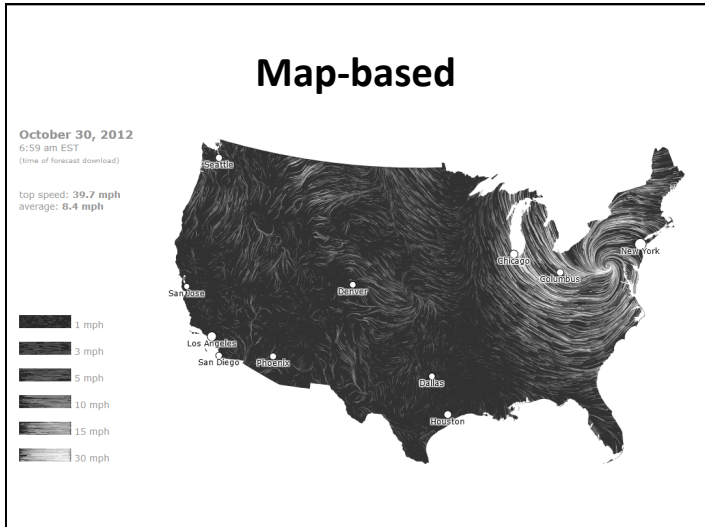
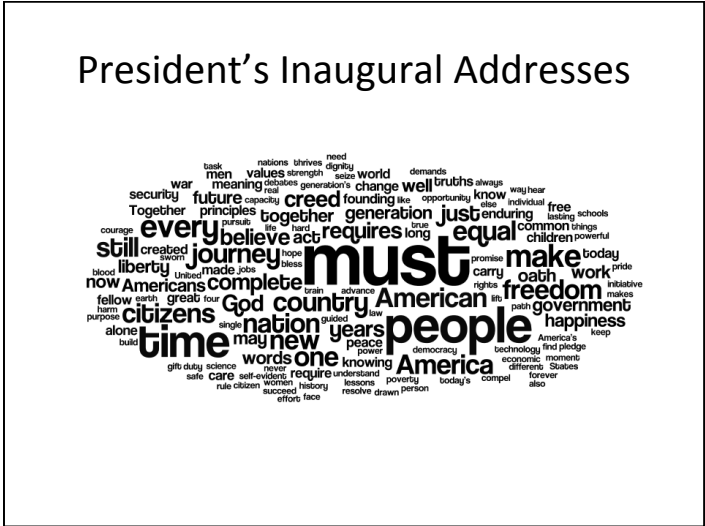
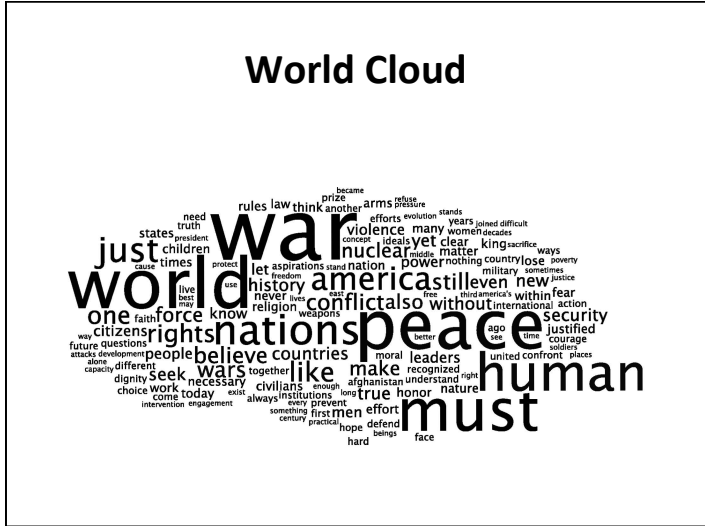
Your daddy's rich  
And your mamma's good lookin'  
So hush little baby  
Don't you cry

Lyrics by George Gershwin

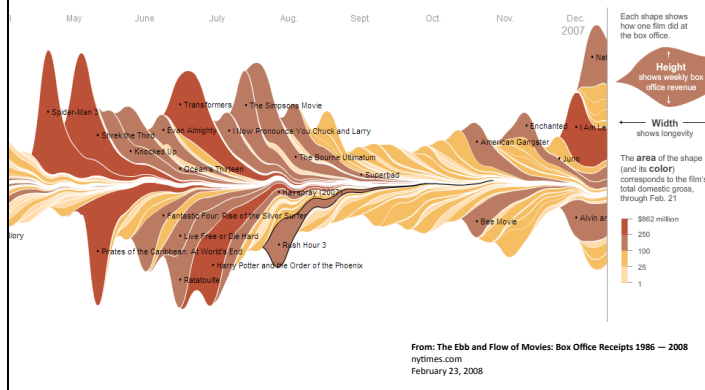
Word Cloud



Created using: wordle.net



## Box Office Earnings



## Our Goal

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- Have fun doing all of the above!

Let's get started...

## How to Use the book

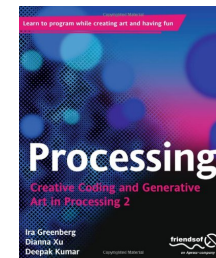
### Software

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- Processing == Java

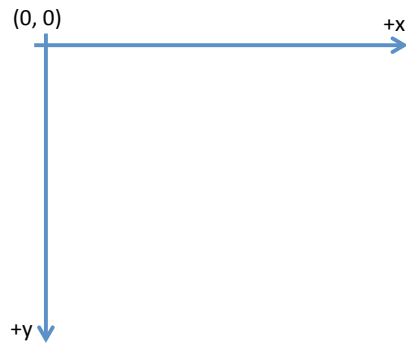
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vendors.

