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Complexidade

2 -

```
void insertion_sort(int v[], int n) {                          n
    for (int i = 1; i < n; i++) {                              n - 1
        int value = v[i];                                      n - 1
        int j;

        for (j = i - 1; (j >= 0) && (value < v[j]); j--) {     tabela
            v[j + 1] = v[j];
        }

        v[j + 1] = value;                                      n - 1
    }
}
```

| i | j | for | troca |
|---|---|---|---|
| 1 | 0...0 | 1+1 | 1 |
| 2 | 1...0 | 2+1 | 2 |
| 3 | 2...0 | 3+1 | 3 |
| 4 | 3...0 | 4+1 | 4 |
| 5 | 4...0 | 5+1 | 5 |
| ⋮ | ⋮ | ⋮ | ⋮ |
| n-1 | n-2...0 | n-1+1=n | n-1 |

for:

$$\sum_{i=2}^{n} i = \frac{n(n+1)}{2} - 1 = \frac{n^2+n-2}{2} = \frac{(n-2).(n+1)}{2}$$

troca:

$$\sum_{i=1}^{n-1} = \frac{n(n-1)}{2}$$

$$T(n) = n + n - 1 + n - 1 + \frac{(n-2).(n+1)}{2} + \frac{n.(n-1)}{2} + n - 1$$

$$= 3n - 3 + \frac{n^2+n-2+n^2-n}{2} = 3n - 3 + \frac{2n^2-2}{2} = n^2 + 3n - 4$$

$O(n^2)$