Conditional Events

Conditional Statements and Boolean Expressions

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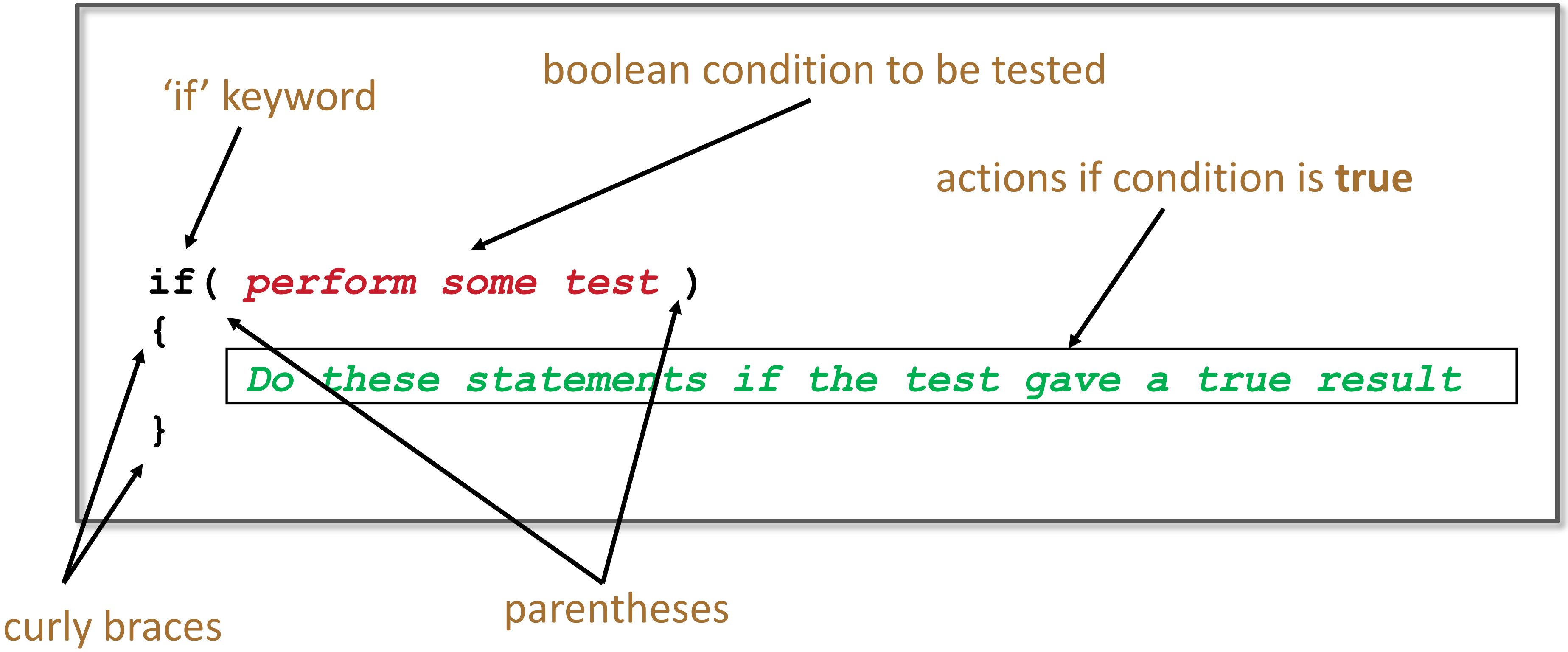
Topics list

1. Conditional Statements

2. Boolean Conditions and Relational Operators

3. Logical Operators

Conditional Statement Syntax (1)



