

Ques.  
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Compute the time complexity  $\Rightarrow$  Big Oh

	Cost per execution	No. of times executed
for ( $i=0; i < n; i++$ )	$\rightarrow c_1$	$n+1$
{		
for ( $j=0; j < i; j++$ )	$\rightarrow c_2$	$\frac{n(n+1)}{2}$
{		
statement	$\rightarrow c_3$	$\frac{n(n-1)}{2}$
}		
}		

No. of times executed :-

for  $i=0$   $0 < 3 \checkmark \rightarrow j=0 \neq i$  False  
 (1) one time Nil (Not executed)

for  $i=1$   $1 < 3 \checkmark \rightarrow j=0 < 1 \checkmark \rightarrow$  1 time  
 $j=1 \neq 1$  Not executed  
 2 times

for  $i=2$   $2 < 3 \checkmark \rightarrow j=0 < 2 \checkmark \rightarrow$  1 time  
 $j=1 < 2 \checkmark \rightarrow$  2nd time  
 $j=2 \neq 2 \times \rightarrow$  Not executed  
 3 times 2 times

for  $i=3$   $3 \neq 3 \rightarrow$  false  
 4 times executed  
 for  $n=3$   
 $n+1$  times  $1+2+\dots+n$  times  
 $(3+1)$  times 3 times  
 $= 4$  times  $= \frac{n(n+1)}{2}$   
 $0+1+\dots+(n-1)$  times  
 $3+2$   
 $= \frac{n(n-1)}{2}$

$$T(n) = c_1(n+1) + c_2 \left[ \frac{n(n+1)}{2} \right] + c_3 \left[ \frac{n(n-1)}{2} \right]$$

$$= c_1 n + c_1 + \frac{c_2}{2} [n^2 + n] + \frac{c_3}{2} [n^2 - n]$$

$$= c_1 n + c_1 + \frac{c_2}{2} n^2 + \frac{c_2}{2} n + \frac{c_3}{2} n^2 - \frac{c_3}{2} n$$

$$= \left( \frac{c_2}{2} + \frac{c_3}{2} \right) n^2 + \left( c_1 + \frac{c_2}{2} - \frac{c_3}{2} \right) n + c_1$$

It is of the form:-

$$T(n) = an^2 + bn + c$$

where:-  $a = \frac{c_2 + c_3}{2}$

$$b = c_1 + \frac{c_2}{2} - \frac{c_3}{2}$$

$$c = c_1$$

$$\Rightarrow T(n) = O(n^2)$$


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