Day 1

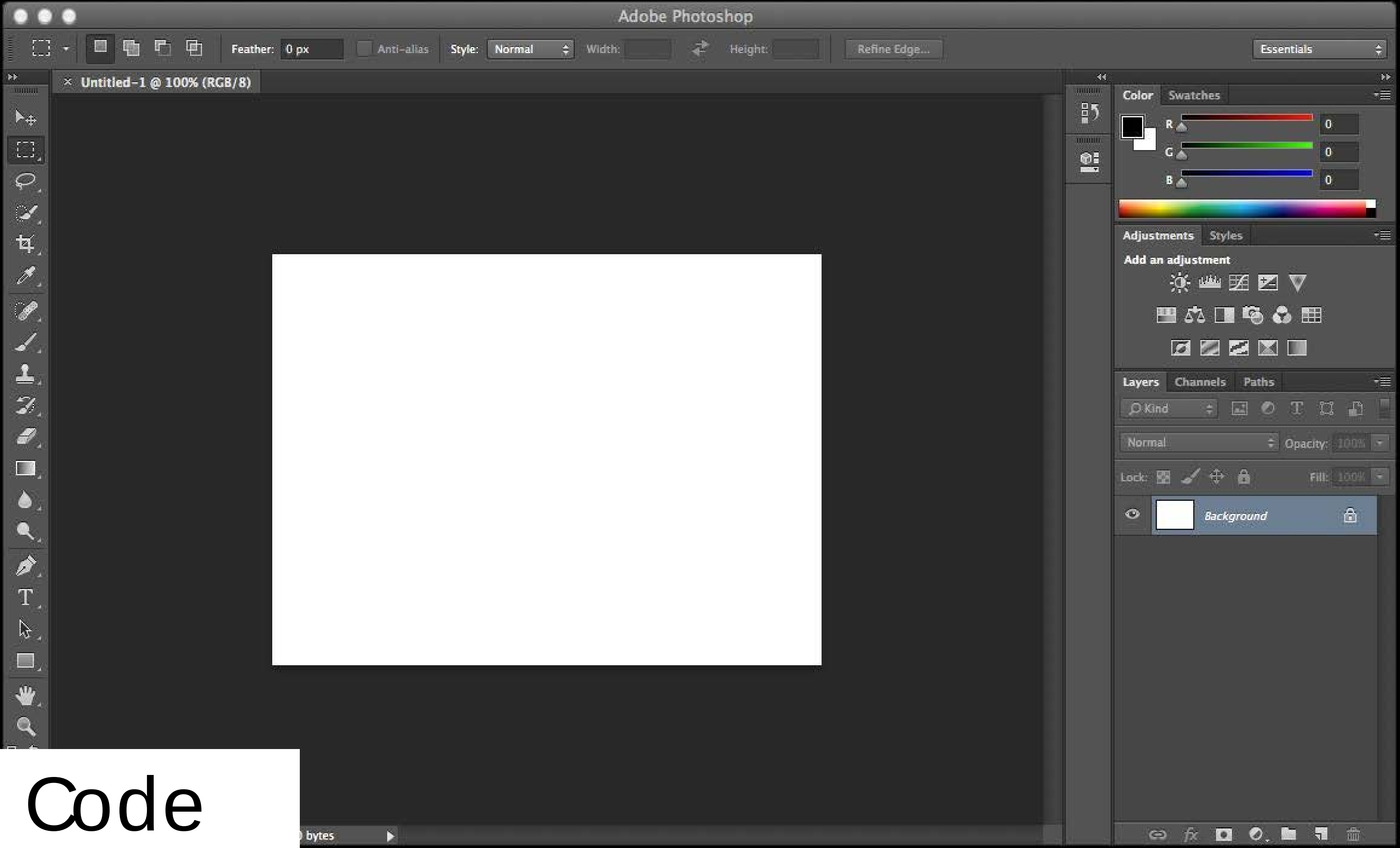
# Code Section

## Day 1 Agenda

| | |
|---|---|
| **Introductions** | Instructor background<br>Student introductions |
| **Creative Code** | What is code?<br>Problem decomposition<br>Learning languages |
| **BREAK** | |
| **Processing** | Anatomy of a sketch<br>Drawing with Processing<br>Live code exercises |

