Programming Fundamentals 1

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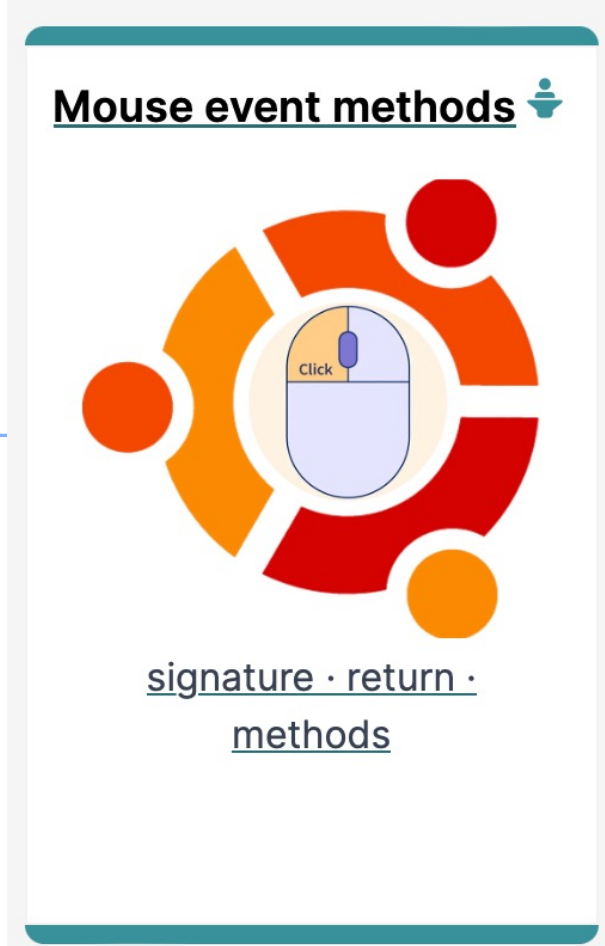
Introduction to Processing

Using Methods that handle events



Agenda

- Method terminology:
  - Return type
  - Method names
  - Parameter list

- Using methods to handle mouse events

Method Terminology

A SIDE NOTE

- The term function is used in Processing e.g. line(), fill(), etc.
- The term method is used in Java.
- As this course is primarily about learning the Java language, we are planning on using the word method instead of function from now on.
- BUT – they are interchangeable ☺

Recap: Methods in Processing

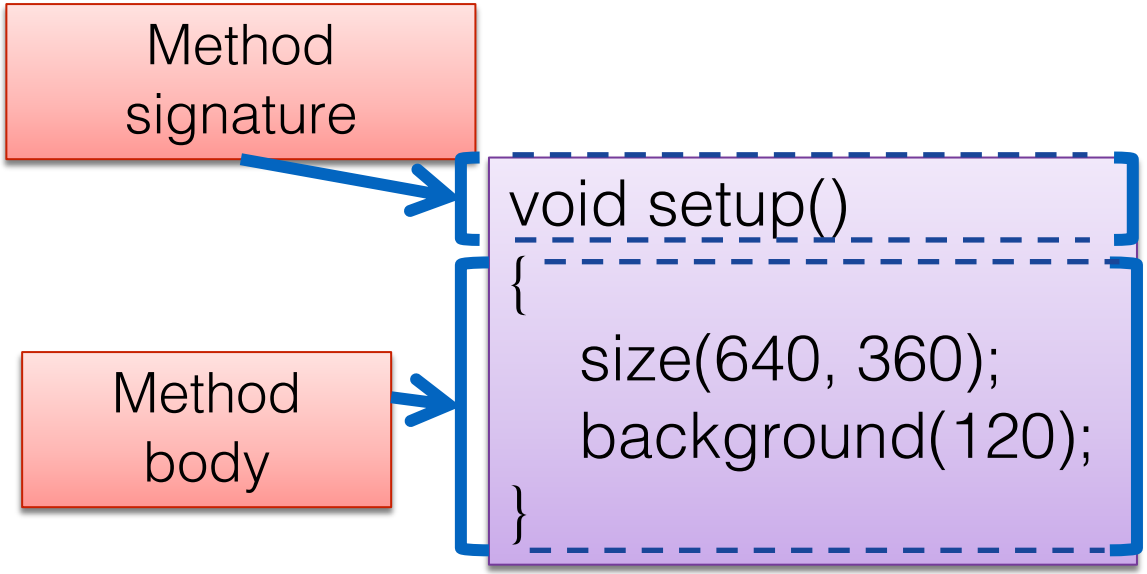
- Processing comes with several **pre-written methods** that we can use.
- A method comprises a **set of instructions** that performs some task.
- When we invoke the method, it performs the task.
- Some methods we have used already are:

  rect, ellipse, stroke, line, fill, etc.

