Did you do this?

- 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/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)

Drawing Basics

- **Canvas** – computer screen
  
  ```
  size(width, height);
  ```

- **Drawing Tools** – shape commands

- **Colors** – grayscale or RGB
  
  ```
  background(125);
  ```

Drawing Tools - Basic Shapes

- **Point**
  
  ```
  point(x, y);
  ```

- **Line**
  
  ```
  line(x1, y1, x2, y2);
  ```

- **Triangle**
  
  ```
  triangle(x1, y1, x2, y2, x3, y3);
  ```

- **Rectangle**
  
  ```
  rect(x, y, width, height);
  ```

- **Ellipse**
  
  ```
  ellipse(x, y, width, height);
  ```

Drawing & Shape Attributes

- **Anti-aliasing**
  
  - smooth();
  - noSmooth();

- **Stroke**
  
  - noStroke();
  - strokeWeight(<pixel width>);
  - stroke(<stroke color>);

- **Fill**
  
  - noFill();
  - fill(<fill color>);
**Drawing Tools - Basic Shapes**

- Point
- Line
- Triangle
- Rectangle
- Ellipse

**Basic Shapes: Arcs**

- What is an arc?

```java
arc(x, y, width, height, startAngle, endAngle);
```

```java
noFill();
stroke(255, 0, 0);
arc(200, 200, 150, 150, 0, PI);
```

```java
fill(255, 255, 0);
stroke(255, 0, 0);
arc(200, 200, 150, 150, 0, TWO_PI);
```

**Basic Shapes: Quadrilaterals**

```java
quad(x1, y1, x2, y2, x3, y3, x4, y4);
```

```java
noStroke();
fill(12, 37, 80);
quad(100, 50, 150, 100, 100, 150, 50, 100);
```

```java
fill(163, 208, 193);
quad(100, 50, 150, 100, 100, 150, 250, 100);
```

```java
fill(240, 127, 71);
quad(100, 50, 200, 50, 250, 100, 50, 100);
```
Basic Shapes: Polygons
beginShape();
vertex(x1, y1);
vertex(x2, y2);
vertex(x3, y3);
vertex(x4, y4);
vertex(xN, yN);
endShape(CLOSE);

fill(240, 127, 71);
beginShape();
vertex(100, 50);
vertex(150, 100);
vertex(100, 150);
vertex(250, 100);
endShape(CLOSE);

fill(240, 127, 71);
beginShape();
vertex(100, 50);
vertex(150, 100);
vertex(100, 150);
vertex(250, 100);
endShape();

Basic Shapes: Curves
curve(cpx1, cpy1, x1, y1, x2, y2, cpx2, cpy2);
cpx1, cpy1 - control point #1
x1, y1 - start of curve
x2, y2 - end of curve
cpx2, cpy2 - control point #2
Draws a Catmull-Rom Spline between x1, y1 and x2, y2

Examples:
curve(50, 50, 150, 50, 250, 100, 50, 200);
curve(50, 50, 80, 150, 50, 100, 150, 50);

50, 50
50, 200
150, 50
250, 100
50, 50
150, 50
50, 100
80, 150

More Complex Curves
beginShape();
curveVertex(x1, y1);
curveVertex(x2, y2);
curveVertex(x3, y3);
curveVertex(xN, yN);
endShape(CLOSE);
curve(50, 50, 150, 50, 250, 100, 50, 200);
beginShape();
curveVertex(50, 50);
curveVertex(150, 50);
curveVertex(250, 100);
curveVertex(50, 200);
endShape();

Example: A Penguin

Review: Drawing Basics
- Canvas
  size(width, height);
- Drawing Tools
  drawRect(x, y, width, height);
  triangle(x1, y1, x2, y2, x3, y3);
  quad(x1, y1, x2, y2, x3, y3, x4, y4);
- Drawing & Shape Attributes
  stroke(color), noStroke();
  fill(color), noFill();
  strokeWeight(pixelWidth);
- Colors
  red(255), green(0), blue(0);
  black(0, 0, 0);
- Simple Program Structure

Simple Program Structure
// Create and set canvas
size(width, height);
smooth();
background(color);

