

Conditional Events

Conditional Statements and Boolean Expressions

Produced Dr. Siobhán Drohan
by: Mr. Colm Dunphy
 Mr. Diarmuid O'Connor



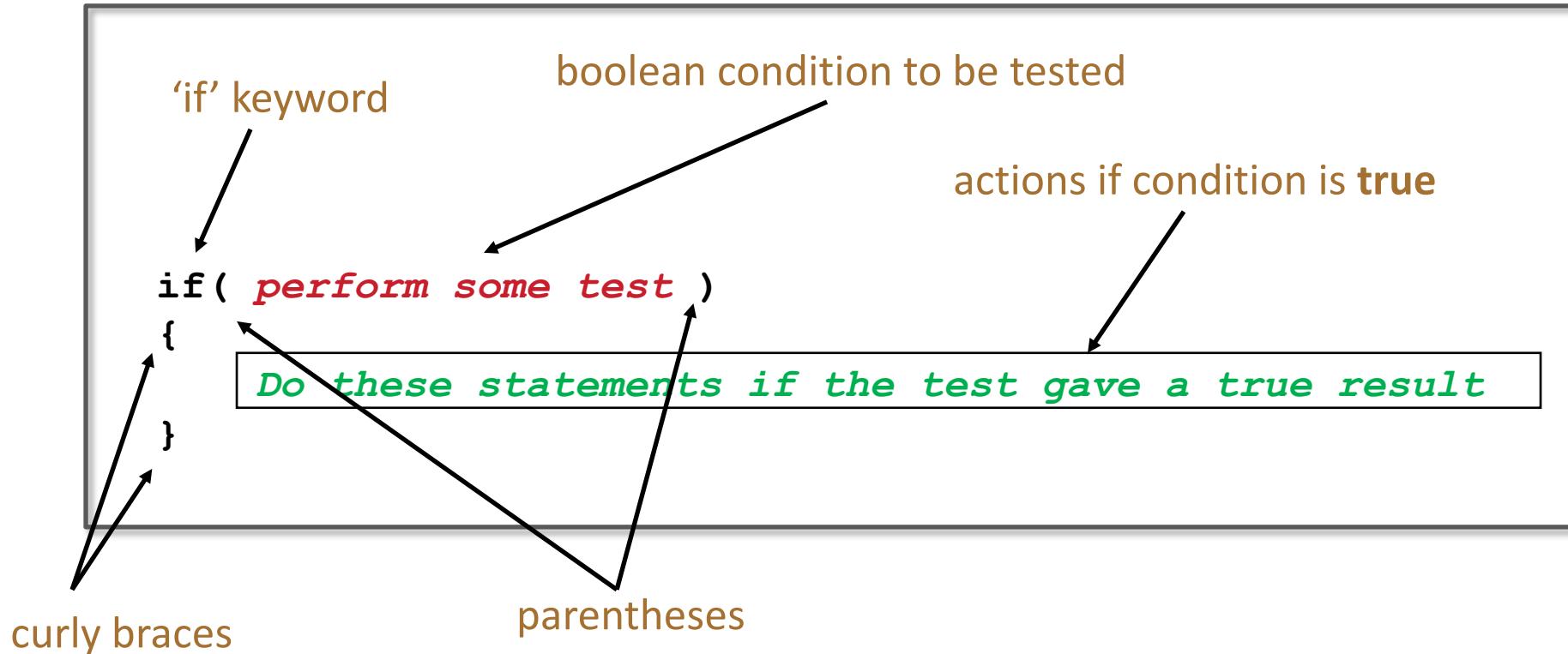
Waterford Institute *of* Technology
INSTITIÚID TEICNEOLAÍOCHTA PHORT LÁIRGE