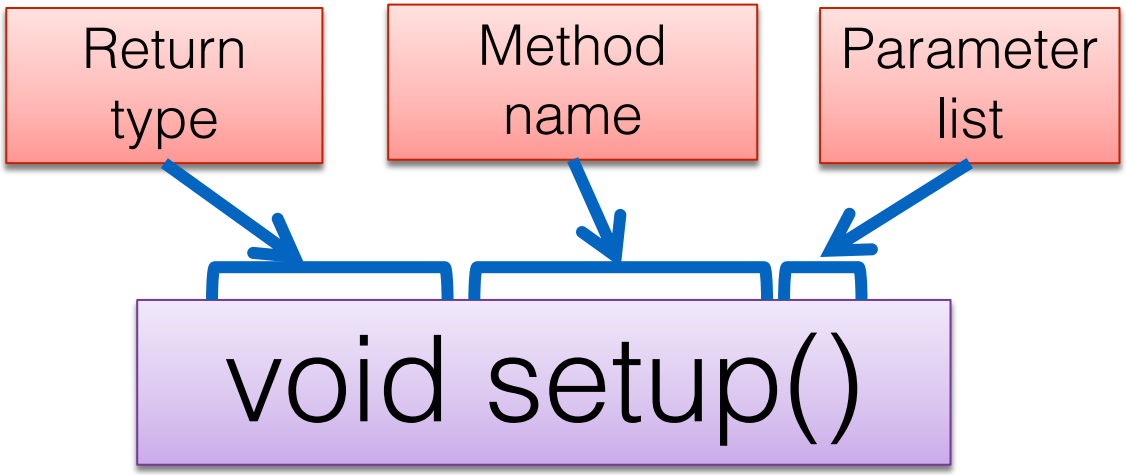
Recap: Methods in Processing

- We have also **written** two methods to animate our drawings:
  - void **setup**()
    - automatically called once when the program starts and should not be called again.
    - It typically sets up your display window e.g. screen size, background colour.
  - void **draw**()
    - automatically called straight after the setup() call.
    - It continuously executes the code contained inside it.

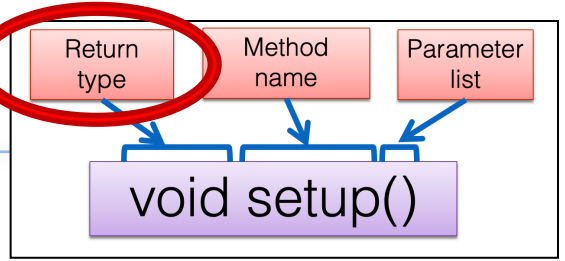
Method terminology



Method signature

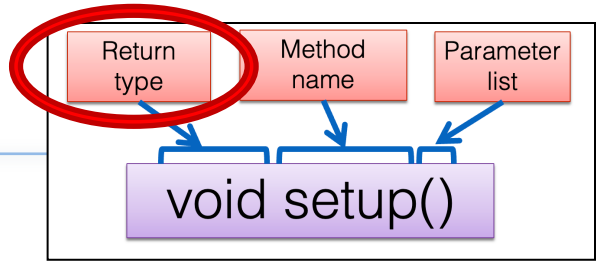


Return Type: void



- Methods can return information.
- The void keyword just before the method name means that **nothing is returned** from the method.
- void is a return type and must be included in the method signature if your method returns no information.

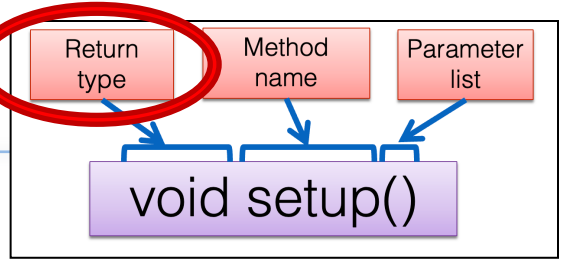
Return Type: int



- When a data type (e.g. int) appears before the method name, this means that **something is returned** from the method.

- Within the body of the method, you use the return statement to **return the value**.