‘if’ keyword

boolean condition to be tested

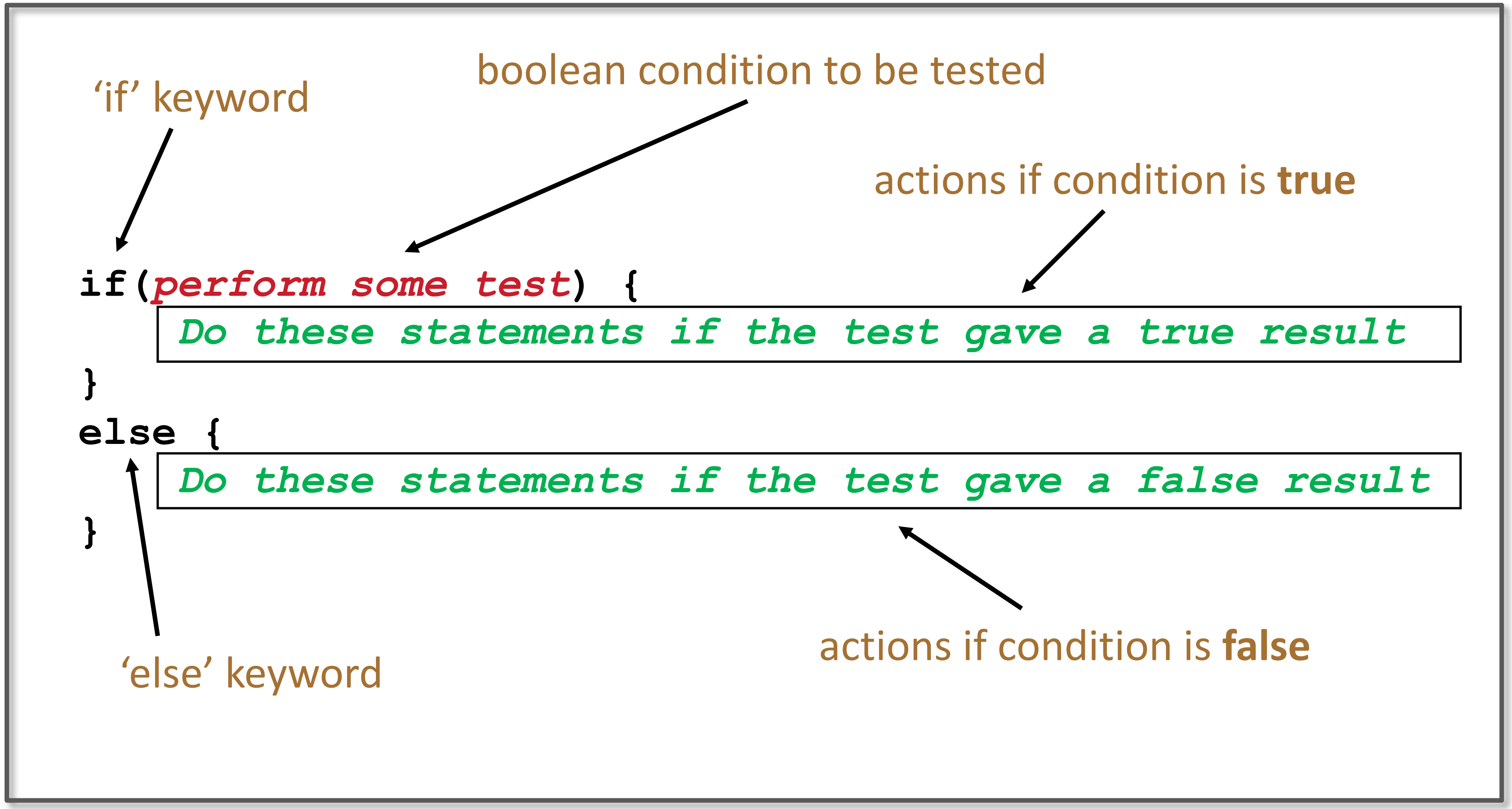
actions if condition is **true**

```
if( perform some test )
{
    Do these statements if the test gave a true result
}
```

curly braces

parentheses

Conditional Statement Syntax (2)



‘if’ keyword

boolean condition to be tested

actions if condition is **true**

```
if(perform some test) {
    Do these statements if the test gave a true result
}
else {
    Do these statements if the test gave a false result
}
```

‘else’ keyword

actions if condition is **false**

Conditional Statement Syntax (3)

```
if(condition1…perform some test)
{
    Do these statements if condition1 gave a true result
}
else if(condition2…perform some test)
{
    Do these statements if condition1 gave a false
    result and condition2 gave a true result
}
else
{
    Do these statements if both condition1 and
    condition2 gave a false result
}
```

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1. Conditional Statements

2. Boolean Conditions and Relational Operators

3. Logical Operators

Boolean conditions

- A boolean condition is an expression that evaluates to either **true** or **false** e.g.

```
mouseX < 50
```

- An if statement evaluates a **boolean condition** and its result will determine which portion of the if statement is executed.

Boolean conditions

```
// Do these statements before.

if (boolean condition)
{
        // Perform this clause if the
        // condition is true.
}

// Do these statements after.
```

Java Relational Operators

Operator	**Use**	**Returns true if…**
>	op1 > op2	op1 is **greater** than op2
>=	op1 >= op2	op1 is **greater than or equal** to op2
<	op1 < op2	op1 is **less** than to op2
<=	op1 <= op2	op1 is **less than or equal** to op2
==	op1 == op2	op1 and op2 are **equal**
!=	op1 != op2	op1 and op2 are **not equal**

BEWARE = is an assignment operator. It doesn’t test for equality. Use **==** to test for equality

Source: http://www.freejavaguide.com/relational_operators.htm

Some notes on the if statement

- An if statement IS a **statement**;

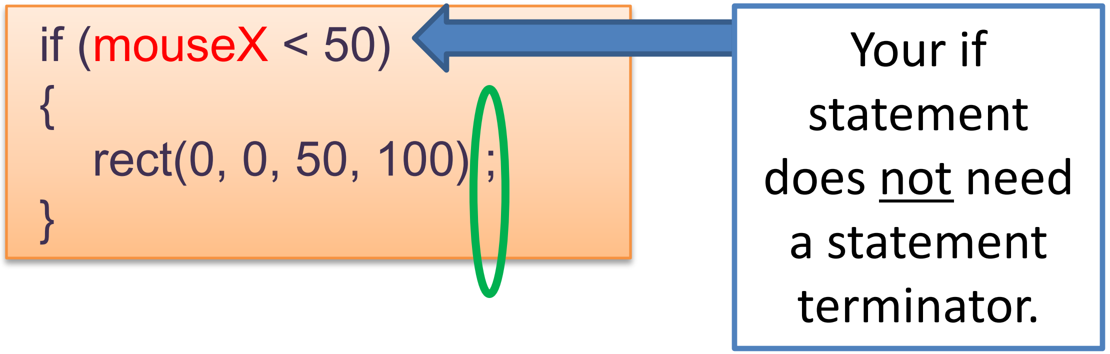
  it is only executed once.
- When your if statement only has one statement inside it, you do not need to use the curly braces.
  - But I would advise to use use them to avoid errors when updating programs later.
- For example, both of these are the same:

```
if (mouseX < 50)
{
    rect(0, 0, 50, 100);
}
```

```
if (mouseX < 50)
    rect(0, 0, 50, 100);
```