// Draw something
--
// Draw something else
--
// etc.
Simple Program Structure

// Draw a simple house
// Create and set canvas
size(300, 300);
smooth();
background(187, 193, 127);
// wall
fill(206, 224, 14);
rect(50, 150, 200, 100);
// Draw Door
fill(72, 26, 2);
rect(125, 200, 50, 50);
// Draw roof
fill(224, 14, 14);
triangle(50, 150, 150, 50, 250, 150);

Variables: Naming Values

• Values
  42, 3.14159, 2013, “Hi, my name is Joe!”, true, false, etc.
  – Numbers
    • Integers
      int meaningOfLife = 42;
      int year = 2013;
    • Floating point numbers
      float pi = 3.14159;
  – Strings
    String greeting = “Hi, my name is Joe!”;
  – Boolean
    boolean keyPressed = true;

Variables: Naming Rules & Conventions

• Names begin with a letter, an underscore (_), or a dollar sign ($) 
  Examples: weight, _meaningOfLife, $value
• Names may include numbers, but only after the initial character 
  Examples: value1, score5, 5bestFriends
• No spaces are permitted in names 
  Examples: value 1, dollar sign
• Processing Conventions
  – Names begin with a lowercase letter
    Example: meaningOfLife, highestScore
  – Constants are written in all caps 
    Examples: DAYS_IN_WEEK, PI

Variables: Declarations & Initialization

• Declaring variables
  int meaningOfLife;
  int year;
  float pi;
  String greeting;
  boolean keyPressed;

• Initializing values in declarations
  int meaningOfLife = 42;
  int year = 2013;
  float pi = 3.14159;
  String greeting = “Hi, my name is Joe!”;
  boolean keyPressed = true;
The **color** type

- Processing has a type called **color**

```javascript
color firebrick = color(178, 34, 34);
color chartreuse = color(127, 255, 0);
color fuchsia = color(255, 0, 255);

fill(firebrick);
rect(50, 100, 75, 125);
```

**Expressions: Doing Arithmetic**

- Assignment statement
  ```javascript
  <variable> = <expression>;
  ```

- Examples:
  ```javascript
  meaningOfLife = 42;
  area = length * height;
  perc = statePop / totalPop * 100.0;
  ```

- Operators
  ```javascript
  + (addition) 
  - (subtraction) 
  * (multiplication) 
  / (division) 
  ```

- Example:
  ```javascript
  mouth_x = ( (leftIris_x + irisDiam) / 2 + eyeWidth ) / 4;
  ```

**Using Variables**

// Draw a simple house
// Create and set canvas
size(300, 300);
smooth();
background(187, 193, 127);

// wall
fill(206, 224, 14);
rect(houseX, houseY - wallHeight, houseWidth, wallHeight);

// Draw Door
fill(72, 26, 2);
rect(houseX + houseWidth / 2 - doorWidth / 2, houseY - doorHeight, doorWidth, doorHeight);

// Draw roof
fill(224, 14, 14);
triangle(houseX, houseY - wallHeight, houseX + houseWidth / 2, houseY - houseHeight, houseX + houseWidth, houseY - wallHeight);

**A Better House Sketch**

// Draw a simple house
// Create and set canvas
size(300, 300);
smooth();
background(187, 193, 127);

// wall
fill(206, 224, 14);
rect(houseX, houseY - wallHeight, houseWidth, wallHeight);

// Draw Door
fill(72, 26, 2);
rect(houseX + houseWidth / 2 - doorWidth / 2, houseY - doorHeight, doorWidth, doorHeight);

// Draw roof
fill(224, 14, 14);
triangle(houseX, houseY - wallHeight, houseX + houseWidth / 2, houseY - houseHeight, houseX + houseWidth, houseY - wallHeight);

A Better House Sketch

// Draw a simple house
// Create and set canvas
size(300, 300);
smooth();
background(187, 193, 127);

// wall
fill(206, 224, 14);
rect(houseX, houseY - wallHeight, houseWidth, wallHeight);

// Draw Door
fill(72, 26, 2);
rect(houseX + houseWidth / 2 - doorWidth / 2, houseY - doorHeight, doorWidth, doorHeight);

// Draw roof
fill(224, 14, 14);
triangle(houseX, houseY - wallHeight, houseX + houseWidth / 2, houseY - houseHeight, houseX + houseWidth, houseY - wallHeight);