# Programming Fundamentals 1

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# Introduction to Processing

## Conditional Mouse Events & Operators

Conditional Events

Mouse Event

mouse events · operators · order of evaluation

# Agenda

❑ Mouse Events

❑ Recap: Arithmetic Operators

❑ Order of Evaluation

# Mouse Events

# What is an event?

*“…an action such as*
*a key being pressed,*
*the mouse moving,*
*or a new piece of data*
*becoming available to read.”*

(Reas & Fry, 2014)

# What happens when an event is “fired”?

*“An event **interrupts***
*the normal flow*
*of a program*
*to run the code*
*within an **event block**”*

(Reas & Fry, 2014)

# Mouse Events

| Mouse Variables | Description |
|---|---|
| mousePressed | *true* if any mouse button is pressed, *false* otherwise.<br>Note: this variable reverts to *false* as soon as the button is released. |
| mouseButton | Can have the value LEFT, RIGHT and CENTER, depending on the mouse button most recently pressed.<br>Note: this variable retains its value until a different mouse button is pressed. |

# Mouse Events

- ❑ Mouse and keyboard events only work when a program has draw()

- ❑ Without draw(), the code is only run once and then stops “listening” for events

Source: https://processing.org/reference/

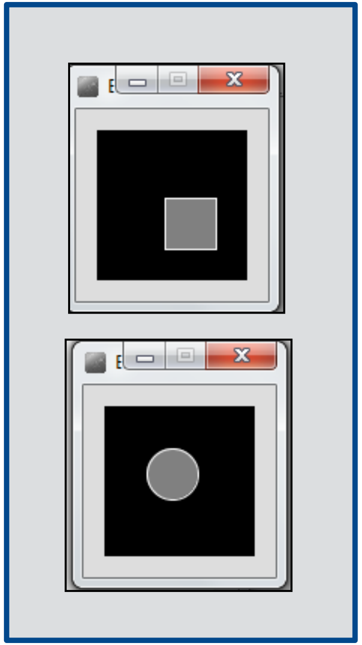
# Processing Example 3.5

Functionality:

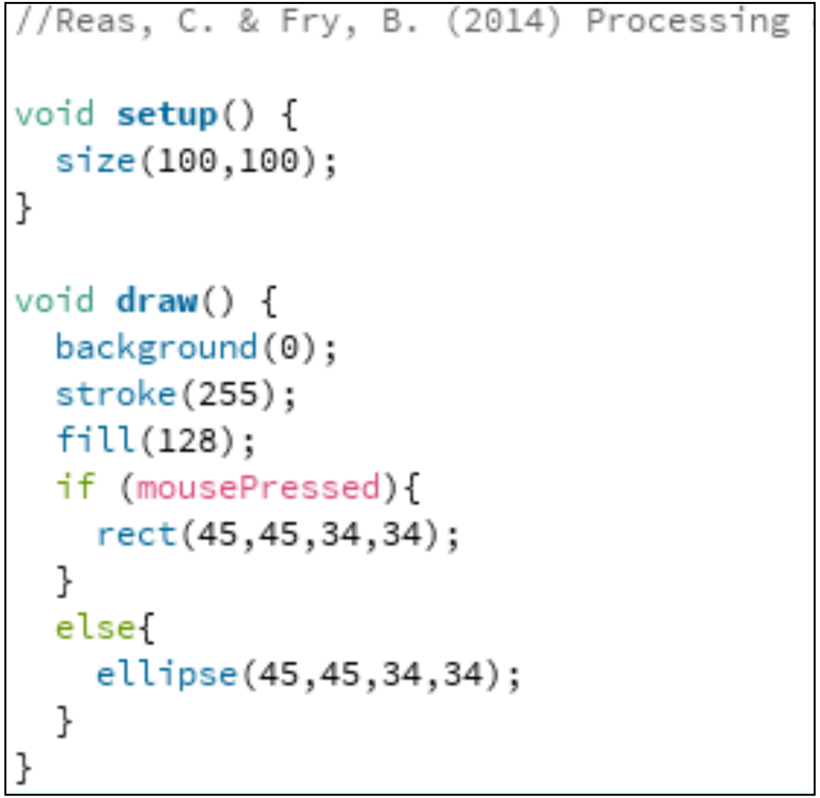
❑ If the mouse is pressed:

- draw a grey square with a white outline.

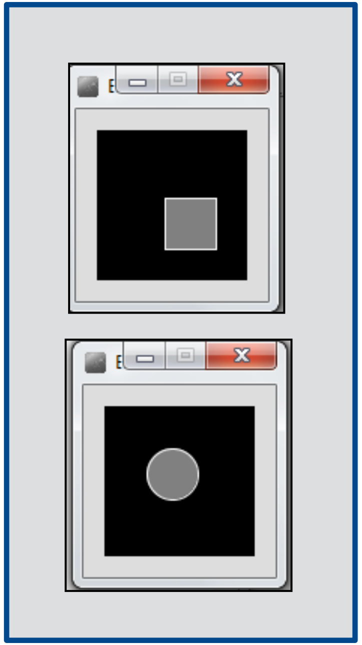
- otherwise draw a grey circle with a white outline.