Return Type: int



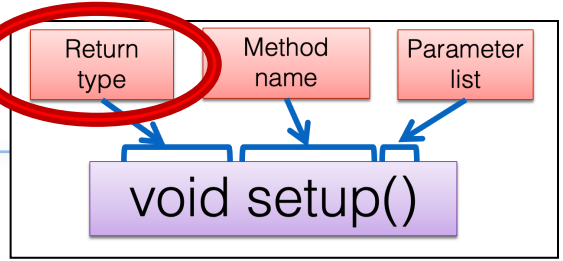

```
int val = 30;


void draw()
{
    int result = timestwo(val);
    println(result);
}
```

```
int timestwo(int number)
{
    number = number * 2;
    return number;
}
```

// The red int in the function declaration
// specifies the type of data to be returned.

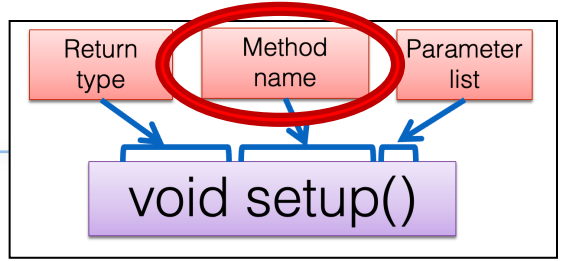
https://processing.org/reference/return.html

Return Types



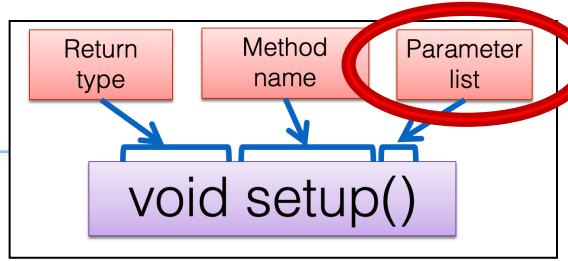
- Methods can return any **type of data**
  e.g.
  - boolean
  - byte
  - char
  - int
  - float
  - String
  - etc.
- You can only have <u>one return type per method</u>.

Method name



- Method names should:
  - Use **verbs** (i.e. actions) to describe what the method does e.g.
    - calculateTax
    - printResults
  - Be **mixed case** with the first letter lowercase and the first letter of each internal word capitalised.
    i.e. **camelCase**

Parameter list



- Methods **take in data** via their **parameters.**

- Methods do not have to pass parameters
  e.g. setup() has **no parameters.**

Methods with NO parameters

- Methods do not have to pass parameters.
- These methods have **no parameters**;
  note how no variable is passed in the parenthesis
  i.e. ().
- These methods don't need any additional
  information to do its tasks.

```
void noStroke()
void setup()
void noCursor()
```

Methods with Parameters

```
void strokeWeight(float weight)

void size(int width, int height)
```

- A **parameter** is a **variable declaration** –
  - it has a **type** (e.g. int) and a **name** (e.g. width).
- If a method needs additional information to execute,
  we provide a parameter, so that the information can be passed into it.
- The first method, *strokeWeight*, above has **one parameter**.
- A method can have any number of parameters
  e.g. the second method, *size* has two

Mouse Event Methods

Mouse actions and their methods

Action	Description	Method
Clicked	Mouse button is pressed and then released	`mouseClicked()`
Pressed	Mouse button is pressed and held down	`mousePressed()`
Released	Mouse button was pressed but now released	`mouseReleased()`
Moved	Mouse is moved without any buttons being pressed	`mouseMoved()`
Dragged	Mouse is moved with a button pressed	`mouseDragged()`

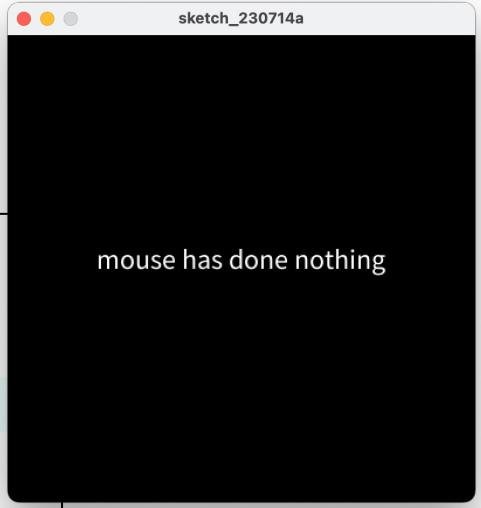
Mouse methods

- 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.