## Why do we code?

TIMES SQUARE
MOTOWN THE MUSICAL
CHRYSLER 300 MOTOWN EDITION
THE CROWD GOES WILD!
JERSEY BOYS
THE PHANTOM of the OPERA
WICKED
MAMMA MIA!
NICE WORK If You Can Get It
Annie
PALACE
MONEY EXCHANGE
BARCLAYS
Coca-Cola
McDonald's
ROXY
Avenue Q


Adobe Photoshop
Feather: 0 px
Anti-alias
Style: Normal
Width:
Height:
Refine Edge...
Essentials
Untitled-1 @ 100% (RGB/8)
Color
Swatches
R 0
G 0
B 0
Adjustments
Styles
Add an adjustment
Layers
Channels
Paths
Kind
Normal
Opacity: 100%
Lock:
Fill: 100%
Background
bytes

Code

como estas

こんにちは

你好

how are you

como allez vous

Code

## What is code?

## Translating Instructions For a Computer

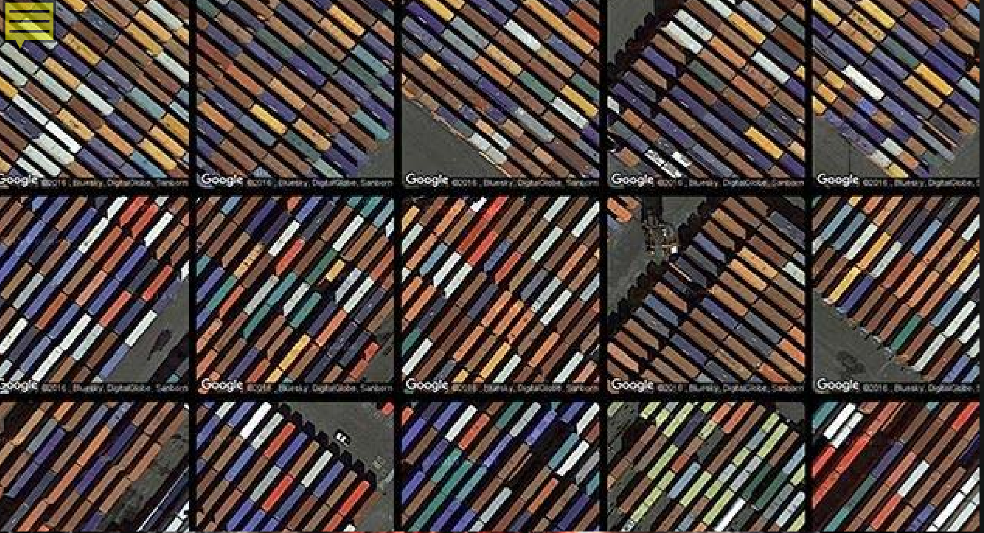
**What computers do**:
Store information as 1s and 0s and
perform math and logic operations on it