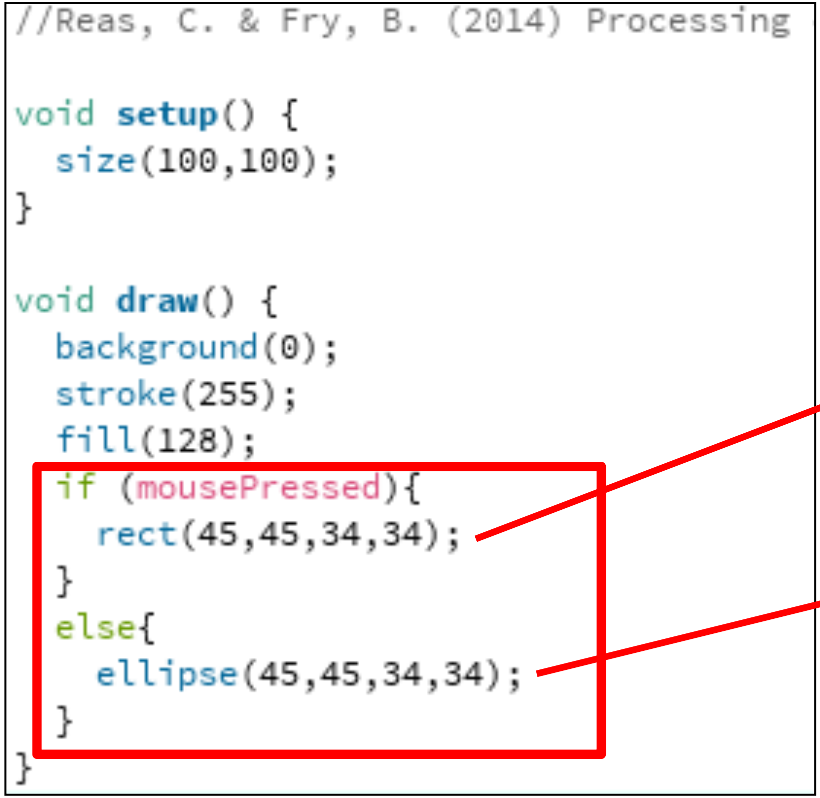
# Processing Example 3.5 - Code



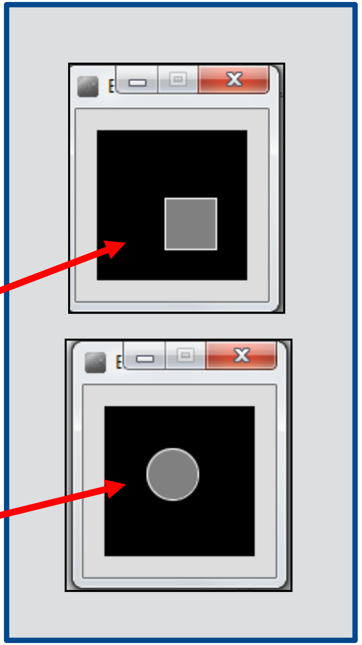
```
//Reas, C. & Fry, B. (2014) Processing

void setup() {
  size(100,100);
}

void draw() {
  background(0);
  stroke(255);
  fill(128);
  if (mousePressed){
    rect(45,45,34,34);
  }
  else{
    ellipse(45,45,34,34);
  }
}
```



# Processing Example 3.5 - Code



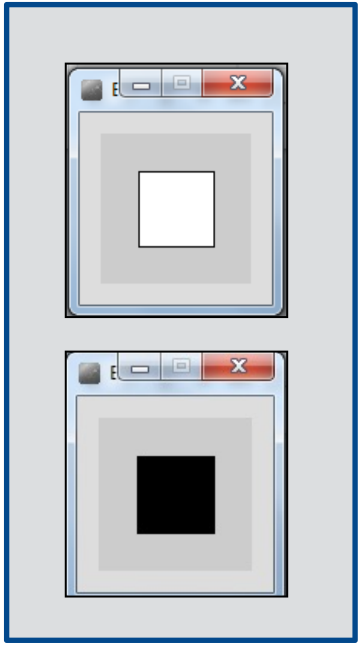
```
//Reas, C. & Fry, B. (2014) Processing

void setup() {
  size(100,100);
}

void draw() {
  background(0);
  stroke(255);
  fill(128);
  if (mousePressed){
    rect(45,45,34,34);
  }
  else{
    ellipse(45,45,34,34);
  }
}
```



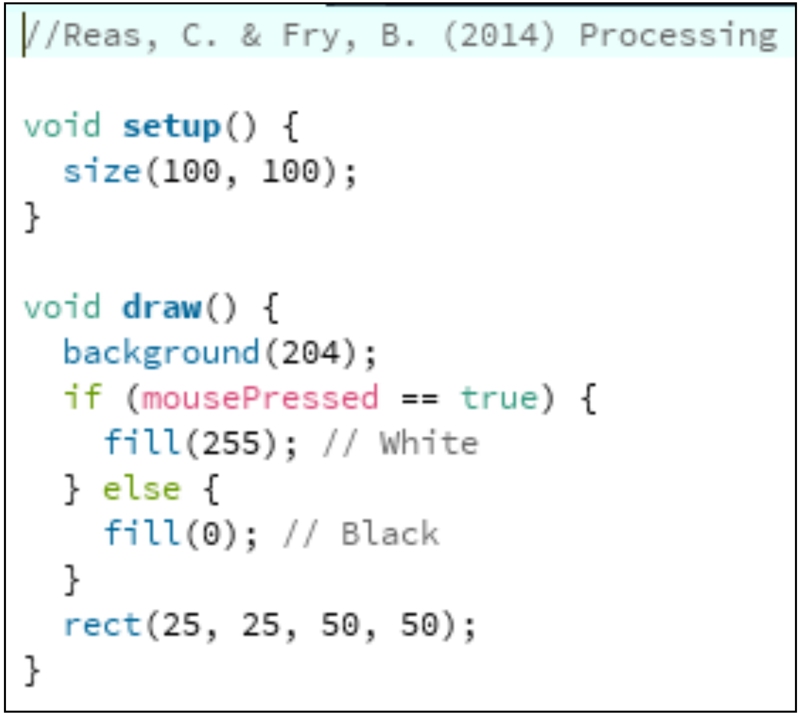
# Processing Example 3.6

Functionality:

