Today we will

- Answer any questions about Chapter 3 (10')
- "Self-paced" learning Shapes and Color in Processing (40')

Warning!

- Exams are written in a piece of paper, individually!
- No calculators are allowed

How is the pace of the course so far?



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How is the pace of the course so far?

Too fast	
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Too slow	
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Just right	
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How is the pace of the course so far?

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CS 101 Shapes and Color in Processing

More Shapes

- We've discussed rect, triangle, and ellipse already
- Processing has several other functions that can be used to draw various shapes
 - Will be presented throughout lecture





- Let's use these various functions to draw a picture of a house using Processing
- Our goal is to make it look like the picture to the right



- Let's use these various functions to draw a picture of a house using processing
- Our goal is to make it look like the picture to the right
- What shapes do we need?



size(400, 400);

rect(50, 200, 300, 150); // house frame rect(120, 280, 50, 70); // door rect(200, 280, 100, 50); // window frame line(200, 305, 300, 305); // window line line(250, 280, 250, 330); // window line triangle(30, 200, 200, 100, 370, 200); // roof



size(400, 400);

rect(50, 200, 300, 150); // house frame rect(120, 280, 50, 70); // door rect(200, 280, 100, 50); // window frame line(200, 305, 300, 305); // window line line(250, 280, 250, 330); // window line triangle(30, 200, 200, 100, 370, 200); // roof

Problem 1. Draw this house

- 1. Copy/paste the code to draw this house from the slides
- 2. Run it and upload the source code to Gradescope



ICA

Color

- Now we have a house, great!
- But the colors are boring
- How can the color be changed of...
 - The inside of each shape?
 - The line/border of each shape?
 - The background?

Color

- A computer screen is composed of a grid (rows and columns) of pixels
 - ... Like the canvas of a Processing window
- Each pixel can display a unique color, which is controlled by a Red,
 Green, and Blue brightness value

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Color

- Thus, when we specify the color to a computer program, we must do so using these three numbers
- The brightness values for each can be between 0 (the darkest) and 255 (the highest)
 - 0-255 inclusive
- Can use the **background()**, **fill()**, and **stroke()** functions to control the colors of things

Color

- background(r, g, b)
 - Control the color of the background of the canvas
- fill(r, g, b)
 - Control the color of all shapes drawn after
- stroke(r, g, b)
 - Control the color of all shape borders drawn after

Color Selector

• How does one determine what R, G, B values produce a color?

Color Selector

- How does one determine what R, G, B values produce a color?
- One way for beginners: use the color picker!

Color Selector

- How does one determine what R, G, B values produce a color?
- One way for beginners: use the color picker in Processing!



Use the color picker to determine

- A. What color is (255, 0, 0)?
- B. What color is (100, 200, 255)?
- C. What color is (150, 200, 0)?

Solutions

- A. What color is (255, 0, 0)?
- A. What color is (100, 200, 255)?
- B. What color is (150, 200, 0)?

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Problem 2. Use the color picker to ...

A. Match this color:

B. Match this color:

C. Match this color:

Write on Gradescope the RGB of these colors

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• Let's revisit the black/white house



- Let's revisit the black/white house
- Using the function we just learned about, how can we change this . . .



• Let's use what we've learned to paint our house!



size(400, 400);

rect(50, 200, 300, 150); // house frame rect(120, 280, 50, 70); // door rect(200, 280, 100, 50); // window frame line(200, 305, 300, 305); // window line line(250, 280, 250, 330); // window line triangle(30, 200, 200, 100, 370, 200); // roof



Call the function to change the background before defining the canvas:



```
rect(50, 200, 300, 150); // house frame
rect(120, 280, 50, 70); // door
rect(200, 280, 100, 50); // window frame
line(200, 305, 300, 305); // window line
line(250, 280, 250, 330); // window line
triangle(30, 200, 200, 100, 370, 200); // roof
```



Call the function to change the house frame Color before drawing the house frame: background(100, 200, 255); size(400, 400); rect(50, 200, 300, 150); // house frame rect(120, 280, 50, 70); // door rect(200, 280, 100, 50); // window frame line(200, 305, 300, 305); // window line line(250, 280, 250, 330); // window line triangle(30, 200, 200, 100, 370, 200); // window