Some notes on the if statement

- The semi-colon (;) is a **statement terminator**.



```
if (mouseX < 50)
{
   rect(0, 0, 50, 100);
}
```

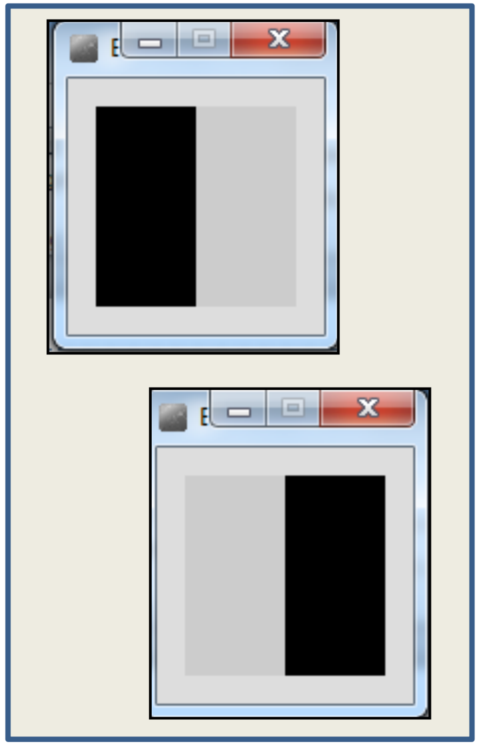
Your if statement does not need a statement terminator.

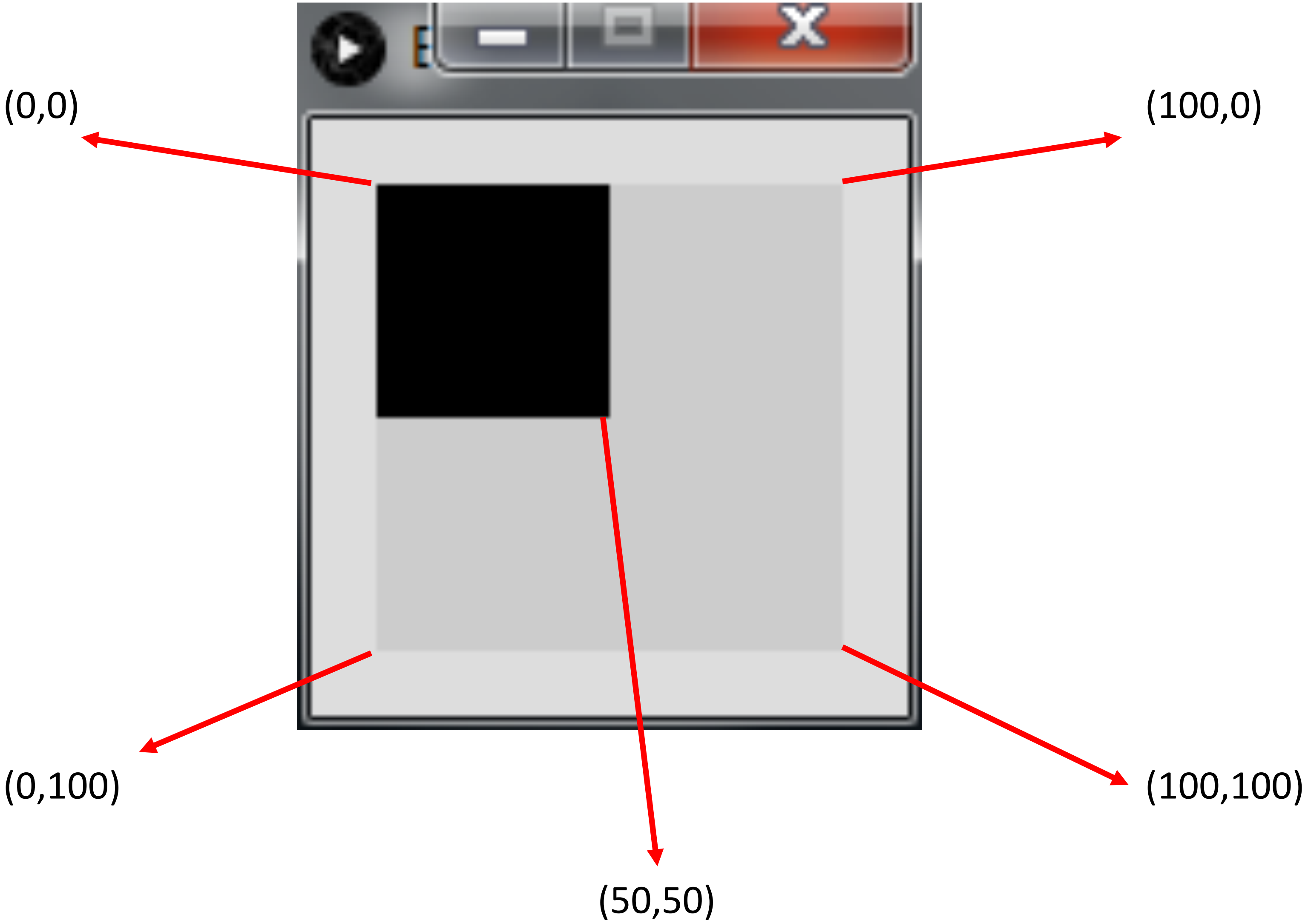
Conditional Example 2.1

Functionality:

If the **x-coordinate of the mouse** pointer is on the:

- **left** half of the display window, draw a rectangle on the left hand side.
- **right** half of the display window, draw a rectangle on the right hand side.