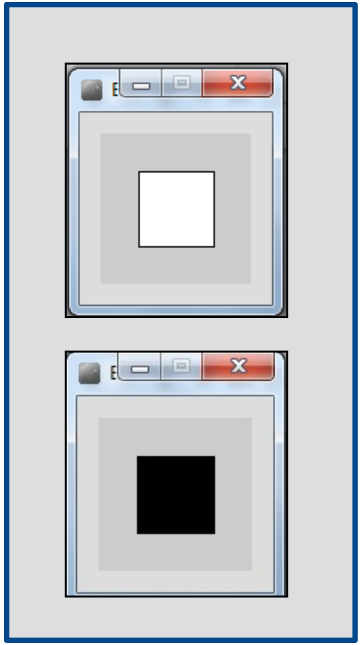
- If the mouse is pressed:
  - set the fill to white and draw a square.
  - otherwise set the fill to black and draw a square.



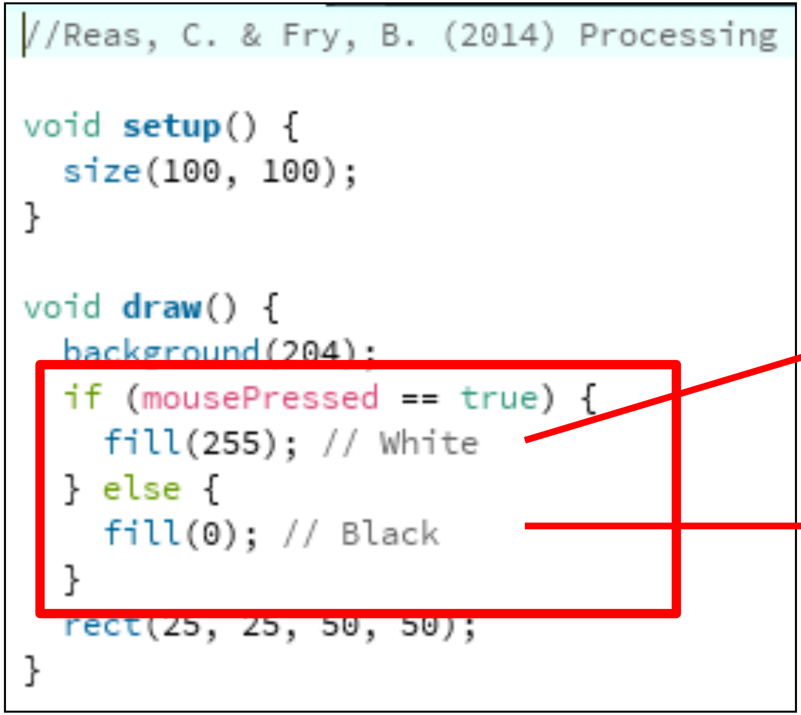
# Processing Example 3.6



```
//Reas, C. & Fry, B. (2014) Processing

void setup() {
  size(100, 100);
}

void draw() {
  background(204);
  if (mousePressed == true) {
    fill(255); // White
  } else {
    fill(0); // Black
  }
  rect(25, 25, 50, 50);
}
```



# Processing Example 3.6



```
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void setup() {
  size(100, 100);
}

void draw() {
  background(204);
  if (mousePressed == true) {
    fill(255); // White
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    fill(0); // Black
  }
  rect(25, 25, 50, 50);
}
```
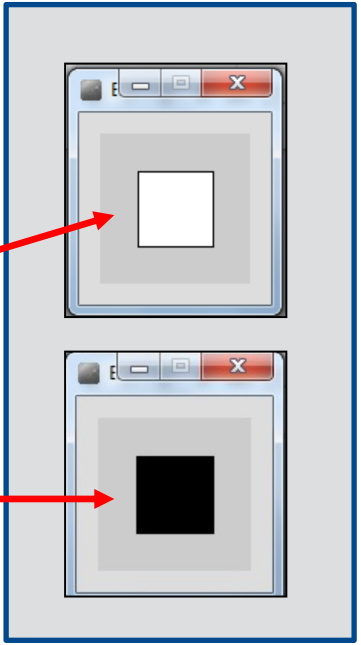



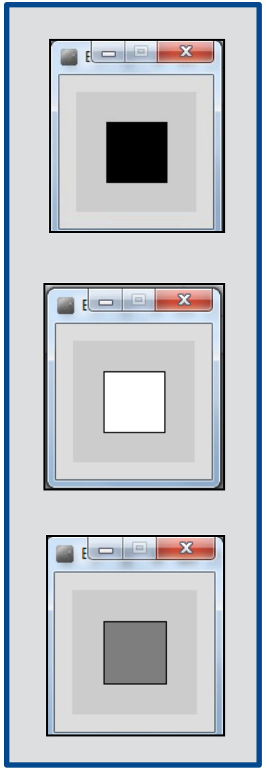
# Processing Example 3.7

Functionality:

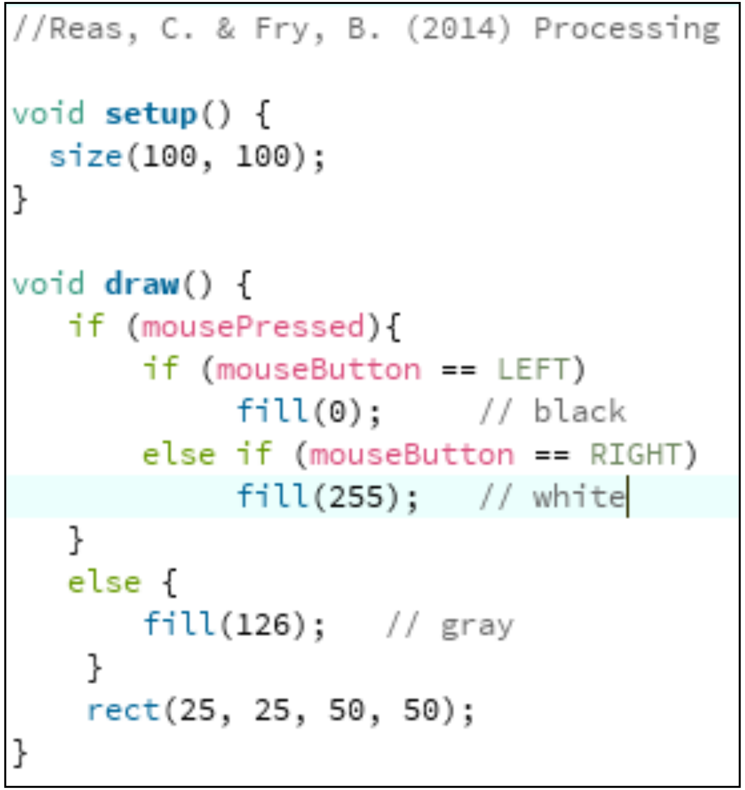
- If the LEFT button on the mouse is pressed, set the fill to black and draw a square.  As soon as the LEFT button is released, grey fill the square.

- If the RIGHT button on the mouse is pressed, set the fill to white and draw a square. As soon as the  RIGHT button is released, grey fill the square.

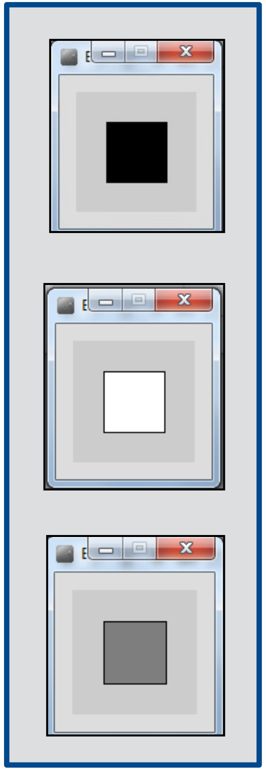
- If no mouse button is pressed, set the fill to grey and draw a square.



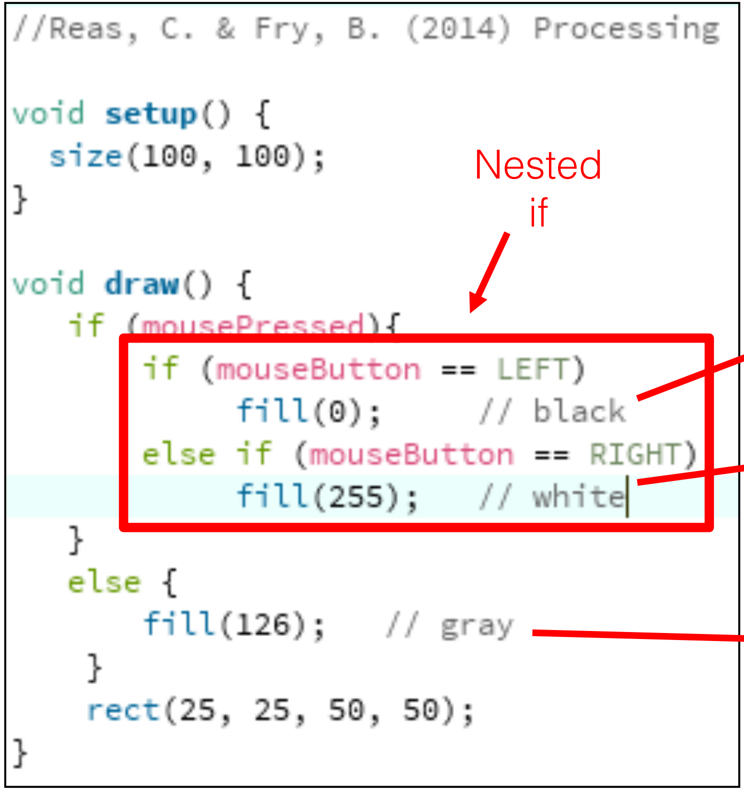
# Processing Example 3.7



```
//Reas, C. & Fry, B. (2014) Processing

void setup() {
  size(100, 100);
}

void draw() {
   if (mousePressed){
       if (mouseButton == LEFT)
            fill(0);     // black
       else if (mouseButton == RIGHT)
            fill(255);   // white
   }
   else {
       fill(126);   // gray
    }
    rect(25, 25, 50, 50);
}
```

