

Iteration in Programming

while loops

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Topics list

1. Repetition in Programming – Intro to looping

2. Use of loops (while loops).

Recap: Boolean conditions

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

`mouseX < 50`

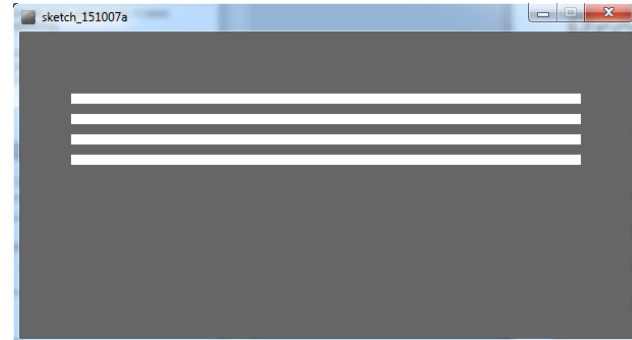
- Boolean conditions can be used to control:
 - Selection i.e. if statements and
 - Iteration i.e. loops (we will look at these now).

Repetition in Programming

- Computers are very good at repetition.
- Example:
 - `calculate pay` for 1000 employees.
 - You should use the same `calculate pay` algorithm 1000 times.
 - You don't write the `calculate pay` algorithm 1000 times; instead you include it in a loop.

Form of loop

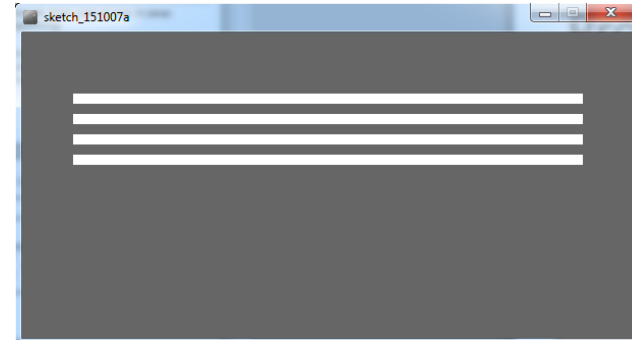
- Draw a rectangle 4 times that has a gap of 10 pixels between each one.



Form of loop

- Draw a rectangle 4 times that has a gap of 10 pixels between each one.
 - Without loop:

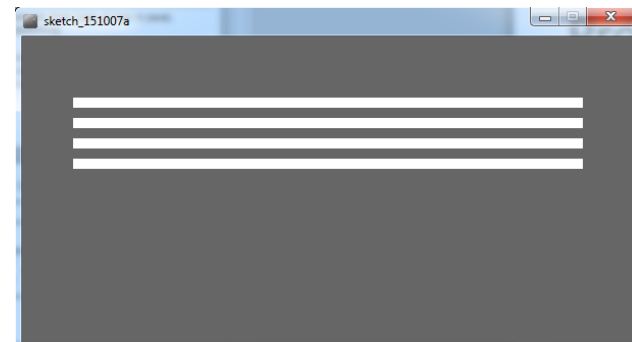
```
rect(50, 60, 500, 10);  
rect(50, 80, 500, 10);  
rect(50, 100, 500, 10);  
rect(50, 120, 500, 10);
```



Form of loop

- Draw a rectangle 4 times that has a gap of 10 pixels between each one.
 - With a loop:
 - do this 4 times
(adding 20 onto the yCoordinate variable each time).

```
rect(50, yCoordinate, 500, 10);
```

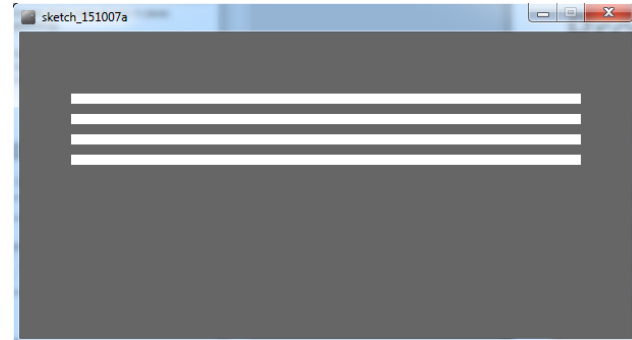


Form of loop

- Draw a rectangle 4 times that has a gap of 10 pixels between each one.
 - With a loop:
 - do this 4 times (adding 20 onto the yCoordinate variable each time).

```
rect(50, yCoordinate, 500, 10);
```

- *We will learn a little more about loops and then we will write the code to solve this problem.*



Topics list

1. Repetition in Programming – Intro to looping
2. Use of loops (while loops).

Loops in Programming

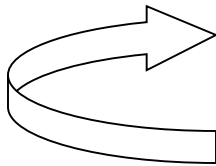
- There are three types of loop in (Java) programming:
 - **While** loops
 - **For** loops
 - **Do While** loops

