COMP 1010- Summer 2015 (A01)

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```
final float MAX_SPEED = 10;
final float BALL_SIZE = 5;

void setup()
{    size(500, 500);   }

void draw()
{
 stroke(255);    fill(255);

 if (mousePressed)
 {
  background(0);
  float ballX = mouseX;   float ballY = mouseY;

  boolean onScreen = ballX >= 0 && ballX < width && ballY >= 0 && ballY <= height;
  while (onScreen)
  {
   float move = random(2*MAX_SPEED)-MAX_SPEED;
   ballX += move;
   move = random(2*MAX_SPEED)-MAX_SPEED;
   ballY += move;

   ellipse(ballX, ballY, BALL_SIZE, BALL_SIZE);
   onScreen = ballX >= 0 && ballX < width && ballY >= 0 && ballY <= height;
  }
 }
}
```

parts of the while loop

```
boolean onScreen = (ballX >= 0 && ballX < width) &&
                   (ballY >= 0 && ballY < height);
```
PRIMING

```
while (onScreen)
```
test

```
{
  …
    onScreen = (ballX >= 0 && ballX < width) &&
               (ballY >= 0 && ballY < height);
}
```
upkeep

note that the priming and upkeep are often the same or very similar

also note that the test is directly related to the upkeep / priming

priming + maintenance is annoying…

A new kind of loop! the
do-while loop!

```
do {
        statement;
} while (booleanCondition);
```

```
while (condition) {
        statement;
}
```

in the **while** loop, if the **condition** is false, the **statement** is never executed.

note: in the do-while loop, the statement is executed BEFORE the while test – the statement is always executed at least once.

Problem?

```
int i = 1;
int j = 1;
while (i < 1000) {
        println(i+j);
        j++;
}
```

Never False!

j will keep getting larger but i will not change

If your condition is never false, it never stops!

Problem?

```
int numTimes = 0;
while (numTimes <= 10)
{
        println(numTimes);
}
```

Never False!

no upkeep

if you don't update numTimes, the loop never ends!!

Problem?

```
int i = 10;
while (i > 100) {
        println(i);
        i--;
}
```

this loop is run 0 times.

problem?

```
boolean onScreen;
while (onScreen)
{
  …
  onScreen = (ballX >= 0 && ballX < width) &&
    (ballY >= 0 && ballY < height);
}
```

Wont compile!

not priming the loop

can't test "onScreen" if it has never been assigned a value

End of while loops

While loops are used when you don’t know how many times you need to loop.

You just need to setup the end condition.

For loops are more practical when you know how many times to loop

More loops???

NESTED LOOPS

note: as a code block acts just like any other code, you can put a **loop** or **if statement** inside of any **loop** or **if statement**

nested just means one thing inside another.

super confusing but common

what about...

```
int count = 0;
for (int i = 0; i < 10; i++) {
        for (int j = 0; j < 10; j++) {
                count++;
        }
}
```

What happens?

The computer goes step by step.

Starts the first for loop, over “i”.

When i is 0, the j loop starts. The j loop completes in entirety while i is 0.

i gets increased to 1..

repeat

count

```
int count = 0;
for (int i = 0; i < 10; i++) {
        for (int j = 0; j < 10; j++) {
                count++;
        }
}
println(count);
```

How many times will the outer loop run? (i)

How many times will the inner loop run? (j)

note: the i loop will iterate 10 times. Each time the j loop is invoked it will run 10 times. The j loop is invoked 10 times, once per iteration of the I loop. Therefore, the j loop iterates 100 times. count == 100

Test- do a println trace

```
for (int i = 0; i < 10; i++) {
        for (int j = 0; j < 10; j++) {
                println(i);
        }
}

print j
```

Use a nested for loop to draw size 2 ellipses on a grid

Make one loop go through all the columns

For each column, go through all the rows

Turn the column,row position into x,y

Draw an ellipse

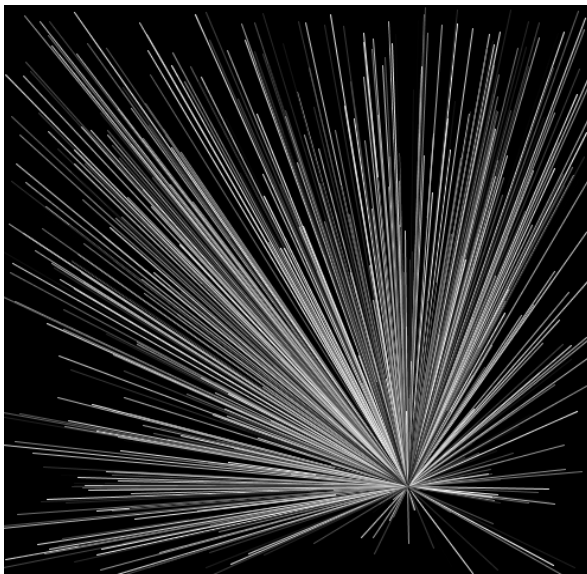
Visual trace to think about the loops

Draw a line from the last x,y to the current one to visualize how the row and column variables change

What happens if we reverse the row/col for loops?

Nested loop example

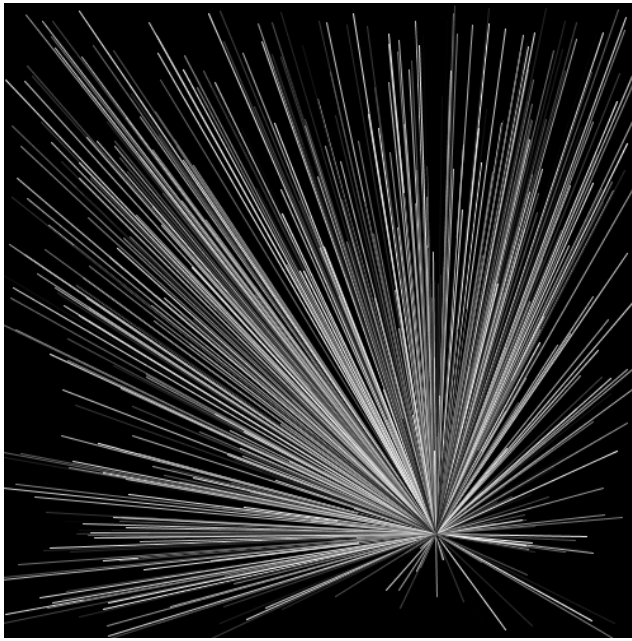
- Pick a random number up to MAX
- If the roll is a 0, we're done. While it's NOT zero,
  - Pick another random number.
  - Draw 5 lines from random locations to the mouse.



Nested loop example

This program will act unpredictably – it will pause a random amount of time, and draw more lines the longer it pauses.

Pause – busy loop (bad idea!)



Example: raster graphics

Set each pixel on the canvas separately, to make complex images

Setup a nested for loop to go through every pixel:

first a loop through the x,

then a loop through the y

set to some color

Slow!!

Speedup methods

- noSmooth() in setup
- smaller screen