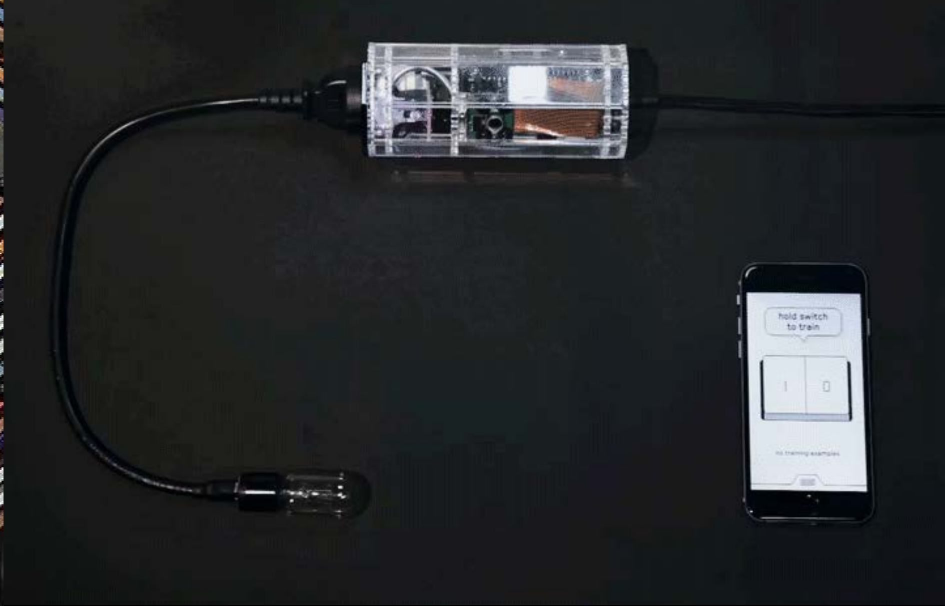
## Intermediate Languages and Libraries

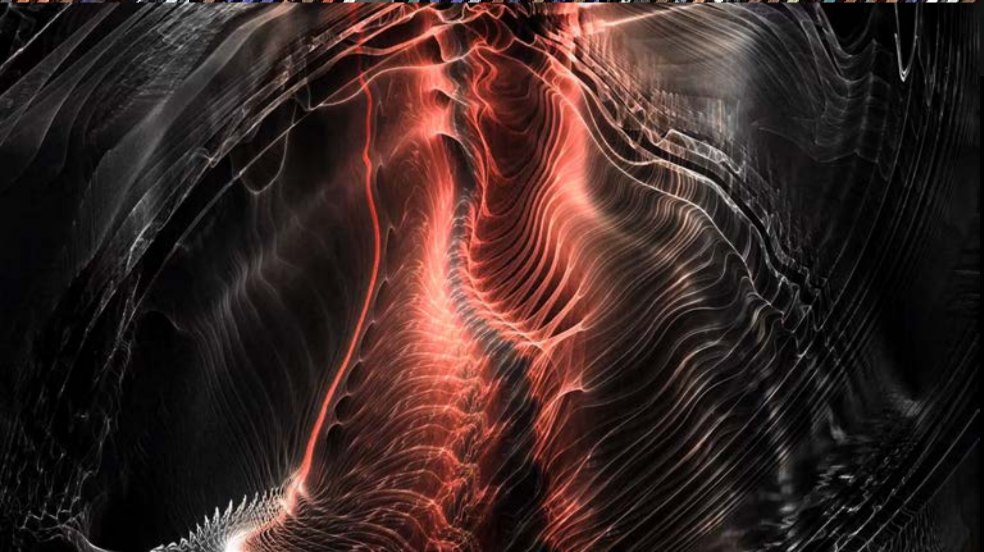
Expand the Computer’s Vocabulary

9:41 PM
Instagram
chchoitoi
128 likes

Squirtle
CP 278
Pokémon GO
Lv 1
Paula
Nearby
Lv 9
Lynn96
Nearby







Processing can be used in physical computing, interactive media, and image generation.

[More Processing projects](More Processing projects)

## Variables

## Types of Variables

In groups of two or three, define one of these. Write your definitions on the board.`

i nt

f l oat

char

s t r i ng

bool ean

## Types of Variables

These are some, but not all, primitive types.

| | |
|---|---|
| int | stores an integer (eg. 1) |
| float | stores a number with a decimal point (eg. 9.31) |
| String | stores text (“Bootcamp 2016”) |
| boolean | true/false |

## Using variables

Use println() to receive values back in the **console**.

```
int myNumber;
myNumber = 10;
println(myNumber);

> 10

myNumber = myNumber + 1;
println(myNumber);

> 11

String thisSchool = “Parsons”;
println(thisSchool);

> Parsons
```

## Functions

## Function example

This example describes a series of materials and actions to accomplish an overall goal: putting on a shoe.