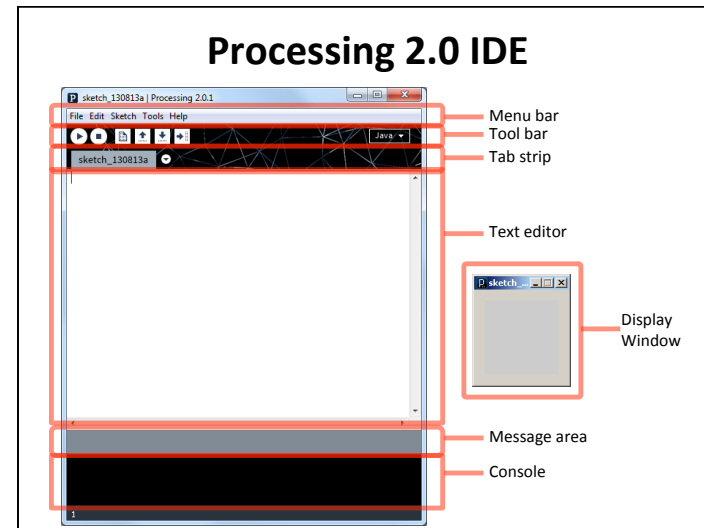


Let's Draw!

## Coordinate System

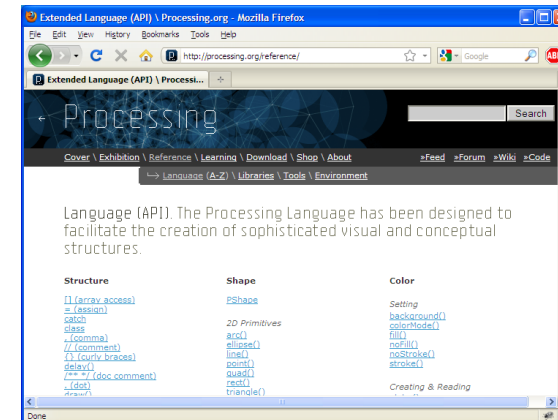


## Processing 2.0 IDE



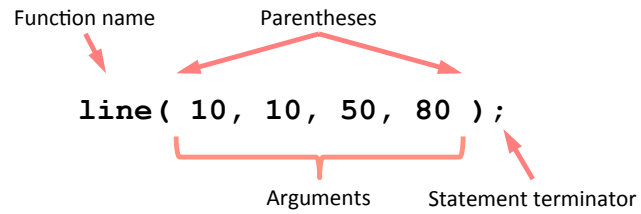
## Primitive 2D Shapes

- point
- line
- triangle
- rect (rectangle)
- quad (quadrilateral, four-sided polygon)
- ellipse
- arc (section of an ellipse)
- curve (Catmull-Rom spline)
- bezier (Bezier curve)

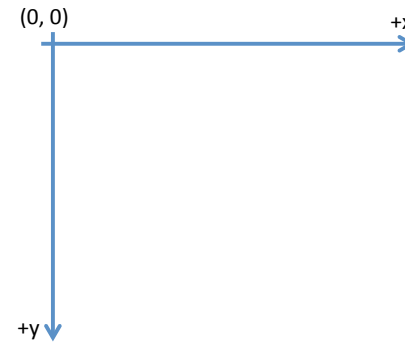


<http://processing.org/reference/>

## Anatomy of a Function Call



## Coordinate System



## Pixels



## Processing Canvas

`size( width, height );`

Set the size of the canvas.

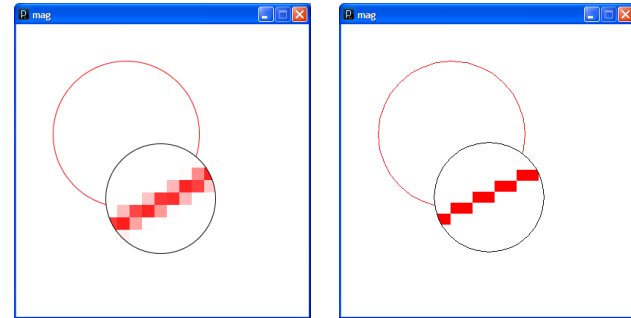
`background( [0..255] );`

Set the background grayscale color.

## Drawing Primitives

```
point( x, y );  
line( x1, y1, x2, y2 );  
triangle( x1, y1, x2, y2, x3, y3 );  
quad( x1, y1, x2, y2, x3, y3, x4, y4 );  
rect( x, y width, height );  
ellipse( x, y, width, height );
```

## smooth() vs. noSmooth()



## Colors

Composed of four elements:

1. Red
2. Green
3. Blue
4. Alpha (Transparency)

Why 0 .. 255?



## Homework

- Go to the CS Computer Lab (Room 231 PSB)
- Log in
- Start the Processing application  
(Make sure it is Version 2.x)
- In a web browser, go to the Tutorials section of [processing.org](http://www.processing.org)  
<http://www.processing.org/tutorials/gettingstarted/>
- Read the Getting Started tutorial (by Casey Reas & Ben Fry) and try out the two examples of simple Processing programs presented there
- If you'd like, install Processing 2.x on your own computer
- Read Chapter 1 (Read pages 1-12, skim 12-32)