Department of Computing and Mathematics
<http://www.wit.ie/>

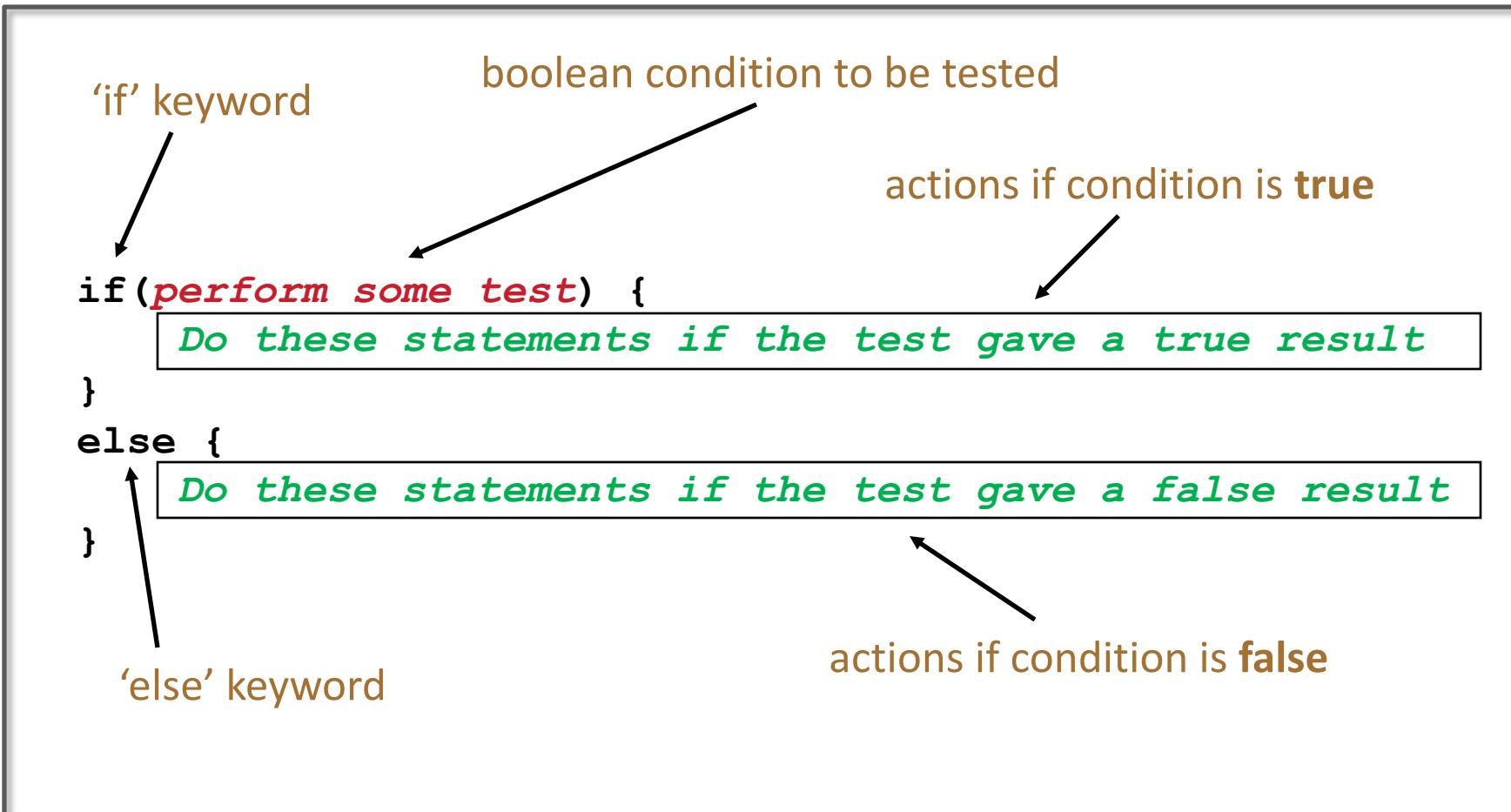
Topics list

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

Conditional Statement Syntax (1)



Conditional Statement Syntax (2)



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
}
```



Topics list

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
\geq	$op1 \geq op2$	op1 is greater than or equal to op2
<	$op1 < op2$	op1 is less than op2
\leq	$op1 \leq op2$	op1 is less than or equal to op2
\equiv	$op1 \equiv op2$	op1 and op2 are equal
\neq	$op1 \neq op2$	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.
- 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);  
}
```



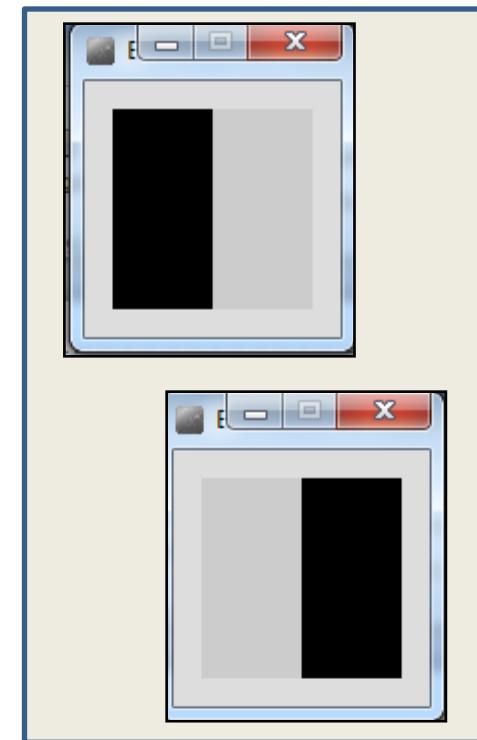
Your if
statement
does not
need
a statement
terminator.

