Data Structure and Algorithm.

Time complexity

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DID YOU KNOW?

Time complexity and Runtime are not the same

Running time refers to the actual time taken by an algorithm to execute for a particular input on a specific machine.

Running time is influenced by various factors such as **hardware architecture**, **programming language**, **compiler optimizations**, and **specific input data**.

WE WILL TALK ABOUT
Time complexity

Time complexity is a way of measuring how the runtime of a program or algorithm grows as the input size increases.

OR,,Time complexity is a theoretical concept that describes the growth rate of an algorithm's running time as the size of the input increases.

It helps us understand how **efficient an algorithm** is by analyzing how many operations it needs to perform **relative to the size of the input**. So, the lower the time complexity, the faster the algorithm runs, which is generally what we're aiming for.

Problem - 1

```
1    print(Hello World!)
```

Problem - 2

```
1   int a = 5;
2   print(a);
```

Problem - 3

```
1   int a = 5,b = 6;
2   sum = a+b;
3   print(sum);
```

Problem - 4

```
1    print(Hello World!)
2
3    print(Hello World!)
4
5    print(Hello World!)
6
7    print(Hello World!)
8
9    print(Hello World!)
10
```

Problem - 5

```
1    for(i = 0; i < n; i++)
```

Or

```
1    for(i = n; i > 0; i--)
```

Problem - 6

```
1    for(i = 0; i < n; i++){
2      //Statement
3    }
```

Problem - 7

```
1    for(i = 1; i < n; i++){
2      //Statement
3    {
```

Problem - 8

```
1    for(i = 0; i < n; i++){
2      for(j = 0; j < n; j++){
3       //Statement
4     }
5    }
```

Problem - 9

```
1    for(i = 1; i < n; i++){
2      //Statement
3    {
4
5     for(j = 0; j < n; j++){
6       //Statement
7     }
```

Problem - 10

```
1     for(i = 0; i < n; i=i+2){
2        //Statement
3      }
```

Or,

```
1     for(i = n; i > 0; i=i-2){
2        //Statement
3      }
```

Problem - 11

```
1     for(i = 1; i < n; i=i*2){
2           //Statement
3     }
```

or,

```
1     for(i = n; i > 1; i=i/2){
2           //Statement
3     }
```

Problem - 12

```
1     for(i = 0; i < n; i=i*2){
2        for(j = 0; j < n; j=j*2){
3           //Statement
4        }
5     }
```

Problem - 13

```
1     for(i = 1; i < n; i=i*2){
2           //Statement
3     }
4
5     for(j = 0; j < n; j=j/2){
6           //Statement
7     }
```

Problem - 14

```
1     for(i = 3; i <= n; i=i*i){
2        //Statement
3      }
```