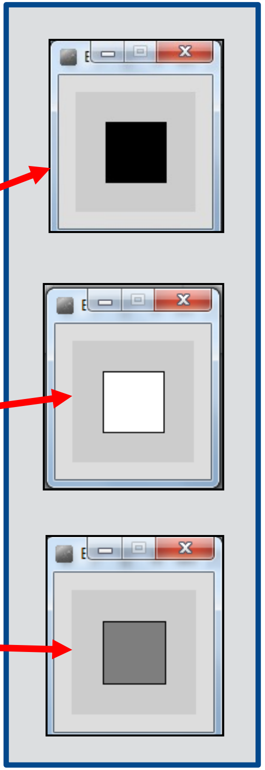


# Processing Example 3.7



```
//Reas, C. & Fry, B. (2014) Processing

void setup() {
  size(100, 100);
}

void draw() {
   if (mousePressed){
       if (mouseButton == LEFT)
            fill(0);      // black
       else if (mouseButton == RIGHT)
            fill(255);    // white
   }
   else {
       fill(126);    // gray
    }
    rect(25, 25, 50, 50);
}
```

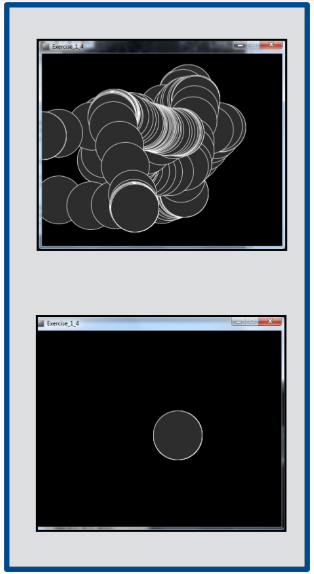
Nested
if



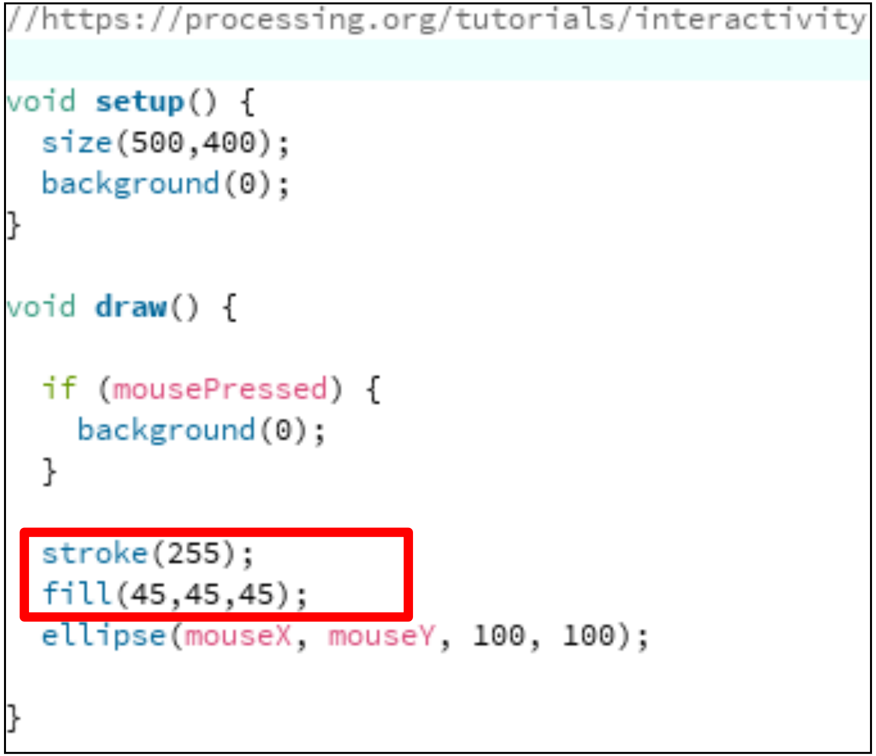
# Processing Example 3.8

Functionality:

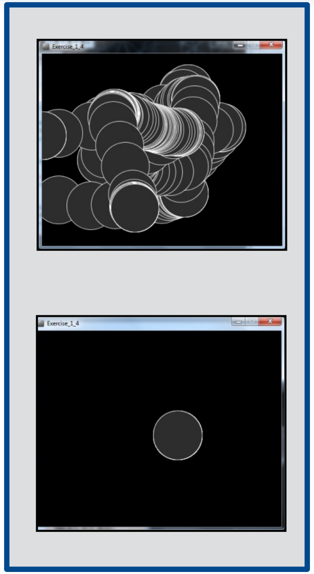
- Draw a circle on the mouse (x,y) coordinates.
- Each time you move the mouse, draw a new circle.
- All the circles remain in the sketch until you press a mouse button.
- When you press a mouse button, the sketch is cleared
  and a single circle is drawn at the mouse (x,y) coordinates.