https://processing.org/reference/mousePressed_.html

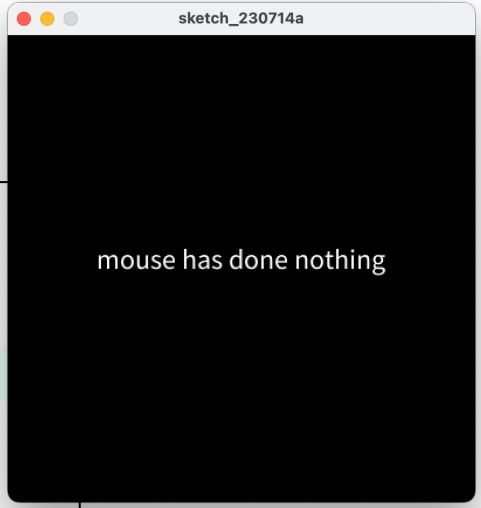
Processing Example 5.1 – setup()




```
void setup() {
  size(400, 400);
  background(0);
  textAlign(CENTER);
  textSize(24);
  fill(255);
  text("mouse has done nothing", width/2, height/2);
}
```

Processing Example 5.1 – draw()

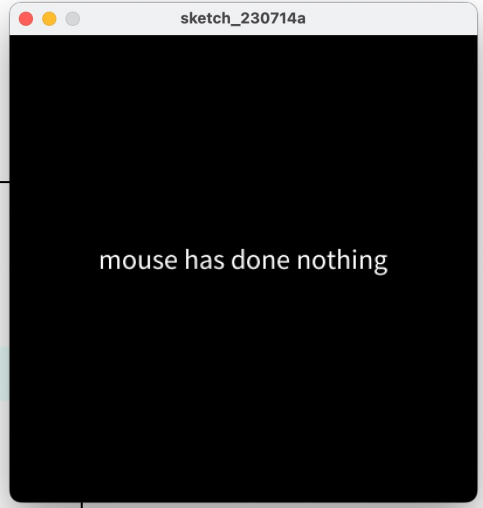
Based on: http://learning.codasign.com/index.php?title=Mouse_Events_in_Processing




```
void setup() {
  size(400, 400);
  background(0);
  textAlign(CENTER);
  textSize(24);
  fill(255);
  text("mouse has done nothing", width/2, height/2);
}

void draw() {
}
```

Processing Example 5.1 – draw()

Based on: http://learning.codasign.com/index.php?title=Mouse_Events_in_Processing

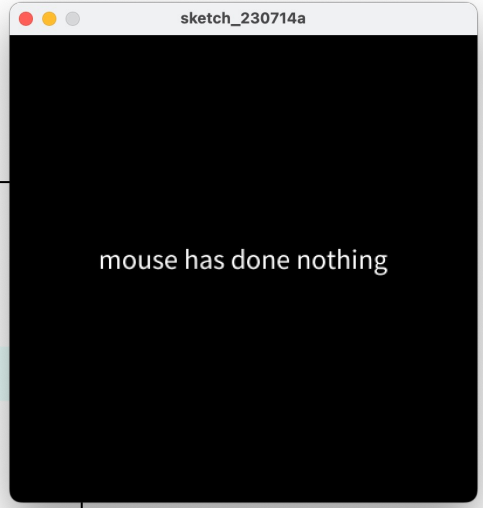



```
void setup() {
  size(400, 400);
  background(0);
  textAlign(CENTER);
  textSize(24);
  fill(255);
  text("mouse has done nothing", width/2, height/2);
}

void draw() {
}
```

Q: Why did we include the draw() method, particularly as it is empty?

Processing Example 5.1 – draw()

Based on: http://learning.codasign.com/index.php?title=Mouse_Events_in_Processing

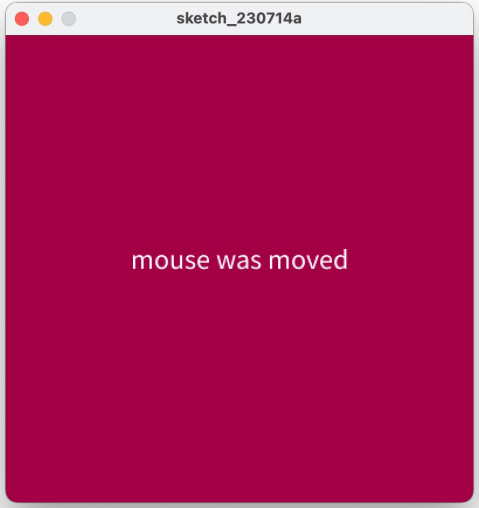



```
void setup() {
  size(400, 400);
  background(0);
  textAlign(CENTER);
  textSize(24);
  fill(255);
  text("mouse has done nothing", width/2, height/2);
}

void draw() {
}
```

A: draw() is required because mouse events only work when a program has it.