Self-paced work

Submit to Gradescope the work that you have so far. Finish the rest of slides at your own pace DEADLINE: 9:50 am - **NO MAKEUP for ICAs!**

```
fill(150, 0, 0);
rect(50, 200, 300, 150); // house frame
???
rect(120, 280, 50, 70); // door
???
rect(200, 280, 100, 50); // window frame
line(200, 305, 300, 305); // window line
line(250, 280, 250, 330); // window line
???
```

colors as you prefer

triangle(30, 200, 200, 100, 370, 200); // roof



Problem 3

- 1. Paint the rest of the house as you wish
- 2. Upload to gradescope **the source code file** (not the screenshot) of your house

ICA

fill(150, 0, 0); rect(50, 200, 300, 150); // house frame fill(0, 200, 0); rect(120, 280, 50, 70); // door fill(0, 0, 255); rect(200, 280, 100, 50); // window frame line(200, 305, 300, 305); // window line line(250, 280, 250, 330); // window line fill(255, 255, 0); triangle(30, 200, 200, 100, 370, 200); // roof



strokeWeight(5); fill(150, 0, 0); rect(50, 200, 300, 150); // house frame fill(0, 200, 0); rect(120, 280, 50, 70); // door fill(0, 0, 255); rect(200, 280, 100, 50); // window frame line(200, 305, 300, 305); // window line line(250, 280, 250, 330); // window line fill(255, 255, 0); triangle(30, 200, 200, 100, 370, 200); // roof



strokeWeight(10); fill(150, 0, 0); rect(50, 200, 300, 150); // house frame fill(0, 200, 0); rect(120, 280, 50, 70); // door fill(0, 0, 255); rect(200, 280, 100, 50); // window frame line(200, 305, 300, 305); // window line line(250, 280, 250, 330); // window line fill(255, 255, 0); triangle(30, 200, 200, 100, 370, 200); // roof



strokeWeight(10); stroke(0, 255, 100); fill(150, 0, 0); rect(50, 200, 300, 150); // house frame fill(0, 200, 0); rect(120, 280, 50, 70); // door fill(0, 0, 255); rect(200, 280, 100, 50); // window frame line(200, 305, 300, 305); // window line line(250, 280, 250, 330); // window line fill(255, 255, 0); triangle(30, 200, 200, 100, 370, 200); // roof



Alpha Values

- The **fill()**, and **stroke()** functions can also take a fourth argument (value) when you call it
 - fill(150, 0, 0,?);
- This is called the *alpha* value
- Also a number between 0 and 255
- Specifies the transparency level
 - 0 is lightest (don't display)
 - o 255 is darkest

Three Circles

- How can an image like this be created?
- What shapes and features of processing should be used?



One Circle

Start with one circle:

```
background(204, 226, 225);
size(400, 150);
noStroke();
fill(255, 0, 0, 150);
ellipse(132, 82, 200);
```



Experiment with the transparency.

Download the code from the website.

Three Circles

Try to make three circles.

Use different colors.

Overlap them!



Three Circles (solution)

background(204, 226, 225);

size(400, 150);

noStroke();

fill(255, 0, 0, 80);

ellipse(132, 82, 200, 200); fill(0, 255, 0, 80);

ellipse(228, -16, 200, 200);

fill(0, 0, 255, 80);

ellipse(268, 118, 200, 200);



Custom Shapes

- You are not limited to the "basic" shapes that we've been using so far
- Processing supports the drawing of custom shapes using beginShape(), vertex(), and endShape()
 - Start by calling beginShape(), then vertex(x,y). This specifies the beginning point of a drawing.
 - call **vertex(x,y)** again to specify the next x and y to draw to
 - repeat for the next vertex (the next x and y)
 - endShape() when done

```
size(120,120);
background(100,238,255);
beginShape();
fill(255,255,100);
vertex(30,20); //upper-left corner
vertex(85,20); //upper-right corner
vertex(85,75); //lower-right corner
vertex(30,75); //lower-left corner
endShape();
```



More Shapes



More Shapes



arc(x, y, width, height, start, stop)

The Shape of Edges

- You can change the style of the edges of a shape using the **strokeJoin()** function
 - o strokeJoin(ROUND);
 - o strokeJoin(MITER);
 - o strokeJoin(BEVEL);

Problem 4

- Run the creature or robot from the book- Chapter 3
- Design your own creature or robot
- Upload the source code file to Gradescope