You'll need some specific materials: a shoe, and a foot.

```
void putShoeOnFoot(Shoe myShoe,
Foot myFoot) {

    pickUp(myShoe);
    liftFoot(myFoot);
    lowerFootIntoShoe(myFoot,
myShoe);
    tieShoe(myShoe);
    releaseShoe(myShoe);

}
```

## Function example

This example describes a series of inputs and actions to accomplish an overall goal: putting on a shoe.

You’ll need to execute some specific actions: picking up your foot, etc.

```
void putShoeOnFoot(Shoe myShoe,
Foot myFoot) {

   pickUp(myShoe);
   liftFoot(myFoot);
   lowerFootIntoShoe(myFoot,
myShoe);
   tieShoe(myShoe);
   releaseShoe(myShoe);

}
```

## Problem Decomposition

# Peanut Butter & Jelly Sandwich

2 slices of bread
Peanut Butter
Jelly

1) Spread peanut butter on one slice of bread
2) Spread jelly on the other slice of bread
3) Put the pieces of bread together

## Recipe Breakdown

*Variables:*

breadSlice1
breadSlice2
peanutButter
jelly

*Functions:*

spreadOnBread()
putBreadTogether()

## Pseudocode 1

Pseudocode is useful for breaking down and understanding a complex task: translate code to “language”

```
// spread peanutButter on breadSlice1

// spread jelly on breadSlice2

// put bread slices together
```

## Pseudocode 2

Pseudocode is useful for breaking down and understanding a complex task.

```
main() {
    spreadOnBread(peanutButter,
    breadSlice1);

    spreadOnBread(jelly, breadSlice2);

    putBreadTogether();
}
```

## Pseudocode: Your Turn!

1. With a partner, write out the instructions for making a sandwich or another food.

1. Swap instructions with another team.

1. Think through the instructions literally and specifically: What happens?

**Br eak**

Return in 10 minutes

## Processing

## Processing

Processing consists of a programming language built on Java and an IDE (Integrated Development Environment).

It is specialized for visual design, drawing, and arts applications. It is also designed for teaching.

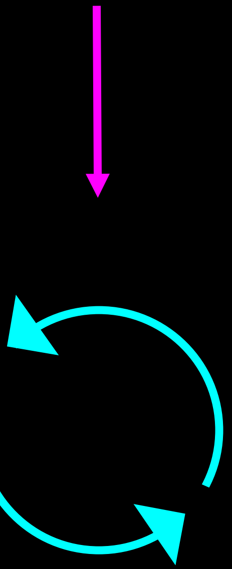
Processing has lots of built-in functions and variables for drawing on a canvas.

## Program Execution

In Processing, `setup()` runs **one time**.

After that, `draw()` **repeats endlessly**, until you stop the program.

```
setup() {

}


draw() {

}
```



## Program Anatomy

In setup(), you’ll put things like canvas size and background color.

In draw, you’ll put actions that you want to happen repeatedly. We’ll add these in a minute.

```
setup() {
        //canvas size
        size(800, 800);
        //background color
        background(0);
}

draw() {

}
```

## Program Anatomy

Add **comments** by putting two slashes at the beginning of a line.

The program doesn't run these: they are for humans to read and understand.

Use comments often!

```
void setup(){
        //canvas size
        size(800, 800);
        //background color
        background(0);
}

void draw(){

}
```

## Drawing functions

Processing has **built-in functions** for drawing, graphics, and creative coding.

You can find information about what Processing can do and how to use functions in the **documentation**.

```
ellipse(x, y, width, height);

rect(x, y, width, height);

line(x1, y1, x2, y2);
```

## Anatomy of functions

Just as in the previous examples, the external part of these functions describes what they do.