Processing Example 5.1 – mouseMoved()

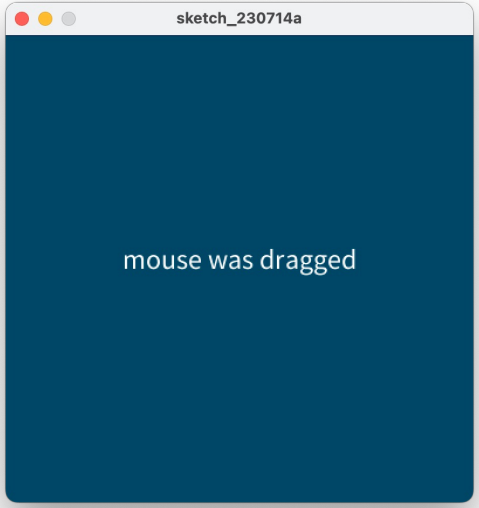
```
void setup() {
  size(400, 400);
  background(0);
  textAlign(CENTER);
  textSize(24);
  fill(255);
  text("mouse has done nothing", width/2, height/2);
}

void draw() {
}
```




```
void mouseMoved() {
  background(150, 10, 70);
  text("mouse was moved", width/2, height/2);
}
```

Processing Example 5.1 – mouseDragged()

```
void setup() {
  size(400, 400);
  background(0);
  textAlign(CENTER);
  textSize(24);
  fill(255);
  text("mouse has done nothing", width/2, height/2);
}

void draw() {
}
```




```
void mouseDragged() {
  background(10, 70, 100);
  text("mouse was dragged", width/2, height/2);
}
```

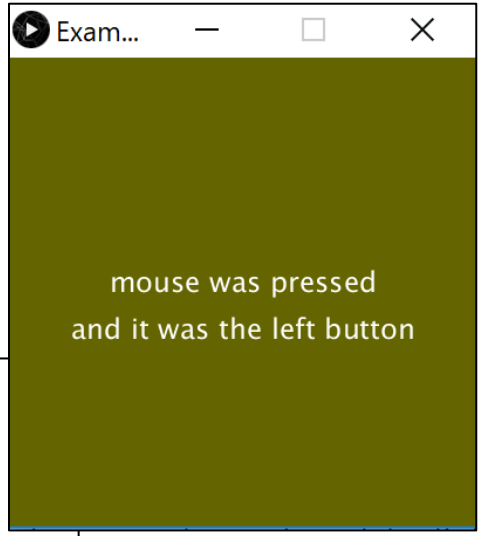
Processing Example 5.1 – mouseReleased()

```
void setup() {
  size(400, 400);
  background(0);
  textAlign(CENTER);
  textSize(24);
  fill(255);
  text("mouse has done nothing", width/2, height/2);
}

void draw() {
}
```


```
void mouseReleased() {
  background(100, 0, 100);
  text("mouse was released", width/2, height/2);
}
```

Processing Example 5.1 – mousePressed()

```
void setup() {
  size(400, 400);
  background(0);
  textAlign(CENTER);
  textSize(24);
  fill(255);
  text("mouse has done nothing", width/2, height/2);
}

void draw() {
}
```




```
void mousePressed() {
  background(100, 100, 0);
  text("mouse was pressed", width/2, height/2);
  if ( mouseButton == LEFT) {
    text("and it was the left button", width/2, height/2 + 40);
  }
  if (mouseButton == RIGHT) {
    text("and it was the right button", width/2, height/2 + 40);
  }
}
```

Some previous exercises

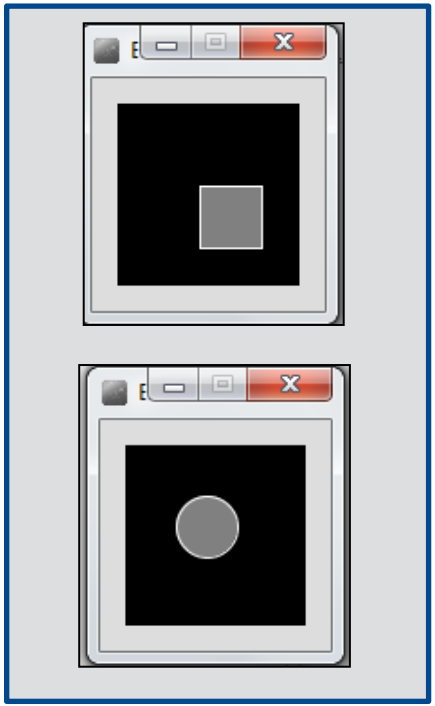
- We will now re-work the following examples that we covered previously:
  - Example 3.5
  - Example 3.6
  - Example 3.7
  - Example 3.8

- Each of these exercises tested the *mousePressed variable*.
  - Now we want them to use the *mousePressed()* **method** instead.

