University of Information Technology and Sciences

Assignment

On

COMPLEXITY GRAPH FOR O(N), O(N^2), O(LOG N) , O(N LOG N)

Course code: CSE 214

Course Title: Algorithms Lab

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Introduction:::

Time complexity is a concept in computer science that deals with the quantification of the amount of time taken by a set of code or algorithm to process or run as a function of the amount of input.

In other words, time complexity is essentially efficiency, or how long a program function takes to process a given input.

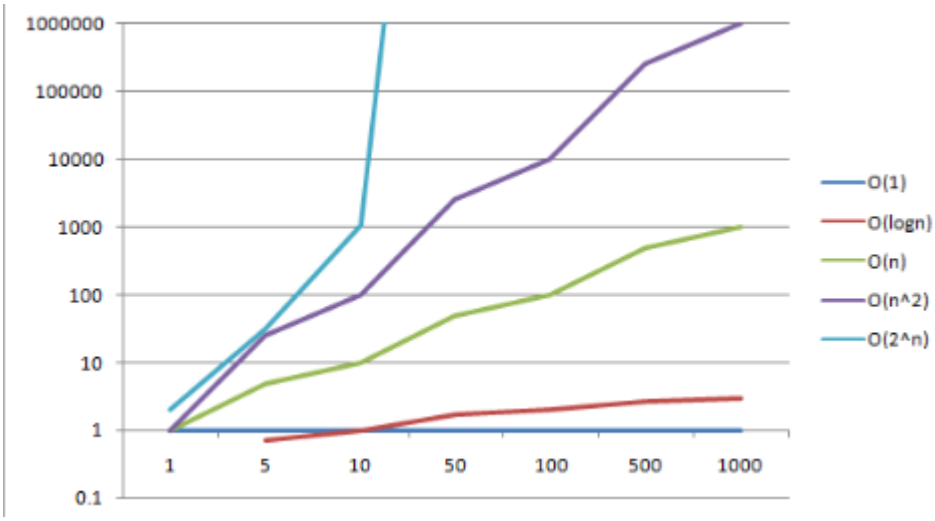
Time complexity is expressed typically in the "big O notation," but there are other notations. This is a mathematical representation of the upper limit of the scaling factor for an algorithm and is written as O (N), with "N" being the number of inputs and "n" being the number of looping expressions.

Table: Comparing the time elapsed by complexity for different input sizes: (time in s)

Input Size	O(N)	O(N^2)	O(Log N)	O(N Log N)
1	0.53	0.577	0.562	0.570
10	1.186	2.278	0.704	0.927
100	1.576	2.855	0.912	1.423
500	1.609	2.925	1.567	1.972
1000	1.856	3.203	1.747	2.075

10000	2.574	3.922	2.013	3.869
100000	3.448	4.538	2.630	4.091

Graph: Complexity graph for O (N), O(N^2), O(log N), O(N log N)



CODE :::

/Generate input/

```
#include <stdio.h>
#include <stdlib.h>
int main()
{
   freopen("Output.text","w",stdout);
   long long i;
   for(i=0;i<=1000000;i++)
   {
```

```
        printf("%ld ",rand());
    }
    printf("Hello\n");
    return 0;
}
/……..END……./
```

Code of O(N):

```
#include <bits/stdc++.h>
using namespace std;

int main()
{

    int n;
    long long arr[100001];
    cin>>n;
    freopen("Output.text","r",stdin);
    for(int i=1;i<=n;i++)
    {
        scanf("%lld ",&arr[i]);
    }
    return 0; }
```

Code of O(N^2):

```
#include <bits/stdc++.h>
using namespace std;

int main()
{
   int n;
   long long arr[100000];
   cin>>n;
   freopen("Output.text","r",stdin);
   for(int i=1;i<=n;i++)
   {
      for(int j=1;j<=n;j++)
      {
         scanf("%lld ",&arr[i]);
      }
   }
   return 0;
}
```

Code of O(Log N):

```
#include <bits/stdc++.h>
using namespace std;

int main()
{
   int n;
   long long arr[100001];
   cin>>n;
   freopen("Output.text","r",stdin);
   for(int i=1;i*i<=n;i++)
   {
      scanf("%lld ",&arr[i]);
   }
   return 0;
}
```

Code of O(N Log N):

```
#include <bits/stdc++.h>
using namespace std;

int main()
{
   int n;
   long long arr[100001];
   cin>>n;
   freopen("Output.text","r",stdin);
   for(int i=1;i<=n;i++)
   {
      for(int j=1;j*j<=n;j++)
      {
         scanf("%lld ",&arr[i]);
      }
   }
   return 0;
}
```