Semicolons indicate the end of the line. Don't forget them!

```
ellipse(x, y, width, height);

rect(x, y, width, height);

line(x1, y1, x2, y2);
```

## Anatomy of functions

Inside the parenthesis, you specify parameters for the shapes you're drawing.

Look in the **documentation** to learn about the parameters for a specific function.

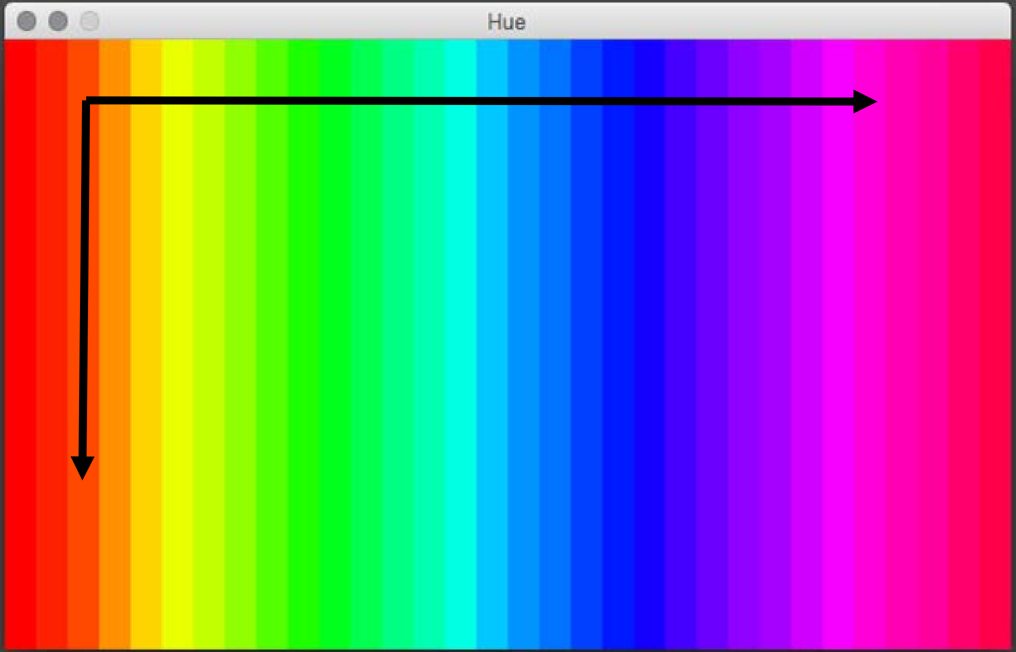
```
ellipse(x, y, width, height);

rect(x, y, width, height);

line(x1, y1, x2, y2);
```

## The Processing Canvas

**What parameters should you use?**

It helps to know something about the drawing space in Processing.

Processing’s canvas uses **x, y coordinates** starting from the **top left corner.**



## The Processing Canvas

Processing represents images in **pixels.**

Each image in Processing is a grid, with numbers representing the color value at each coordinate.