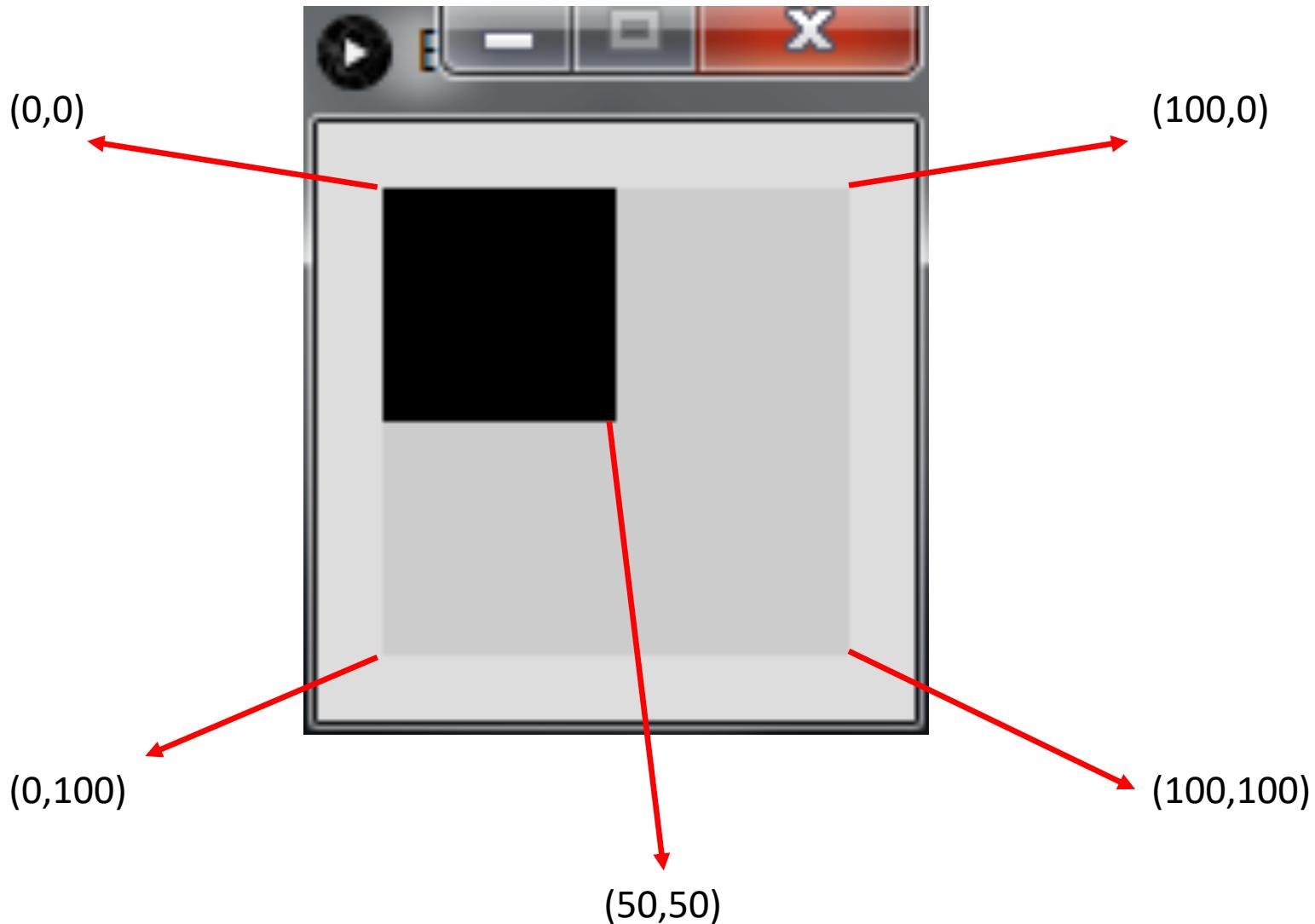
Conditional Example 2.1

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.





