


National University of Computer and Emerging Sciences, Lahore Campus

	Course:	Data Structures	Course Code:	CS2001
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Compute the time complexity of the following code fragment using step count method (frequency of each instruction) in the worst case. Also compute the big-oh of the time complexity function.

```
void f1(int arr[], int n)
{
    while(n>0){
        for(int j=0;j<n;j++){
            if(j%3==0)
                arr[j] = -1;
        }
        n = n/3;
    }
}
```

Handwritten analysis of the code fragment:

The code fragment is analyzed using the step count method. The while loop runs n times, and the for loop runs n times. The if statement runs $n/3$ times, and the assignment statement runs $n/3$ times. The while loop runs $n/9$ times, and the for loop runs $n/9$ times. The if statement runs $n/27$ times, and the assignment statement runs $n/27$ times. This forms a geometric series:

$$n + \frac{n}{3} + \frac{n}{9} + \dots$$

The sum of the series is calculated using the formula for the sum of a geometric series:

$$S = \frac{n}{1 - \frac{1}{3}} = \frac{n}{\frac{2}{3}} = \frac{3n}{2}$$

Therefore, the time complexity is $O(3n/2)$.

$$T(n) \Rightarrow 3^{n/2}$$

Big-Oh $\rightarrow O(n)$