Recap: Processing Example 3.5

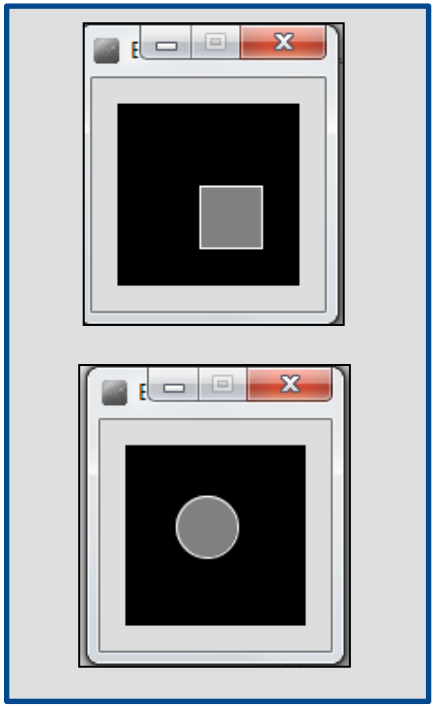
Functionality:

- If the mouse is pressed:
  - draw a grey square with a white outline.
  - otherwise draw a grey circle with a white outline.



Recap: Processing **Example 3.5**

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

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);
  }
}
```



Example 3.5 (v2) – mouse methods

```
void setup()
{
   size(100,100);
   stroke(255);
   fill(150);
   background(0);
   ellipse(45,45,34,34);
}

void draw(){
}
```

```
void mousePressed(){
   background(0);
   rect(45,45,34,34);
}

void mouseReleased(){
  background(0);
  ellipse(45,45,34,34);
}
```

Before VS After

```
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);
  }
}
```

```
void setup() {
  size(100,100);
  stroke(255);
  fill(150);
  background(0);
  ellipse(45,45,34,34);
}

void draw(){
}
```

```
void mousePressed(){
  background(0);
  rect(45,45,34,34);
}

void mouseReleased(){
  background(0);
  ellipse(45,45,34,34);
}
```

Before VS After

```
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);
  }
}
```

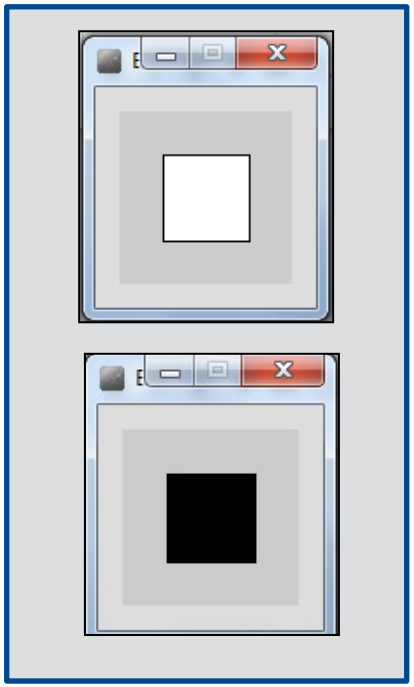
```
void setup() {
  size(100,100);
  stroke(255);
  fill(150);
  background(0);
  ellipse(45,45,34,34);
}