Conditional Example 2.1 - code

The image shows the Processing IDE interface with a sketch titled "Example_2_1". The code is as follows:

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

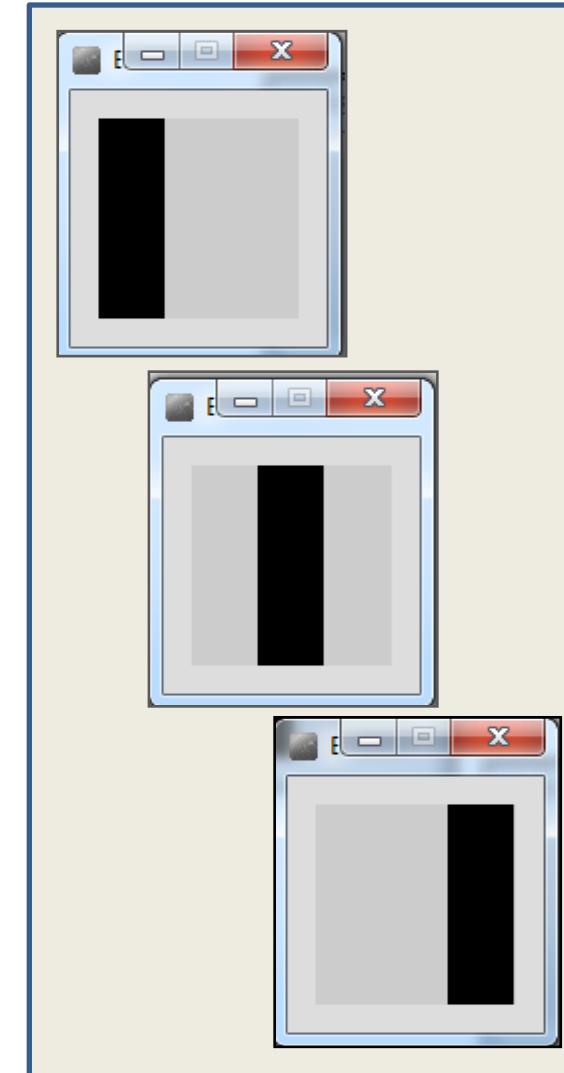
Two output windows are shown on the right, each displaying a 100x100 pixel square divided into two 50x100 pixel quadrants. The top window shows the left half (0-50) in black and the right half (50-100) in light gray. The bottom window shows the left half (0-50) in light gray and the right half (50-100) in black. Red arrows point from the corresponding code blocks in the draw() function to these outputs.

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

The image shows the Processing IDE with the sketch titled "Example_2_2". The code uses a conditional statement to draw different rectangles based on the mouse position:

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

Three separate windows show the resulting output for different mouse positions:

- Top window: Mouse at approximately (16, 50). A black rectangle is drawn from (0, 0) to (33, 100).
- Middle window: Mouse at approximately (50, 50). A black rectangle is drawn from (33, 0) to (66, 100).
- Bottom window: Mouse at approximately (83, 50). A black rectangle is drawn from (66, 0) to (100, 100).

Red arrows point from the corresponding sections of the code to each of the three output windows.

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:

&& (and)

|| (or)

! (not)

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 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 $(a < b) \mid\mid (c < a)$