(0,0)

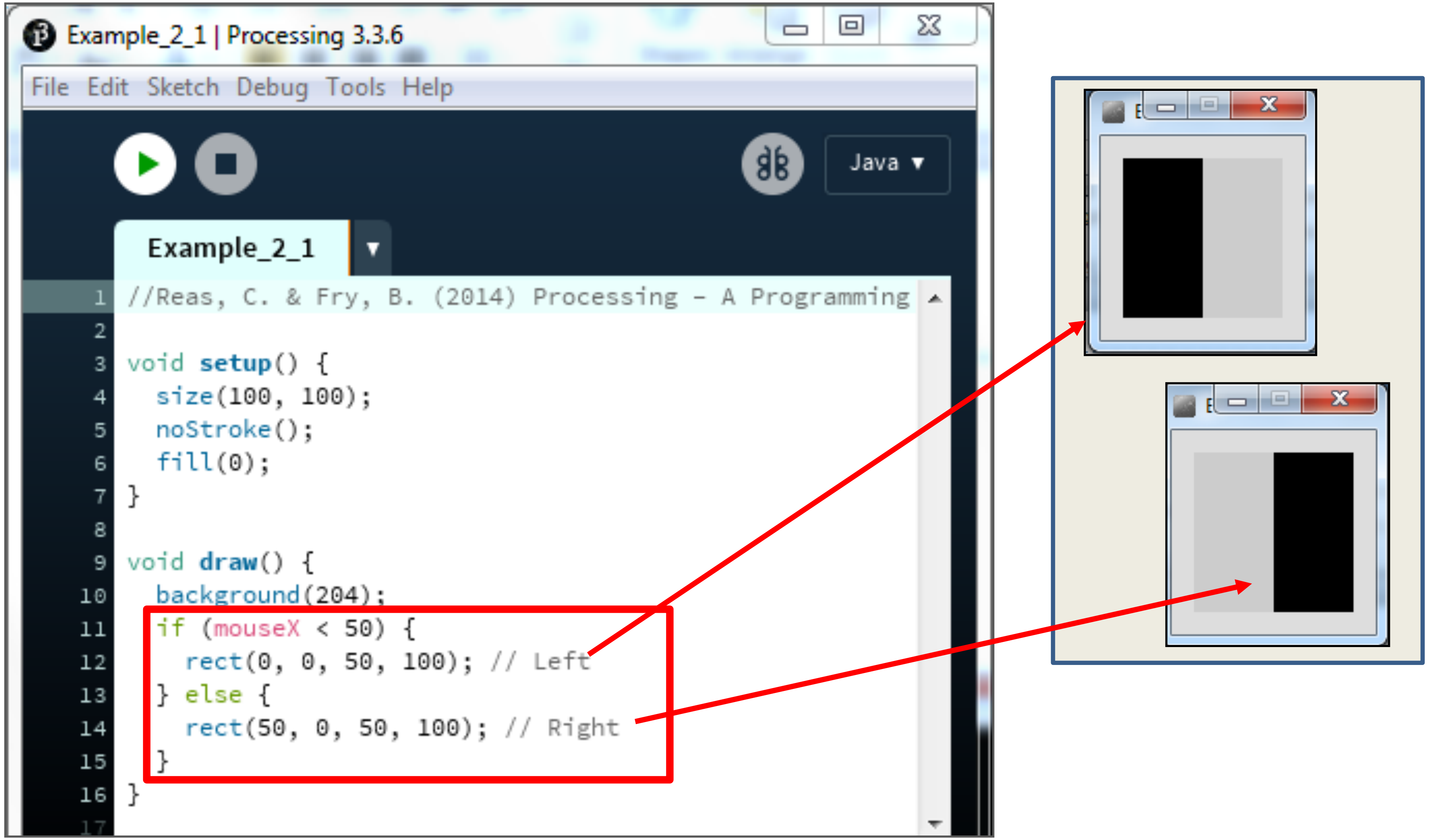
(100,0)

(0,100)

(100,100)

(50,50)

Conditional Example 2.1 - code


Example_2_1 | Processing 3.3.6
File Edit Sketch Debug Tools Help
Java ▾
Example_2_1