# Processing Example 3.8

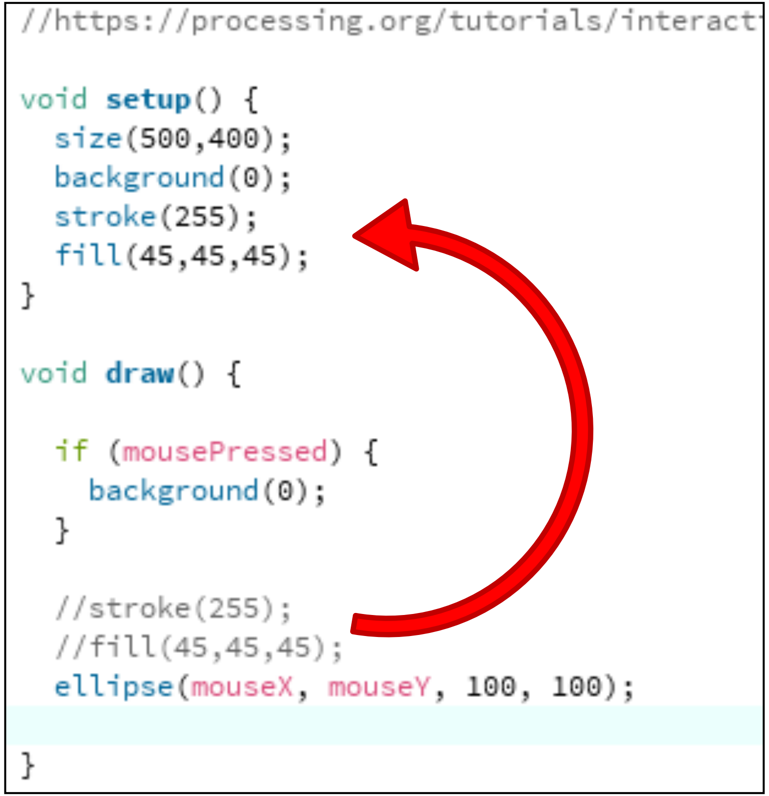


```
//https://processing.org/tutorials/interactivity

void setup() {
  size(500,400);
  background(0);
}

void draw() {

  if (mousePressed) {
    background(0);
  }

  stroke(255);
  fill(45,45,45);
  ellipse(mouseX, mouseY, 100, 100);

}
```

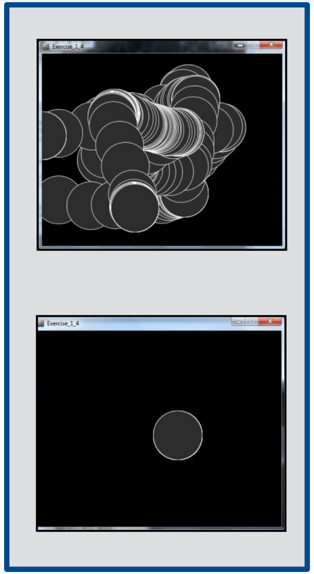


https://processing.org/tutorials/interactivity/

# Processing Example 3.8



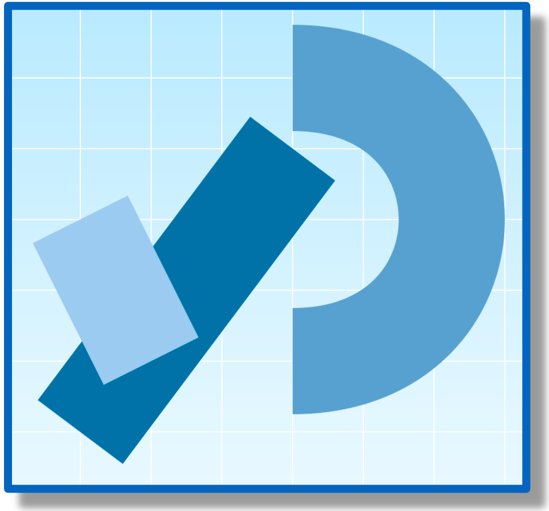
```
//https://processing.org/tutorials/interact

void setup() {
  size(500,400);
  background(0);
  stroke(255);
  fill(45,45,45);
}

void draw() {

  if (mousePressed) {
    background(0);
  }

  //stroke(255);
  //fill(45,45,45);
  ellipse(mouseX, mouseY, 100, 100);

}
```



We moved the stroke and fill function calls to the setup() function.

