20.21. WHEN SINGLE FOR $\neq O(n)$

HERE ARE SOME EXAMPLES WHEN SINGLE FOR LOOP $\neq O(n)$

1. LET'S SAY FOR LOOP NOT RUNNING AT N TIMES BUT AT AMOUNT OF CONSTANT TIME.

$$for(i = 1, i \leq 2; i++)\{$$
$$k = k + 1;$$
$$\}$$

Here n number of times means n is any number from $0, 1, 2, \ldots$.
$which\ is\ not\ fixed, though\ k = k + 1\ print\ twice\ but$
$it\ runs\ twice\ at\ any\ circumstances\ i.e.\ upper\ bound\ is\ fixed.$
$when\ upper\ bound\ is\ fixed\ , then\ constant\ becomes\ 2\ and\ it$
looks like $f(n) \leq 2\ \times 1\ , where\ c = 2\ and\ g(n) = 1$.
$Hence\ O\big(g(n)\big) = O(1)$.

2. LET'S SAY FOR LOOP'S UPPER BOUND GETS INCREASED.

$$for(i = 1, i \leq n^2; i++)\{$$
$$k = k + 1;$$
$$\}$$

SOLUTION

$$At\ n\ no.of\ inputs\ , loop\ runs\ upto\ n^2 times,$$

$$\sum_{i=1}^{n^2} 1 = (1 + 1 + \cdots + n^2) = O(n^2)$$

HENCE IT IS PROVED THAT SINGLE FOR LOOP DOES NOT ALWAYS GIVES COMPLEXITY $O(n)$.