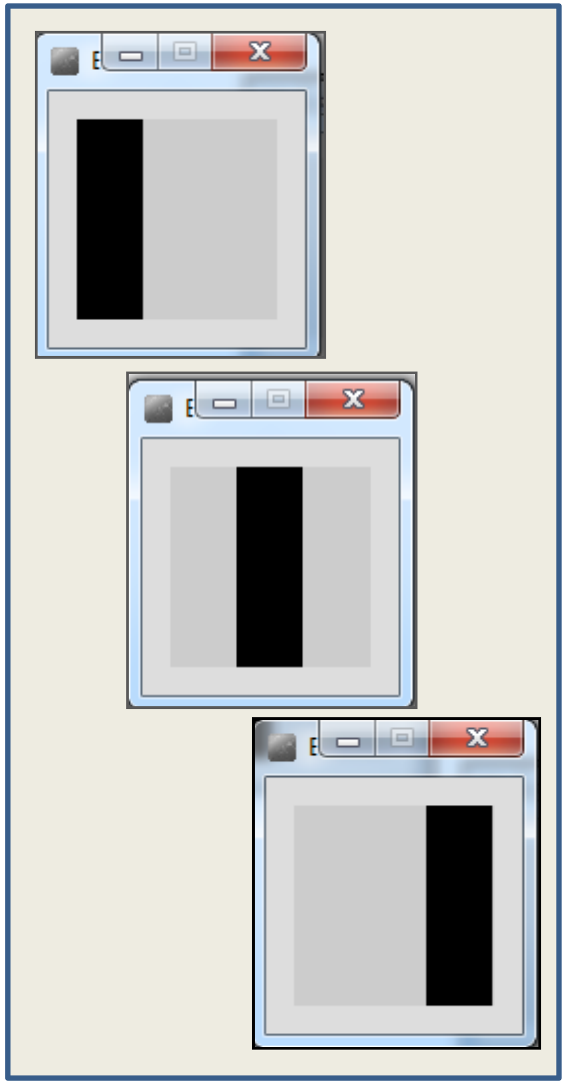
```
//Reas, C. & Fry, B. (2014) Processing – A Programming

void setup() {
  size(100, 100);
  noStroke();
  fill(0);
}

void draw() {
  background(204);
  if (mouseX < 50) {
    rect(0, 0, 50, 100); // Left
  } else {
    rect(50, 0, 50, 100); // Right
  }
}
```

Conditional Example 2.2

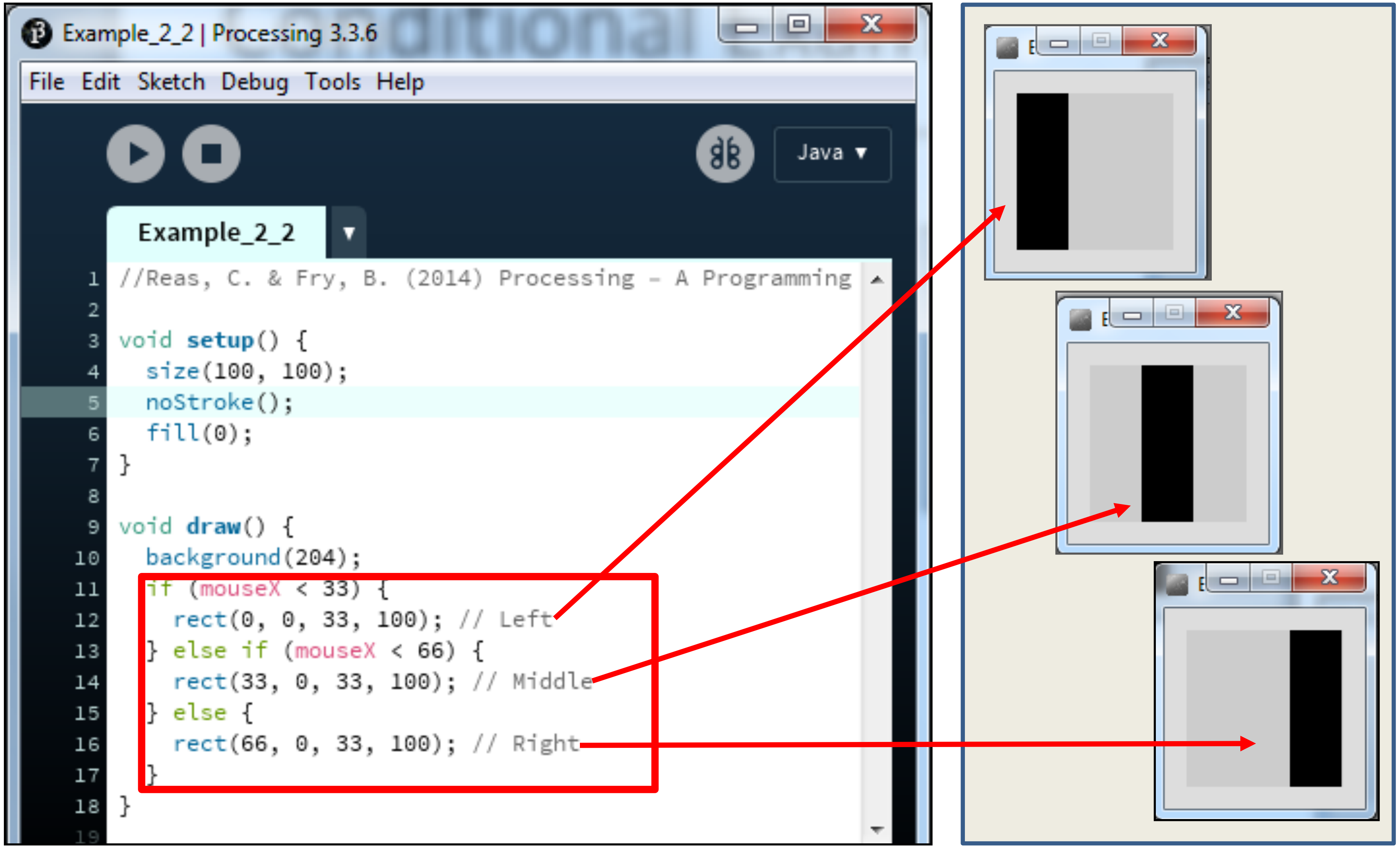
Functionality:

If the **x-coordinate of the mouse pointer** is on the:

- **left third** of the display window, draw a rectangle on the left third of the window.
- **middle third** of the display window, draw a rectangle on the middle third of the window.
- **right third** of the display window, draw a rectangle on the right third of the window.



