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).

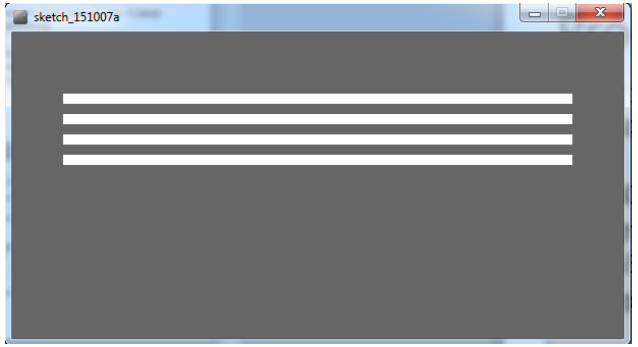
Repetition in Programming

- 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.

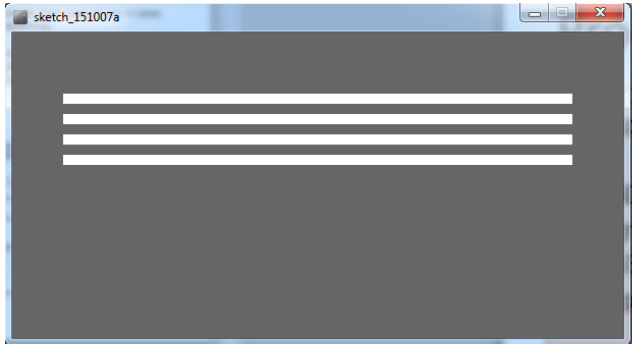


Form of loop

- 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);
```



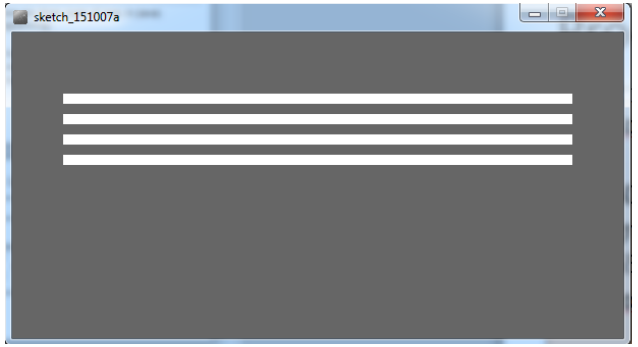
Form of loop

- 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

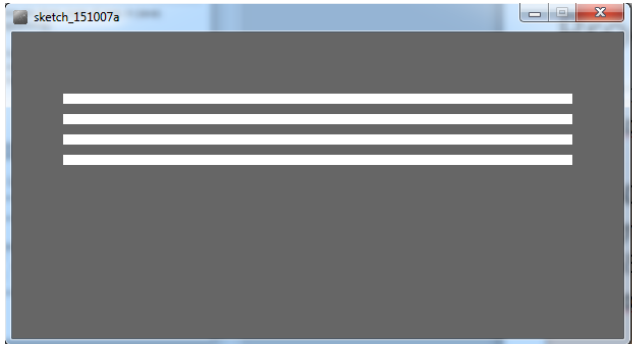
- Draw a rectangle 4 times
  that has a gap of 10 pixels between each one.

  – 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

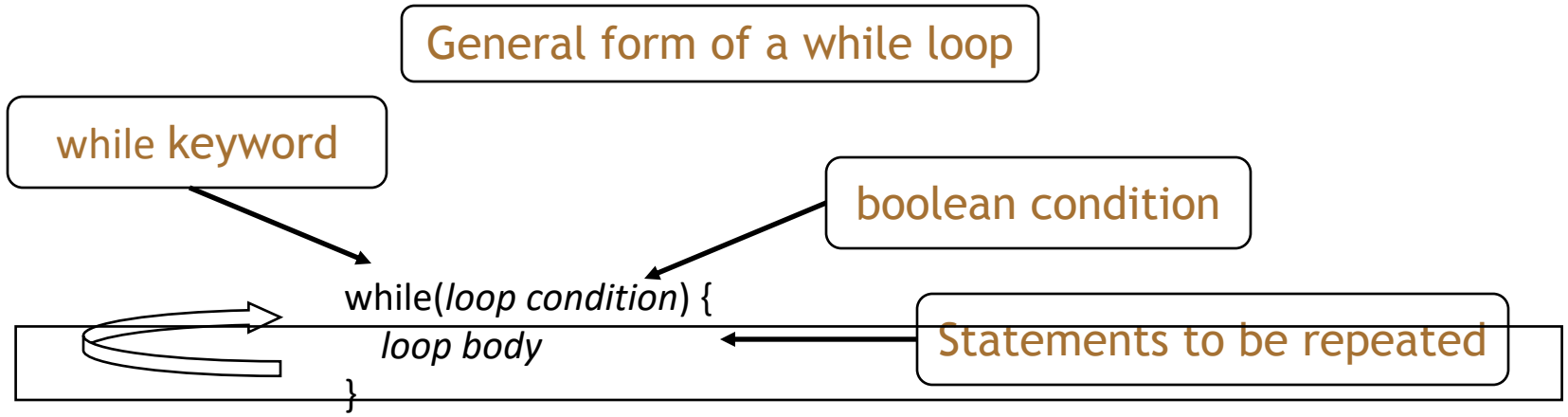
1. Repetition in Programming – Intro to looping

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



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)