void draw(){
}
```

```
void mousePressed(){
  background(0);
  rect(45,45,34,34);
}

void mouseReleased(){
  background(0);
  ellipse(45,45,34,34);
}
```

Recap: Processing **Example 3.6**

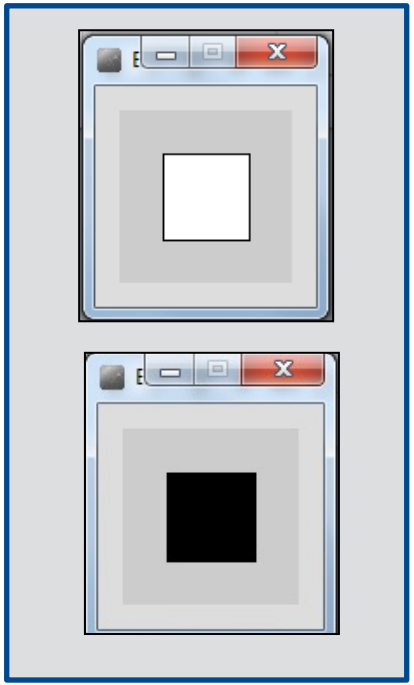
Functionality:

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



Recap: Processing Example 3.6

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

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

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

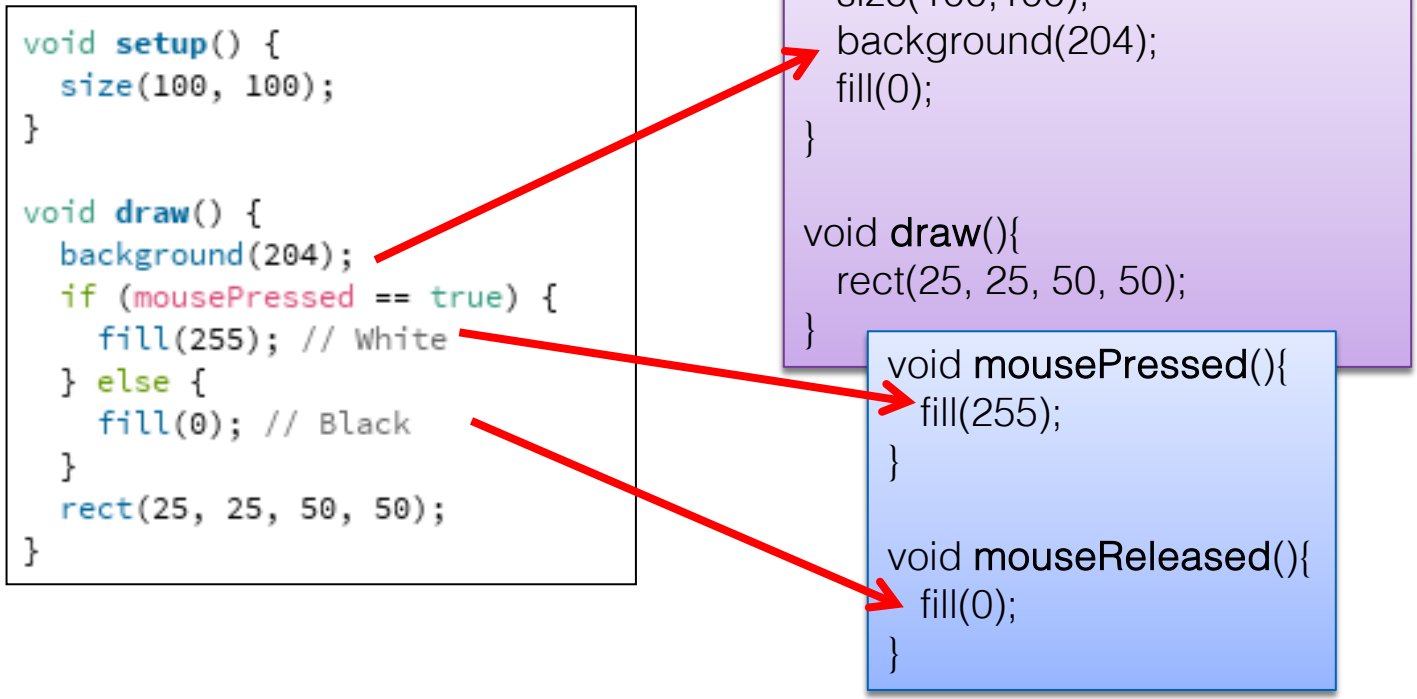


Example 3.6 (v2) – mouse methods

```
void setup()
{
  size(100,100);
  background(204);
  fill(0);
}

void draw(){
  rect(25, 25, 50, 50);
}
```

```
void
mousePressed(){
  fill(255);
}

void
mouseReleased(){
  fill(0);
}
```

Before VS After



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

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

```
void setup() {
  size(100,100);
  background(204);
  fill(0);
}

void draw(){
  rect(25, 25, 50, 50);
}
```

```
void mousePressed(){
  fill(255);
}

void mouseReleased(){
  fill(0);
}
```

Before VS After

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

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

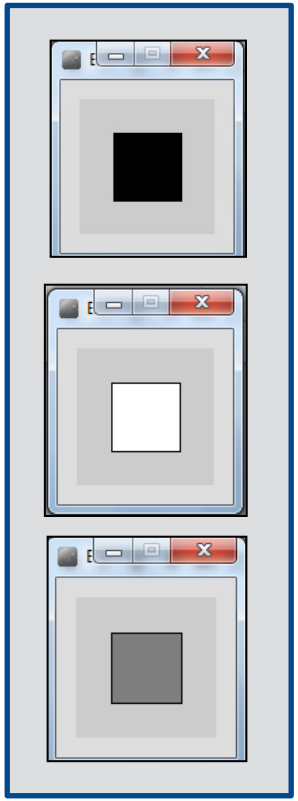
```
void setup() {
  size(100,100);
  background(204);
  fill(0);
}