Conditional Example 2.2 - code


Example_2_2 | Processing 3.3.6
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Java ▼
Example_2_2

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

void setup() {
  size(100, 100);
  noStroke();
  fill(0);
}

void draw() {
  background(204);
  if (mouseX < 33) {
    rect(0, 0, 33, 100); // Left
  } else if (mouseX < 66) {
    rect(33, 0, 33, 100); // Middle
  } else {
    rect(66, 0, 33, 100); // Right
  }
}
```

Topics list

1. Conditional Statements
2. Boolean Conditions and Relational Operators
3. Logical Operators

Logical operators

- Logic operators operate on boolean values.
- They produce a new boolean value as a result.
- The ones that we will use, so far, are:

<table>
<tr><td><b>&&</b></td><td>(and)</td></tr>
<tr><td><b>||</b></td><td>(or)</td></tr>
<tr><td><b>!</b></td><td>(not)</td></tr>
</table>

Logical operators - AND

a && b

- This evaluates to true if both ***a*** and ***b*** are true.
- It is false in all other cases.

a	b	a && b
0	0	**0**
0	1	**0**
1	0	**0**
1	1	**1**

Logical operators - OR

a || b

- This evaluates to true if either ***a*** or ***b*** or both are true, and false if they are both false.

a	b	a II b
0	0	**0**
0	1	**1**
1	0	**1**
1	1	**1**

Logical operators - NOT

!a

- This evaluates to true if ***a*** is false, and false if ***a*** is true.

a	!a
0	**1**
1	**0**

Logical operators - summary

a && b *(and)*

- This evaluates to true if both ***a*** and ***b*** are true.
- It is false in all other cases.

a || b *(or)*

- This evaluates to true if either ***a*** or ***b*** or both are true, and false if they are both false.

!a *(not)*

- This evaluates to true if ***a*** is false, and false if ***a*** is true.

Logical operators - **quiz**