{

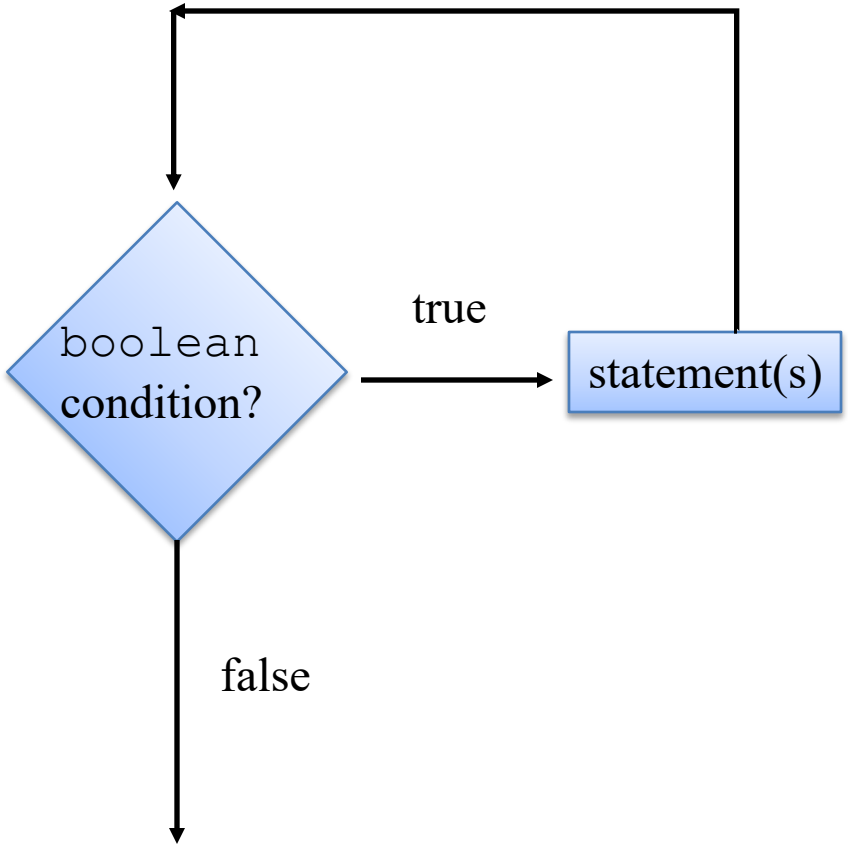
    “do the job to be repeated”

    “update the LCV”

}

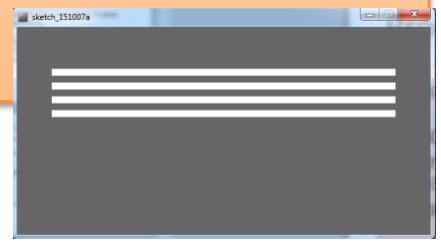
This structure should always be used

`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

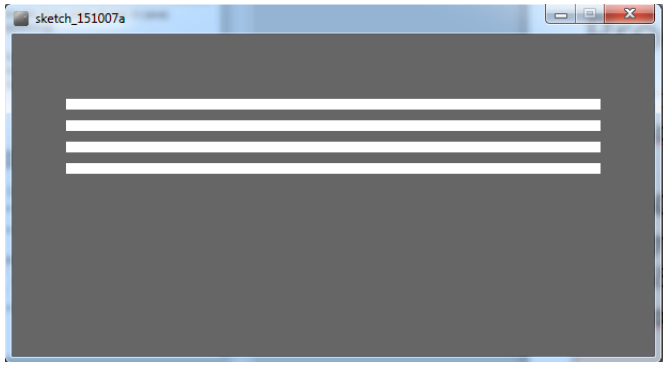
Example_2_13 | Processing 3.3.6

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

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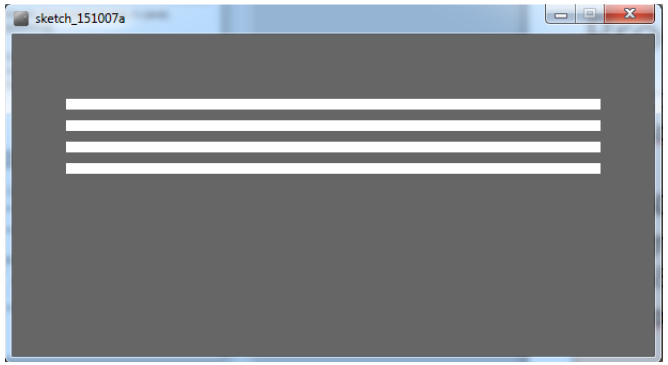
Example_2_13

```
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.

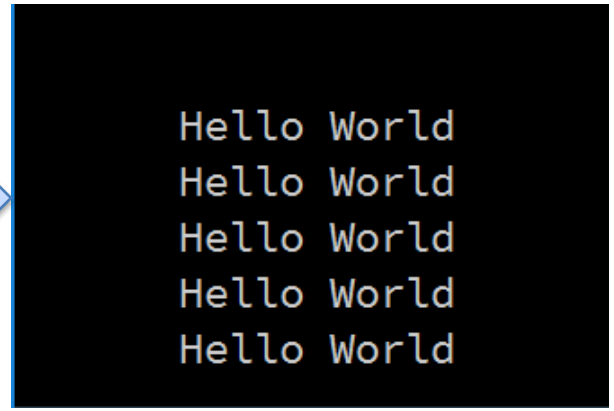


Some Study Exercises

This basic while loop,
produces this output.

```
int i = 1;

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



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?