While loop pseudo code

General form of a while loop

while keyword

boolean condition



```
while(loop condition) {  
  loop body  
}
```

Statements to be repeated

Pseudo-code expression of the actions of
a while loop

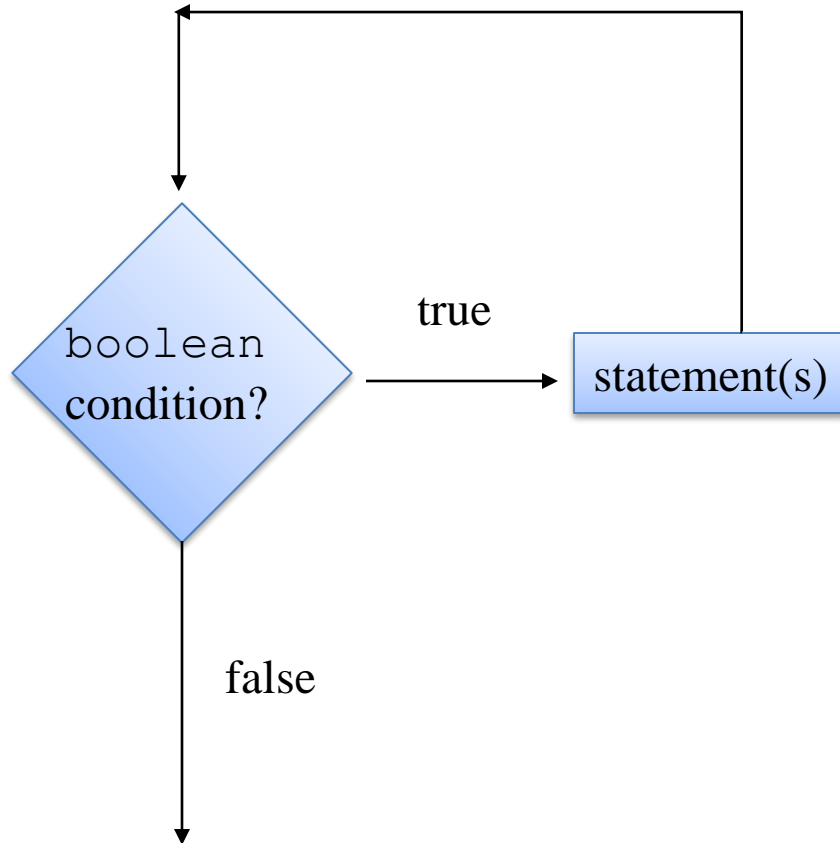
while we wish to continue, do the things in the loop body

Construction of while loop

```
Declare and initialise loop control variable (LCV)  
while(boolean condition based on LCV is true)  
{  
    "do the job to be repeated"  
    "update the LCV"  
}
```

This structure should always be used

while loop Flowchart



```
int yCoordinate = 60;
```

```
int i = 0; //i is the LCV
```

```
while(i < 4)
```

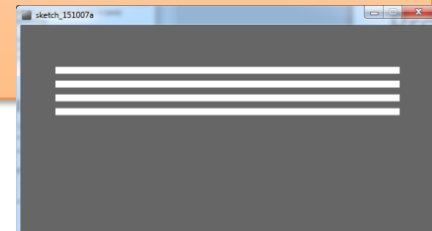
```
{
```

```
    rect(50, yCoordinate, 500, 10);
```

```
    yCoordinate += 20;
```

```
    i++;
```

```
}
```

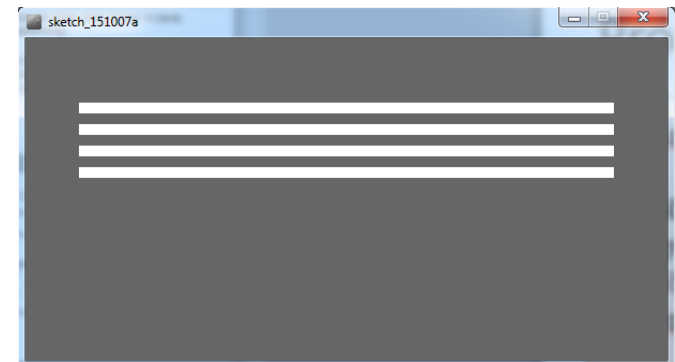


Processing Example 2.13

```
Example_2_13 | Processing 3.3.6
File Edit Sketch Debug Tools Help

Example_2_13
1 int yCoordinate = 60;
2
3 size(600, 300);
4 background(102);
5 fill(255);
6 noStroke();
7
8 int i = 0;
9 while(i < 4)
10 {
11     rect(50, yCoordinate, 500, 10);
12     yCoordinate += 20;
13     i++;
14 }
15
```

Q: Could we remove the **yCoordinate** variable and rework the code to still produce the four lines using the while loop?

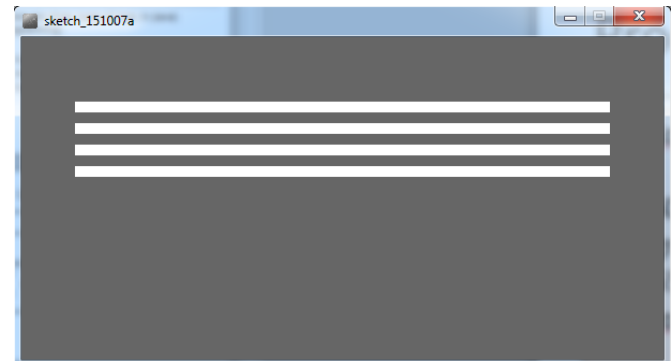


Processing Example 2.14

Example_2_13 | Processing 3.3.6
File Edit Sketch Debug Tools Help

```
1 size(600, 300);  
2 background(102);  
3 fill(255);  
4 noStroke();  
5  
6 int i = 60; ★  
7 while(i <= 120) ★  
8 {  
9     rect(50, i, 500, 10);  
10    i += 20; ★  
11 }
```

A: Yes. Here is the solution with *no* **yCoordinate** variable.

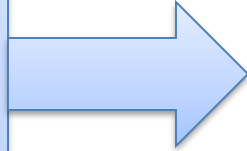


Some Study Exercises

This basic while loop,
produces this output.

```
int i = 1;

while (i <=5)
{
    println("Hello World");
    i++;
}
```



```
Hello World
Hello World
Hello World
Hello World
Hello World
```


Some Study Exercises

1. Change the code so that “Hello World” is printed out 10 times.
2. Change the code so that the numbers from 1 to 10 (inclusive) are printed out, one line at a time.
3. Change the code so that the numbers from 10 to 1 are printed out.

Questions?

