



**Objective:**

- Learn to calculate the Time equation.
- To get your hands dirty: It's good for you ☺.

**Task - 1:**

Think of any function that you coded in your previous programming courses and try to calculate the Time equation of them:

For example:

- Calculating the power
- Calculating the factorial
- Array Sorting
- Union of two sets
- Intersection of two sets
- Addition of two matrices
- Multiplication of two matrices
- Two matrices are symmetric or not
- Finding the binary representation of a given number
- And many more ....

**Task - 2:**

Determine, for the typical algorithms that you use to perform calculations **by hand**, the running time to do the following:

- A. Add two N-digit integers.
- B. Multiply two N-digit integers.
- C. Decimal to Binary Conversion.

Explicitly, specify the problem size in them too.

**Task - 3:**

Write a function, which receives an array of integers of size  $N$  and returns a new array whose each element at index  $i$  is the product of all the elements of received array except the element at index  $i$ . Your solution must not use division operation in it and gives answer in  $O(N)$  time (For you, at the moment  $O(N)$  means the dominant term of time equation of your solution). You must not use any extra which is dependent on problem size other than the output array.

Example:

EX-1:

Input array = {1,2,3,4,5};

Output array = {120, 60, 40, 30, 24}

// 120 = 2\*3\*4\*5, 60 = 1\*3\*4\*5, 40 = 1\*2\*4\*5, 30 = 1\*2\*3\*5, 24 = 1\*2\*3\*4

EX-2:

Input array = {8, 8, 11, 3, 10};

Output array = {2640, 2640, 1920, 7040, 2112}

**Task - 4: Time step counting of some dummy code snippets.**

A	<pre>for (int i = 1; i &lt;= n; i += 2)     for (int j = 1; j &lt;= i; j++)         cout &lt;&lt; "*";</pre>
B	<pre>for (int i=0; i&lt;10; i++)     for (int j=0; j&lt;N; j++)         for (int k=N-2; k&lt;N+2; k++)             cout &lt;&lt; i &lt;&lt; " " &lt;&lt; j &lt;&lt; '\n';</pre>
C	<pre>for (int i = 1; i &lt;= n; i++) {     if ( i%2 == 0 )     {         for (int j = 1; j &lt; n; j *= 3)         {}     } }</pre>
D	<pre>for (int i = 1; i &lt;= n; i *= 2)     for (int j = 1; j &lt;= i; j++)         cout &lt;&lt; "*";</pre>