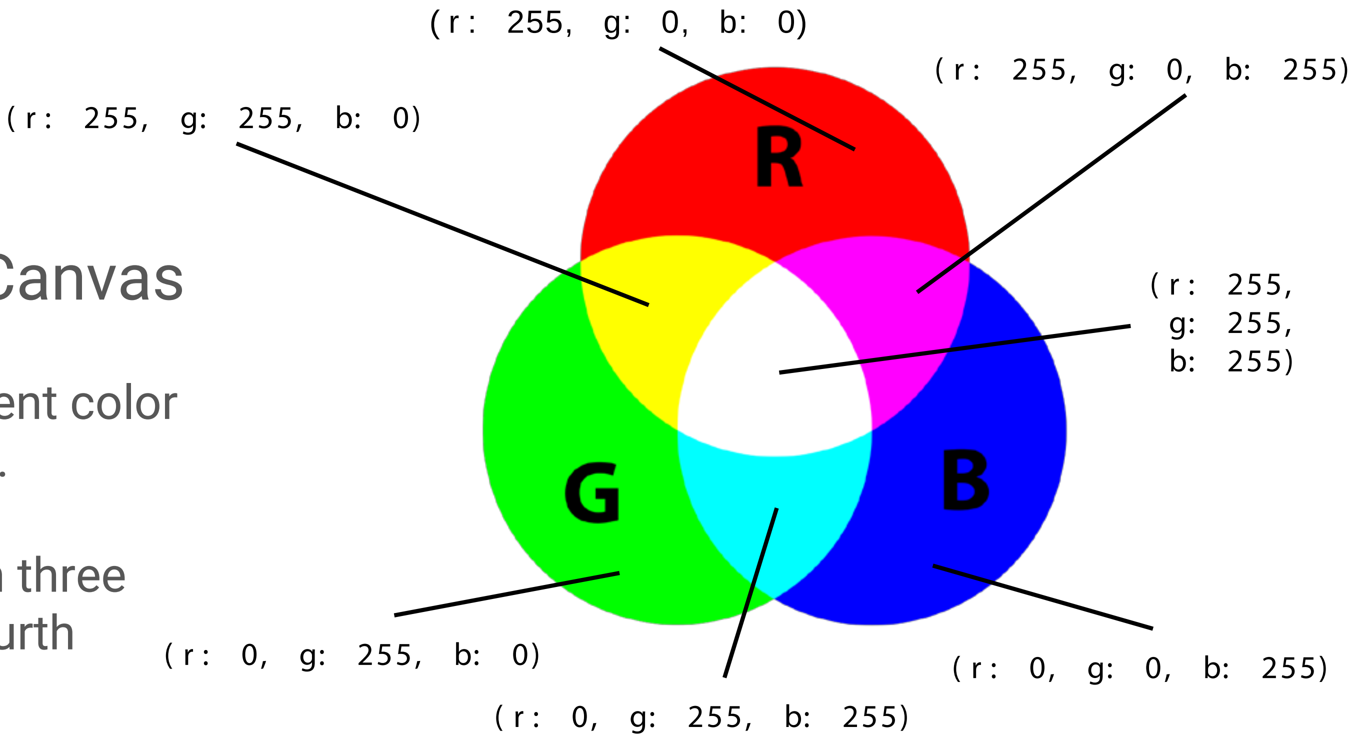
When you specify measurements, like square width, you’re referencing pixels.

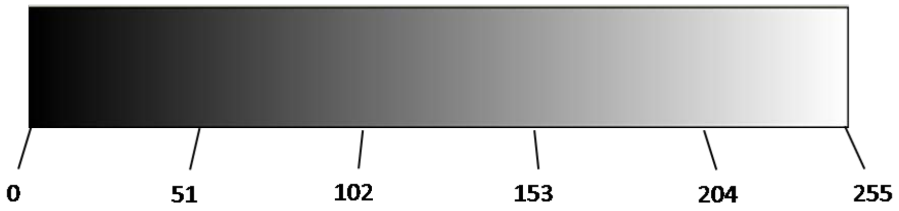
## The Processing Canvas

Processing can represent color in a few different ways.

**RGB:** Represented with three values, 0-255, and a fourth for transparency.

**Grayscale:** One value, 0-255.





## Bringing it Together

Let’s do some live coding! You can follow along by downloading and opening **Day01_exercise01.pde** from Drive.

We’ll add parameters to our shape functions to create some images.

```
void setup(){
          size(800,800);
          background(0);
}

void draw(){
          ellipse(100, 100, 50, 50);

}
```

## Live Code

Next, we'll create named variables to store our parameter information.

```
int x = 100;
int y = 100;

int circWidth = 70;
int circHeight = 70;

void setup(){
        size(800,800);
        background(0);
}

void draw(){
    ellipse(x, y, circWidth,
                circHeight);

}
```

## Live Code

We'll add some color to the circle by creating a color variable, and setting the color.