```
int a = 5;
int b = 10;
int c = 7;
```

What is the result of each of these boolean expressions:

Q1 `(a > b) && (a < c)`

Q2 `(a < b) || (c < a)`

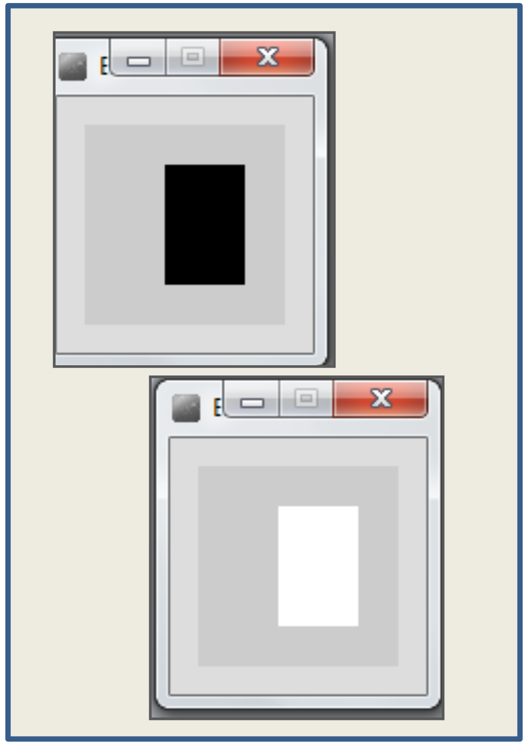
Q3 `!(b < a) && (c > b)`

Conditional Example 2.3

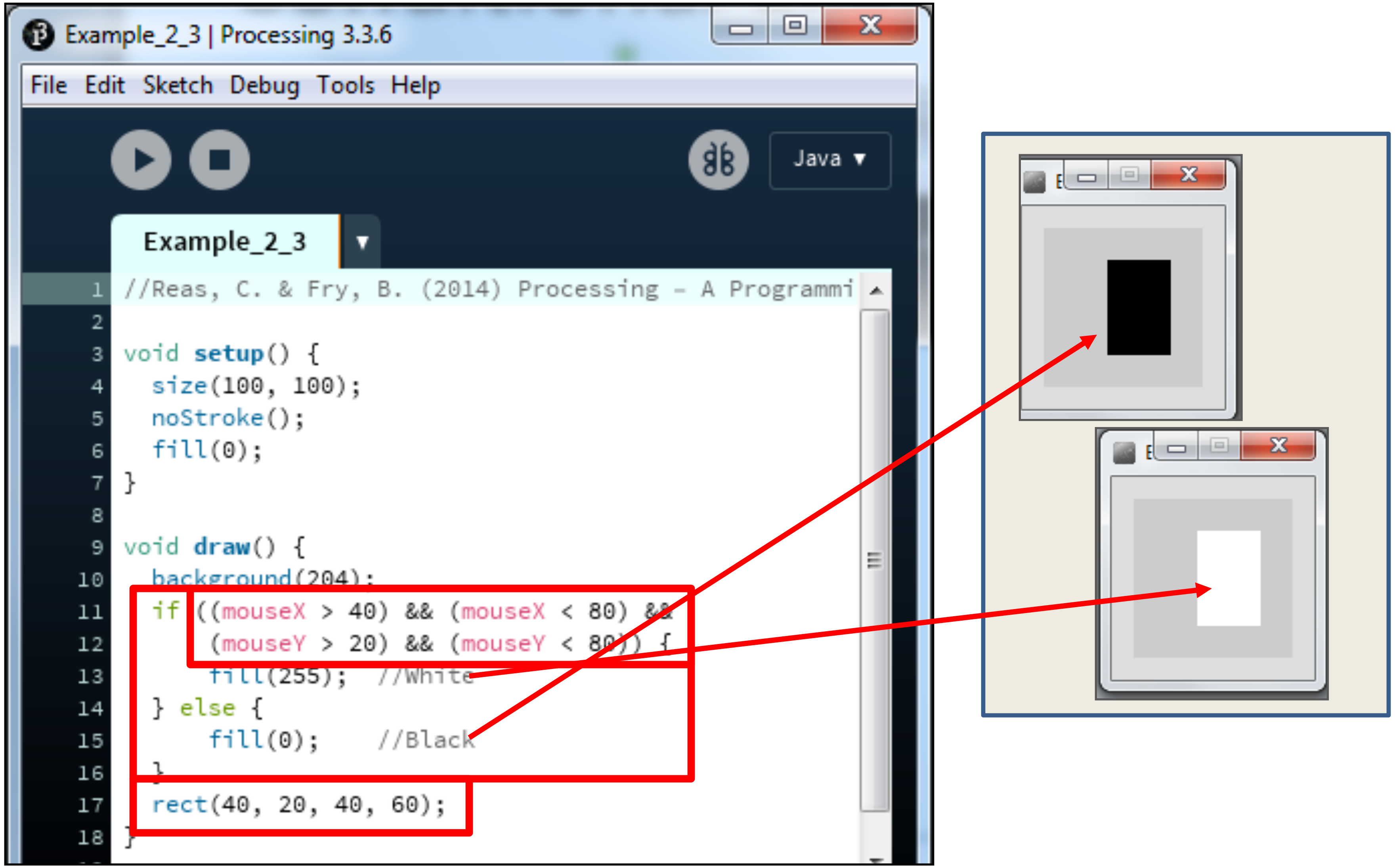
Functionality:

If the mouse pointer is:

- inside the rectangle coordinates, then fill the rectangle with white.
- otherwise, fill with black.



Conditional Example 2.3 - code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Java
Example_2_3

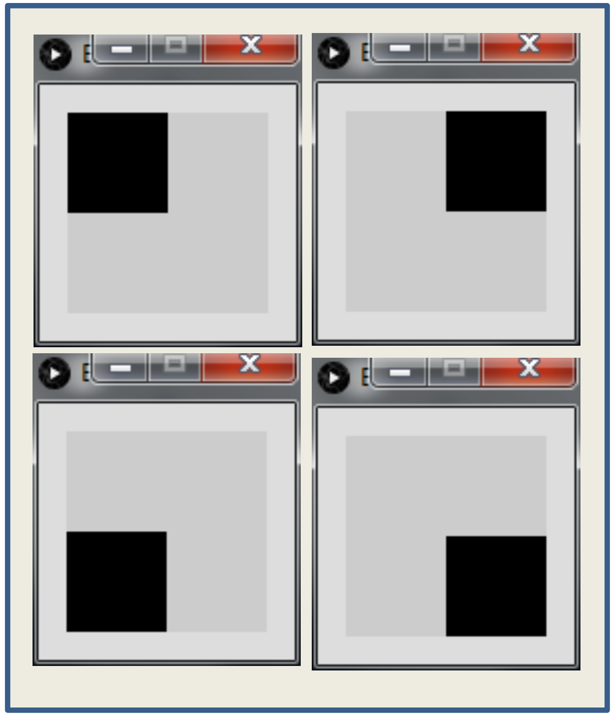
```
//Reas, C. & Fry, B. (2014) Processing – A Programmi