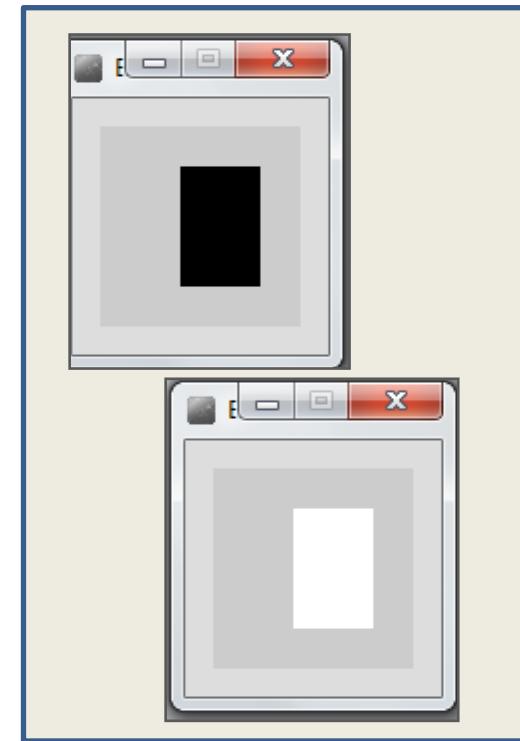
Q3 $!(b < a) \&\& (c > b)$

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

The image shows the Processing 3.3.6 IDE with a sketch titled "Example_2_3". The code uses a conditional statement to draw either a white or black rectangle based on the mouse position.

```
//Reas, C. & Fry, B. (2014) Processing - A Programming Handbook
void setup() {
    size(100, 100);
    noStroke();
    fill(0);
}

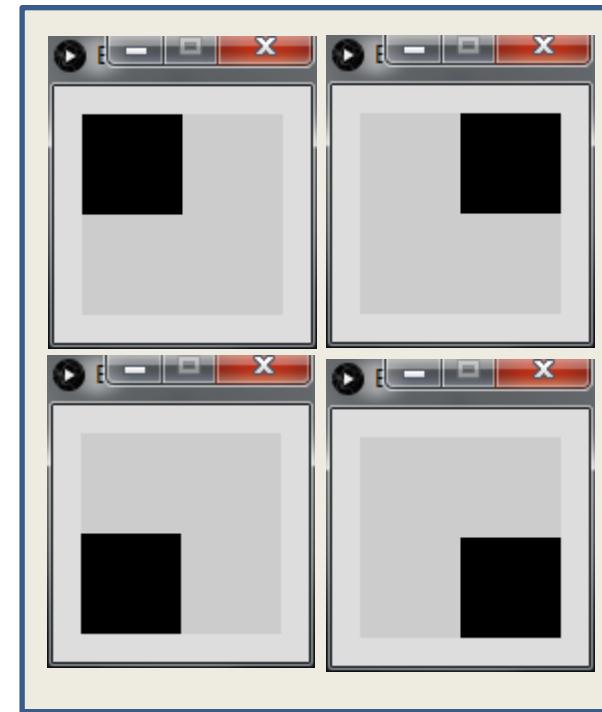
void draw() {
    background(204);
    if ((mouseX > 40) && (mouseX < 80) &&
        (mouseY > 20) && (mouseY < 80)) {
        fill(255); //White
    } else {
        fill(0); //Black
    }
    rect(40, 20, 40, 60);
}
```

Two output windows are shown on the right, each containing a gray square frame. The top window contains a black rectangle, and the bottom window contains a white rectangle. Red arrows point from the corresponding code blocks (the "if" condition and the "else" block) to their respective outputs.

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

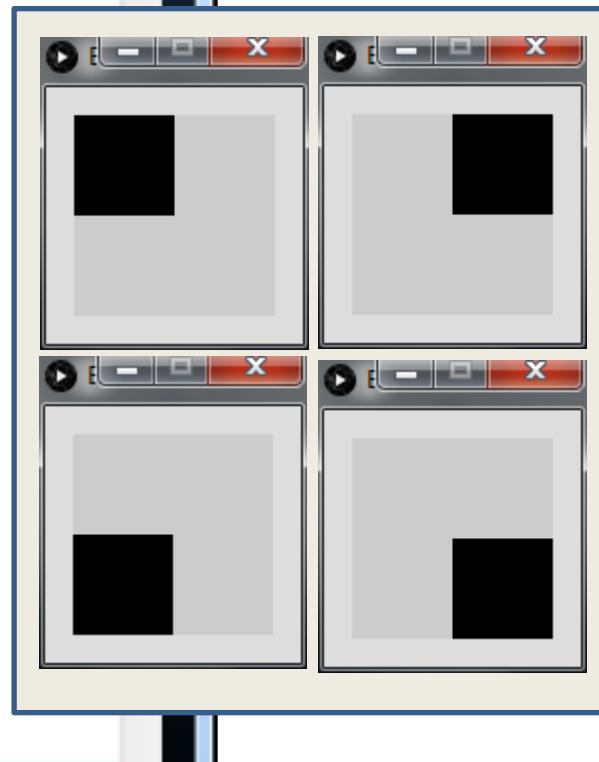
Example_2_4 | Processing 3.3.6

File Edit Sketch Debug Tools Help

Java

Example_2_4

```
1 //Reas, C. & Fry, B. (2014) Processing - A Programming Handbook
2
3 void setup() {
4     size(100, 100);
5     noStroke();
6     fill(0);
7 }
8
9 void draw() {
10    background(204);
11    if ((mouseX <= 50) && (mouseY <= 50)) {
12        rect(0, 0, 50, 50);      // Upper-left
13    }
14    else if ((mouseX <= 50) && (mouseY > 50)) {
15        rect(0, 50, 50, 50);    // Lower-left
16    }
17    else if ((mouseX > 50) && (mouseY <= 50)) {
18        rect(50, 0, 50, 50);    // Upper-right
19    }
20    else {
21        rect(50, 50, 50, 50);   // Lower-right
22    }
23 }
```



Questions?



References

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