

**ITERATIVE ALGORITHM ANALYSIS**  
**2009**

**STEP 1.**

What are the basic operations?

For example addition, subtraction, multiplication, division, comparison.

If no other basic operation exists we then consider assignments.

**STEP 2.**

What is the structure?

Do we have loops? Are they nested? Are they independent (ie range over numbers)? Are they dependent (ie they involve another loops index like i)?

**STEP 3.**

Independent nested loops.

Calculate the size of each loop. Calculate how many operations are inside each loop. Multiply these numbers together to get the total number of operations.

**STEP 3.**

Dependent nested loops.

You need to consider the cases. Start at the first value the outer loop takes (for example  $i = 0$ ). Calculate the number of operations. Consider the next case calculate the number of operations. Spot a pattern. Consider the last value the outer loop takes (for example  $i = n$ ). Calculate the number of operations.

Now add up all the operations.

**STEP 4.**

What is the big O class?

Using the total number of operations calculate the big O class. Look for the largest term involving  $n$ . Ignore any scalar multipliers or smaller terms.

For example if we have  $3n^4 + 2n^3 - 74n^2 + 86$  operations the big O class is  $O(n^4)$  because  $n^4$  is the biggest term, we ignore the scalar of 3 and all the smaller terms.