void draw(){
  rect(25, 25, 50, 50);
}
```

```
void mousePressed(){
  fill(255);
}

void mouseReleased(){
  fill(0);
}
```

Recap: Processing **Example 3.7**

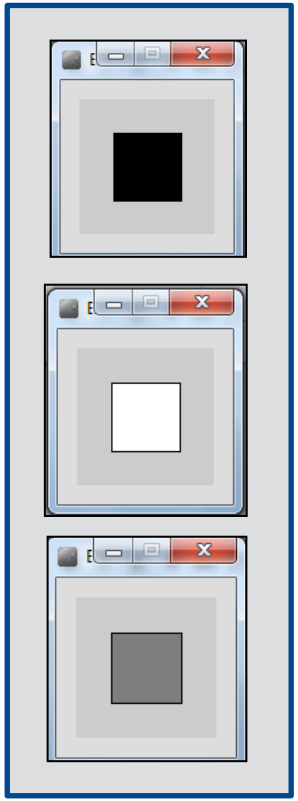
Functionality:

- 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.



Recap: Processing Example 3.7

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

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);
}
```



Example 3.7 (v2) – mouse methods

```
void setup()
{
  size(100,100);
  background(204);
  fill(126);
}

void draw(){
  rect(25, 25, 50, 50);
}
```

```
void mousePressed(){
  if (mouseButton == LEFT)
    fill(0);      // black
  else if (mouseButton == RIGHT)
    fill(255);    // white
}

void mouseReleased(){
  fill(126);
}
```

Before VS After

```
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);
}
```

```
void setup() {
   size(100,100);
   background(204);
   fill(126);
}

}
```

```
void mousePressed(){
   if (mouseButton == LEFT)
      fill(0);       // black
   else if (mouseButton == RIGHT)
      fill(255);     // white
}

void mouseReleased(){
   fill(126);
}
```

Before VS After

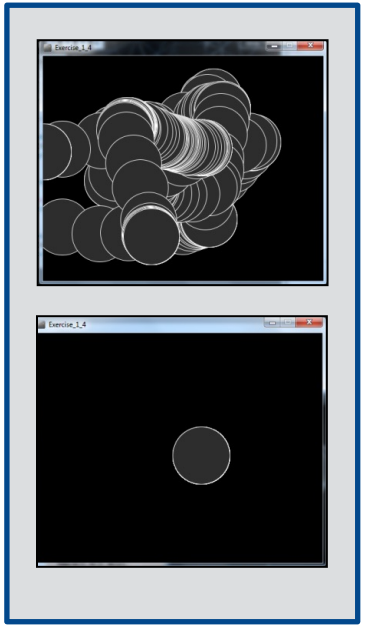
```
void setup() {
  size(100, 100);
}

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);
}
```

```
void setup() {
   size(100,100);
   background(204);
   fill(126);
}

void mousePressed(){
   if (mouseButton == LEFT)
      fill(0);       // black
   else if (mouseButton == RIGHT)
      fill(255);     // white
}

void mouseReleased(){
   fill(126);
}
```

Recap: Processing **Example 3.8**

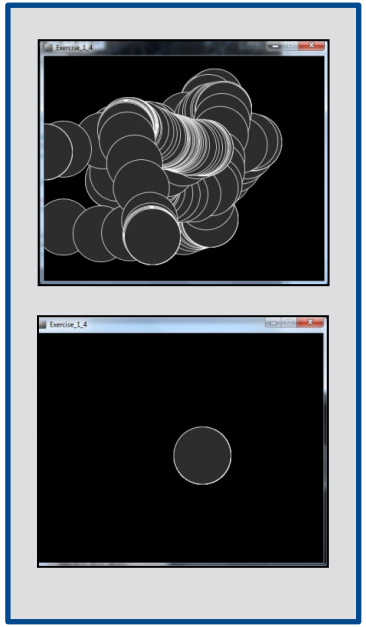
Functionality:

- 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.



Recap: Processing Example 3.8

```
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/

Before VS After

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

void draw() {

  if (mousePressed) {
    background(0);
  }

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

}
```

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

void draw(){
  ellipse(mouseX, mouseY, 100, 100);
}
```

```
void
mousePressed(){
  background(0);
}
```

Questions?

References

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


Thanks.