Or,

```
1     for(i = n; i >= 3; i=i/i){
2        //Statement
3      }
```

Problem - 15

```
1 for (i = 0; i*i<n; i++){
2       //Statement
3   }
```

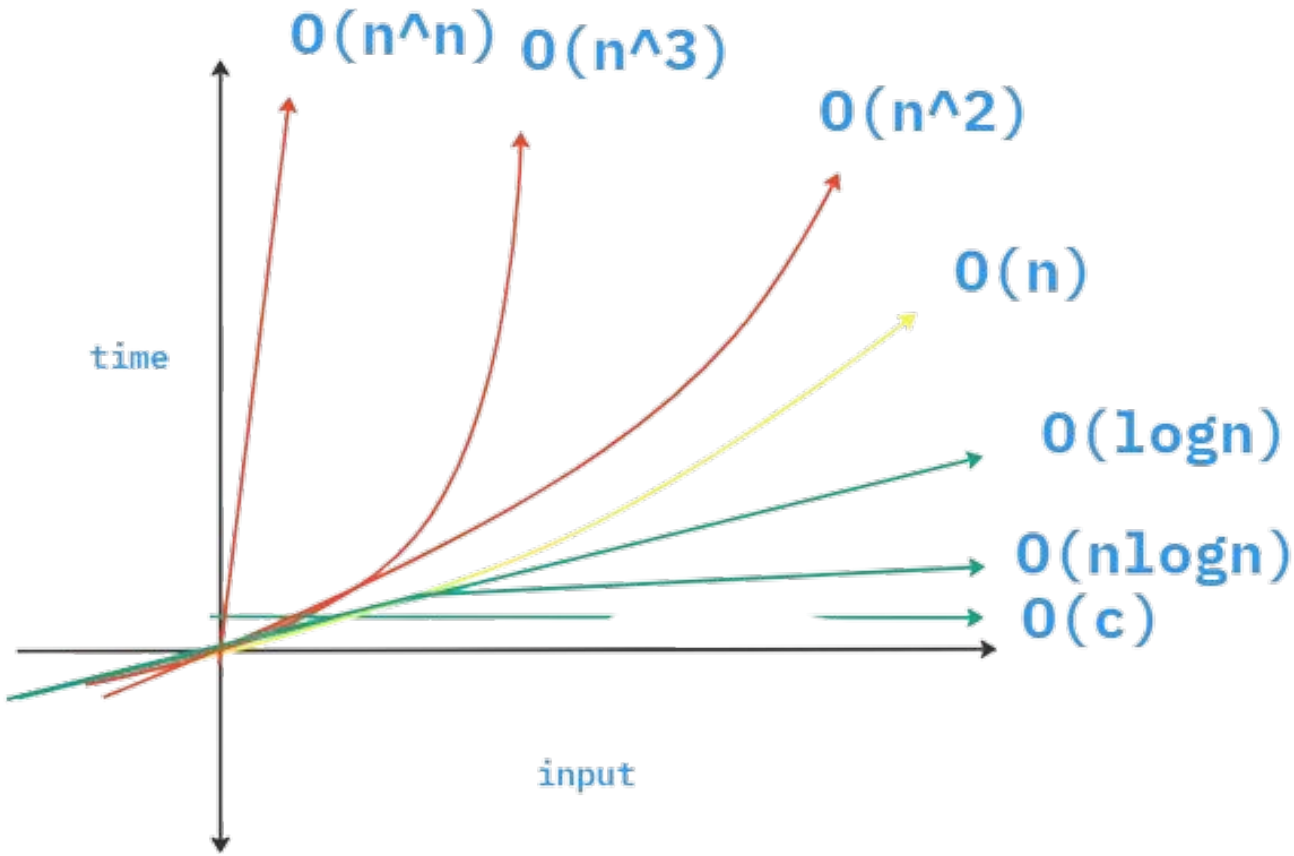
Problem - 16

```
1     for(i = 0; i*i < n; i++){
2        for(j = 0; j*j < n; j++){
3           //Statement
4        }
5     }
```

Different types of time of Time complexity

1.n	1.for(i = 0; i < n;i++) 2.for(i = n; i > 0;i--)
2.log(n)	1.for(i = 1;i < n;i=*c) 2.for(i = n;i > 1;i=/c)
3.(n/2)	1.for(i = 0;i < n;i=+c) 2.for(i = n;i > 0;i=-c)
4.(sqrt(n))	1.for (i = 0; i*i<n; i++)
5.(loglog(n))	1.for(i = c; i <= n; i=i*i) 2.for(i = n; i >= c; i=i/i)

Different types of time of Time complexity



For Loop

```
1 for(i = 0;i < n; i++){
2    //Statement
3 }
```

While Loop

```
1 i = 0;
2 while(i < n){
3    //Statement
4  i++;
5 }
```

D0-While Loop

```
1 i = 0;
2 do{
3    //Statement
4  i++;
5 }while(i < n)
```

Problem - 17

```
1     for(i = 0; i < n; i=i+2){
2           for(j = n; j > 1; j=j/2){
3         //Statement
4         }
5      }
```

Problem - 18

```
1 i = 1
2 k = 1
3 while(){
4   k=k+i;
5   i++;
6 }
```

or,

```
1 for (i = 0; i*i<n; i++){
2      k=k+i;
3      i++;
4   }
```

Problem - 19

```
1 for (i = 0; i < n; i++){
2       for (j = 0; j < n; j++){
3        a=a+j;
4    }
5
6   for (k = 0; k < n; k++){
7       b=b+k;
8   }
```

Problem - 20

```
1 for (i = 0; i < n; i++){
2       for (j = n; j > i; j--){
3        a=a+i+j;
4   }
```

Problem - 21

```
1 for(i = n; i>1; i/=3)
2     for(j = 0; j <n ; j+=2)
3         print(Hello)
4        }
5     }
6
7  for( k = 3;k < n; k++)
8      print(hello)
9   }
```

Problem - 22

```
1 void fun(n){
2       while(i < n){
3        j = n;
4         while(j>0)
5               j = j / 2
6               i = 2 * i
7         }
8     }
9   }
```

Thank you

Do you have any questions?

-> **comment down below.**

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