Bubble Sort

Algorithm:

```
1  for i = 0 to n-1
2      for j = i to n inclusive        } (A)
3          if v[i] > v[j]              }
4              swap(v[i], v[j])        }
                                       } (B)
```

Analysis

(A) $\Rightarrow \sum_{j=i}^{n} c = \underbrace{c + c + \ldots + c}_{n-i+1} = c(n-i+1)$

$n-(n-2)+1$

3

(B) $\Rightarrow \sum_{i=0}^{n-1} c(n-i+1) = c\sum_{i=0}^{n-1}(n-i+1) = c\overbrace{\left[(n+1)+(n)+(n-1)+\ldots+3\right]}^{n-1}$

Arithmetic Progression

$$= c\left\{\frac{[(n+1)+3]\cdot(n-1)}{2}\right\} = c\left(\frac{n^2+3n-4}{2}\right) \Rightarrow O(n^2)$$

Time complexity

$O(n^2)$

$\Theta(n^2)$

$\Omega(n^2)$

Space complexity

$\Theta(1)$

Number of swaps

best case: 0

worst case: n^2

Average: n^2

Good for nothing

// There are implementations with $\Omega(n)$