*Q: Does this change the functionality of our sketch?*

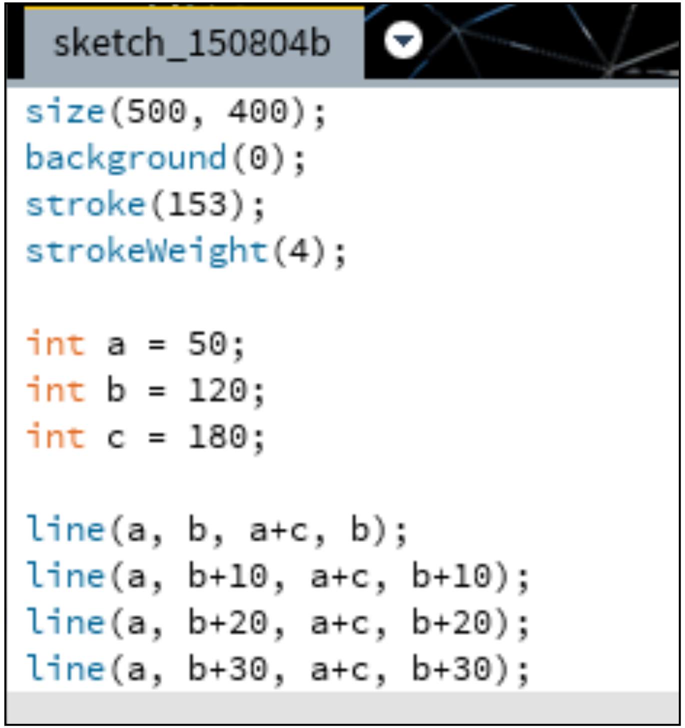
# Recap : Arithmetic Operators



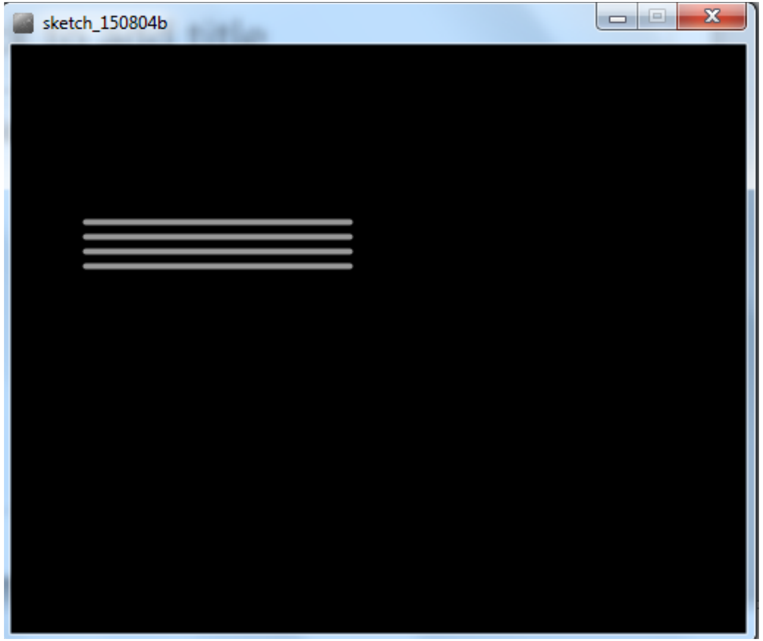
# Recap: Arithmetic Operators

| Arithmetic Operator | Explanation | Example(s) |
|---|---|---|
| + | Addition | 6 + 2<br>amountOwed + 10 |
| - | Subtraction | 6 – 2<br>amountOwed – 10 |
| * | Multiplication | 6 * 2<br>amountOwed * 10 |
| / | Division | 6 / 2<br>amountOwed / 10 |

# Recap: Arithmetic Operators

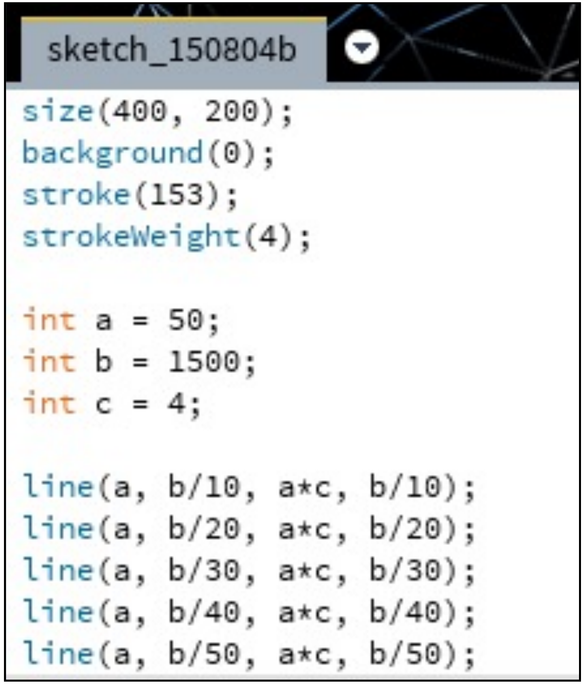


```
size(500, 400);
background(0);
stroke(153);
strokeWeight(4);

int a = 50;
int b = 120;
int c = 180;

line(a, b, a+c, b);
line(a, b+10, a+c, b+10);
line(a, b+20, a+c, b+20);
line(a, b+30, a+c, b+30);
```

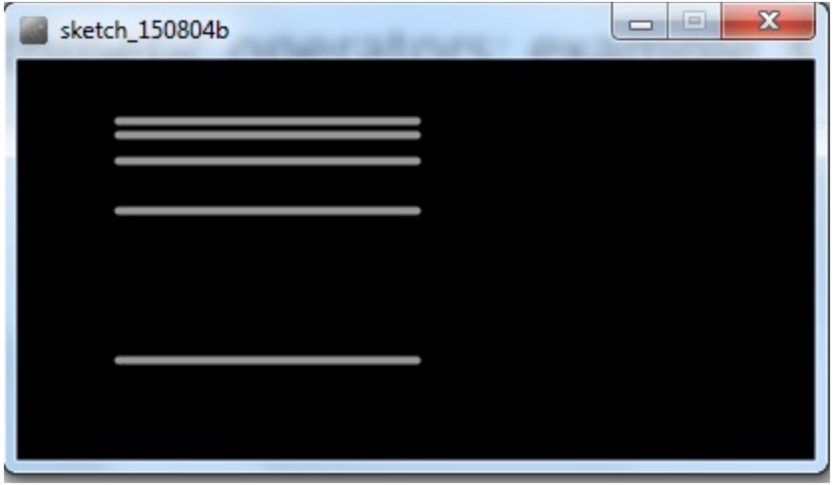


Based on the Processing Example: Basics → Data → Variables

# Recap: Arithmetic Operators



```
size(400, 200);
background(0);
stroke(153);
strokeWeight(4);

int a = 50;
int b = 1500;
int c = 4;

line(a, b/10, a*c, b/10);
line(a, b/20, a*c, b/20);
line(a, b/30, a*c, b/30);
line(a, b/40, a*c, b/40);
line(a, b/50, a*c, b/50);
```



