csl 101 2-1-24

How to measure runtime?

- choose some <u>basic operation(s)</u> in the algorithm, count # executions of that op.

<u>Ex</u>

```
op1
for i = 1 to 10
    op2
    for j = 1 to 10
        op3
        for k = 1 to 10
            op4
```

	# executions
OP1 :	1
OP2 :	10
OP3 :	100
OP4 :	1000

count this.

why not count all OPs?

EX.

```
OP
for i = 1 to n
    OP
    for j = 1 to n
        OP
        for k = 1 to n
            OP
```

let $T(n)$ be # basic ops on input of size n ← input size

$$T(n) = n^3 + n^2 + n + 1$$

Rephrase question: why not toss out n^2, n and 1. left with n^3.

We care about what happens as $n \to \infty$.

$$\lim_{n\to\infty} \frac{T(n)}{n^3} = \lim_{n\to\infty} \frac{n^3+n^2+n+1}{n^3}$$

$$= \lim_{n\to\infty} \left(1 + \frac{1}{n} + \frac{1}{n^2} + \frac{1}{n^3}\right) = 1$$