In Processing, you can set a **fill** color and an **stroke** (outline) color.

There is a built in **color function** that accepts RGB or other color information.

```
int x = 100;
int y = 100;

int circWidth = 70;
int circHeight = 70;

color circColor = color(255, 0, 0);

void setup(){
        size(800, 800);
        background(0);
}

void draw(){
        fill(circColor);
    ellipse(x, y, circWidth,
                circHeight);
}
```

## Exercise

**Let’s get off screen!**

Take a sheet of paper and
draw out the code **step by step.**

The canvas size is already
set for you.

Loop through `draw()` five
times.

```
int x = 5;
int y = 5;

int rectWidth = 2;
int rectHeight = 2;

color rectColor = color(0);

void setup(){
        size(20,20);
        background(255);
}

void draw(){
        fill(rectColor);
    rect(x, y, rectWidth,
                rectHeight);
    y = y+1
}
```

## Exercise

**Let's get off screen!**

**What does your sketch look like?**

```
int x = 5;
int y = 5;

int rectWidth = 2;
int rectHeight = 2;

color rectColor = color(0);

void setup(){
        size(20, 20);
        background(255);
}

void draw(){
        fill(rectColor);
    rect(x, y, rectWidth,
                rectHeight);
    y = y+1
}
```

## Live Code

Because `draw()` repeats constantly, we can create change and movement using math.

When we add 1 to `y` with each loop, the dot's y position slowly increases, so the dot slides down the screen.

```
int x = 100;
int y = 100;

int circWidth = 70;
int circHeight = 70;

color circColor = color(255, 0, 0);

void setup(){
        size(800, 800);
        background(0);
}

void draw(){
        fill(circColor);
    ellipse(x, y, circWidth,
                circHeight);
    y= y+1;
}
```

## Live Code

Because `draw()` repeats constantly, we can create change and movement using math.

When we add y = y+1, the dot begins to slide down the canvas.

**Why does it leave a trail?**

Why might you want to put `y= y+1` at the **bottom of the function**?

```
int x = 100;
int y = 100;

int circWidth = 70;
int circHeight = 70;

color circColor = color(255,0,0);

void setup(){
        size(800,800);
        background(0);
}

void draw(){
        fill(circColor);
    ellipse(x, y, circWidth,
                  circHeight);
    y= y+1;
}
```

## Live Code

The dot leaves a trail because we've only drawn the background once, during setup.

Let's re-draw the background at the beginning of each draw loop.

What would happen if we put `background(0)` at the **end of the loop?**

```
int x = 100;
int y = 100;

int circWidth = 70;
int circHeight = 70;

color circColor = color(255, 0, 0);

void setup(){
        size(800, 800);
        background(0);
}

void draw(){
    background(0);
        fill(circColor);
    ellipse(x, y, circWidth,
                circHeight);
    y= y+1;
}
```

## Wrapping up

Take a minute to explore Processing.

Draw a rectangle.

Then draw a line.

Make your rectangle change color as the sketch runs.

Make one point of your line move as the sketch runs.

```
ellipse(x, y, width, height);

rect(x, y, width, height);

line(x1, y1, x2, y2);
```

## Homework

- Research some artists or designers working with code. Bring in an example of work you're interested in!
- Pseudocode: think of something simple you would like to draw in Processing. Decompose it and write the pseudocode for it.
- Bonus: actually program it (or try)
    - Look at the docs: https://processing.org/reference/
    - Good places to start: background(), fill(), rect(), triangle(), ellipse(), line()

## Resources

https://processing.org/tutorials/

Dan Schiffman: The Coding Train

https://www.amazon.com/Learning-Processing-Second-Programming-Interaction