Based on the Processing Example: Basics → Data → Variables

# Arithmetic Operators

- If you want to keep track of how many times something happens, you are keeping a running total. For example

  - The number of times you drew a line on the computer screen

  - As each line is drawn, you add one to your counter variable

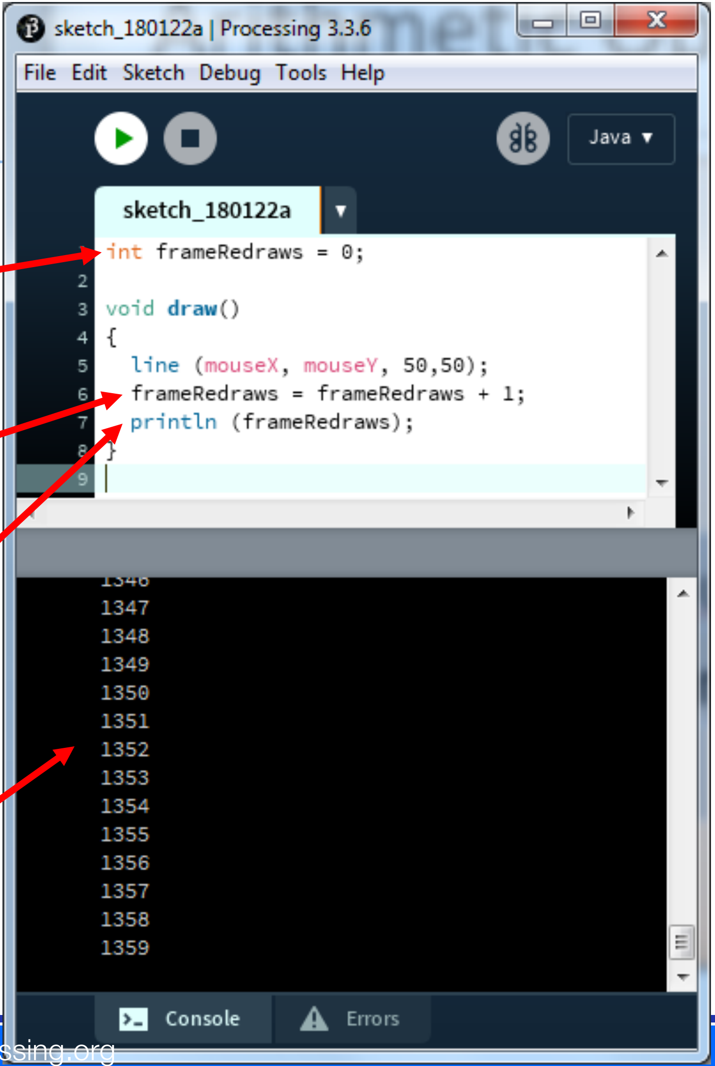
# Arithmetic Operators

This code declares a new variable of type int called frameRedraws and initialises it to 0.

One is added to the frameRedraws variable each time the draw() method is called.

The value of frameRedraws is then printed to the console.

frameRedraws is a “running total” of the number of frame redraws.


sketch_180122a | Processing 3.3.6
File Edit Sketch Debug Tools Help
Java
sketch_180122a
Console
Errors

```
int frameRedraws = 0;

void draw()
{
  line (mouseX, mouseY, 50,50);
  frameRedraws = frameRedraws + 1;
  println (frameRedraws);
}
```

```
1346
1347
1348
1349
1350
1351
1352
1353
1354
1355
1356
1357
1358
1359
```

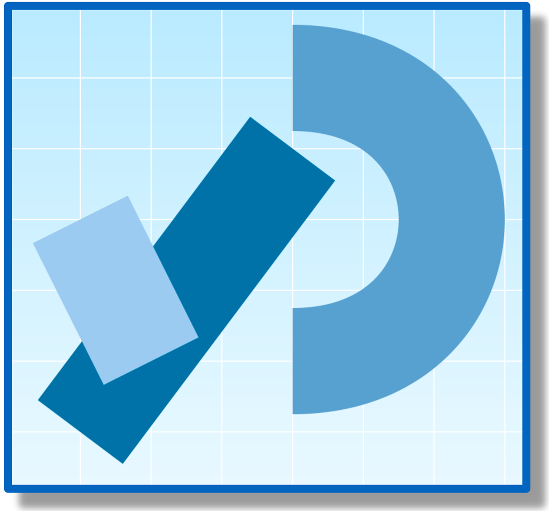
# Arithmetic Operators

❑ These examples are straightforward uses of the arithmetic operators

❑ However, we typically want to do more complex calculations involving many arithmetic operators

❑ To do this, we need to understand the Order of Evaluation

# Order of Evaluation



# Order of Evaluation

- ❑ Brackets ()
- ❑ Multiplication (*)
- ❑ Division (/)
- ❑ Addition (+)
- ❑ Subtraction (-)

BoMDAS

Buy Me Dimsum And Soup ☺

# Order of Evaluation - **Quiz**

What are the results of these calculations?

| | | |
|---|---|---|
| ❑ | Q1: | 3+6*5-2 |
| ❑ | Q2: | 3+6*(5-2) |
| ❑ | Q3: | (3+6)*5-2 |

# Questions?

# References

- Reas, C. & Fry, B. (2014) Processing – A Programming Handbook for Visual Designers and Artists, 2nd Edition, MIT Press, London.

Thanks.