void setup() {
  size(100, 100);
  noStroke();
  fill(0);
}

void draw() {
  background(204);
  if ((mouseX > 40) && (mouseX < 80) &&
     (mouseY > 20) && (mouseY < 80)) {
     fill(255);   //White
  } else {
     fill(0);     //Black
  }
  rect(40, 20, 40, 60);
}
```

Conditional Example 2.4

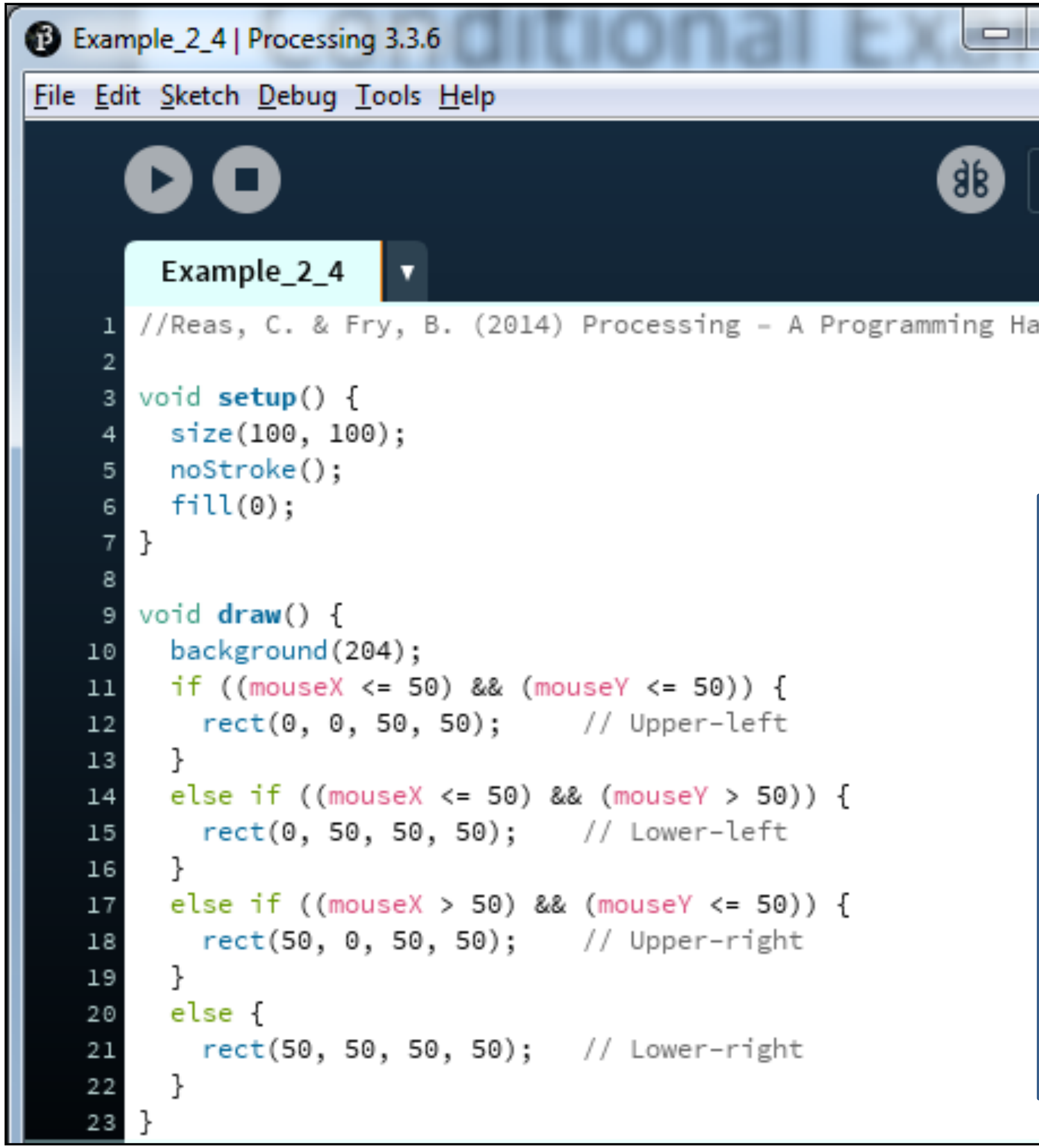
Functionality:

- If the mouse pointer is in the upper-left quadrant of the display window, draw a black rectangle covering the upper-left quadrant of the window.

- Repeat this approach for upper-right, lower-left and lower-right quadrants.



Conditional Example 2.4 - code


Example_2_4 | Processing 3.3.6
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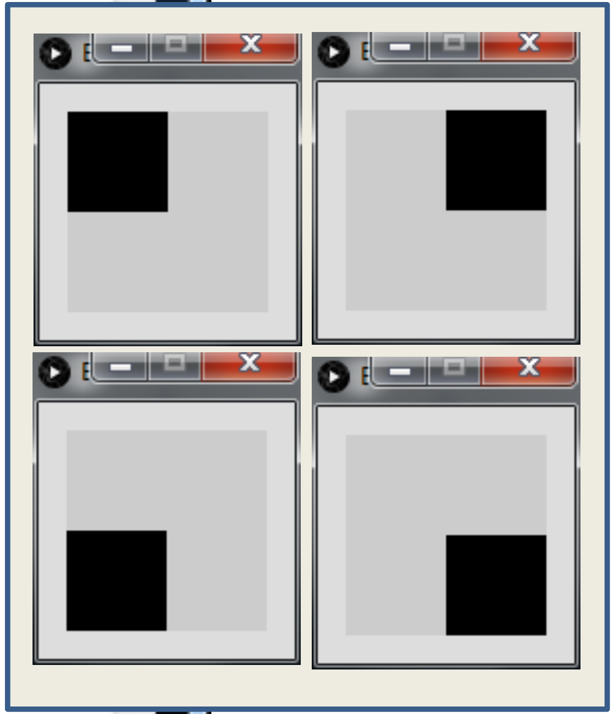
Java ▾
Example_2_4

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

void setup() {
  size(100, 100);
  noStroke();
  fill(0);
}

void draw() {
  background(204);
  if ((mouseX <= 50) && (mouseY <= 50)) {
    rect(0, 0, 50, 50);      // Upper-left
  }
  else if ((mouseX <= 50) && (mouseY > 50)) {
    rect(0, 50, 50, 50);     // Lower-left
  }
  else if ((mouseX > 50) && (mouseY <= 50)) {
    rect(50, 0, 50, 50);     // Upper-right
  }
  else {
    rect(50, 50, 50, 50);    // Lower-right
  }
}
```



Questions?

References

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