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DAA Hands On - 3

```
function x = f(n)
x=1
for i=1:n
    for j=1:n
        x=x+1;
```

1) find the runtime of the algorithm mathematically

Ans let us count the number of basic operations in terms of the output size "n"

this algorithm contains nested loops

and the inner loop of the nested loop contains the operation

$x = x + 1$

↓

it is executed $n \times n$ times

$\therefore$ runtime $T(n) = 1 + \sum_{i=1}^{n} \sum_{j=1}^{n} 1$

$$T(n) = 1 + \sum_{i=1}^{n} \left(\sum_{j=1}^{n} 1 \right)$$

$\therefore$ inner summation $\longrightarrow$ Constant

$$T(n) = 1 + \sum_{i=1}^{n} n$$

$$= 1 + n \sum_{i=1}^{n} 1 \qquad \because \sum_{i=1}^{n} 1 \Rightarrow n$$

$$T(n) = 1 + n(n)$$

$$T(n) = 1 + n^2$$

Runtime of given algorithm is $O(n^2)$