

04/09/2022

Calcular  $T(n)$  para los siguientes fragmentos de código

1)

```

p=0
for (int i=1; i<=n; i++) { #iteraciones = n+1-1 = n
    p = p + i * i;
    for (int j=1; j<=n; j++) { #iteraciones = n+1-1 = n
        System.out.println(a[i,j]);
    }
}

```

Complexity analysis for code 1:

- Outer loop:  $O(n)$
- Inner loop:  $O(n)$
- Operation inside inner loop:  $O(1)$
- Total complexity:  $O(n) \cdot O(n) = O(n^2)$

2)

```

for (i=1; i<=n; i++) { #iter n+1-1 = n
    for (j=1; j<=n; j++) { #iter n+1-1 = n
        suma = 0;
        for (k=1; k<=n; k++) { #iter n+1-1 = n
            suma = suma + a[i][k] * b[k][j];
        }
        c[i][j] = suma;
    }
}

```

Complexity analysis for code 2:

- Outer loop:  $O(n)$
- Inner loop:  $O(n)$
- Innermost loop:  $O(n)$
- Operation inside innermost loop:  $O(1)$
- Total complexity:  $O(n) \cdot O(n) \cdot O(n) = O(n^3)$

3)

```

i=1, ..., n
while (i<=n) {
    if (a[i] = a[n]) {
        a[n] = a[i];
        i = i * 2;
    }
}

```

Complexity analysis for code 3:

- Outer loop:  $O(1)$
- Inner loop:  $O(1)$
- Operation inside inner loop:  $O(1)$
- Total complexity:  $O(1) \cdot O(1) = O(1)$

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4)

```

max = 0; ... O(1)
for(int i=1; i<=n; i++) { #iter n+1-1=n
    cont = 1; ... O(1)
    j = i+1; ... O(2)
    while(a[i] <= a[j]) { #iter n
        j = j+1; ... O(2)
        cont = cont+1; ... O(2)
    }
    if(cont > max) ... O(1)
    max = cont; ... O(1)
}

```

Complexity Analysis for Question 4:

- Line 1:  $O(1)$
- Line 2:  $O(1)$
- Line 3:  $O(2)$
- Line 4:  $O(3) + O(\max(3, 2)) * n$
- Line 5:  $O(2) + O(2)$
- Line 6:  $O(2) + O(2)$
- Line 7:  $O(3) + O(3) * n$
- Line 8:  $O(2) + O(2)$
- Line 9:  $O(3) + O(n)$
- Line 10:  $O(1) + O(\max(1, 1))$
- Line 11:  $O(1) + O(1)$
- Line 12:  $O(\max(1, 1))$
- Line 13:  $O(1)$

$O(n^2) + O(1)$   
 $O(\max(n^2, 1))$   
 $O(n^2)$

5)

```

max = a[1]; ... O(2)
for(int i=2; i<=n; i++) { #iter n+1-2 = n-1
    if(a[i] > max) { ... O(2)
        max = a[i]; ... O(2)
    } else {
        cout << i; ... O(2)
        System.out.print(i); ... O(1)
    }
}

```

Complexity Analysis for Question 5:

- Line 1:  $O(2)$
- Line 2:  $O(2) + O(\max(2, 2))$
- Line 3:  $O(2) + O(2)$
- Line 4:  $O(\max(2, 2))$
- Line 5:  $O(2) + O(1)$
- Line 6:  $O(\max(2, 1))$
- Line 7:  $O(2)$

Norma



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6)  
 i=1... O(1)  
 j=1... O(1)  
 while (i < j) # iter n=1... O(1)  
 {  
 if (a[i] < a[j]) { ... O(3) }  
 i=i+2; ... O(2)  
 }  
 }  
 O(1) + O(1) + O(3) \* (n-1) = O(n)  
 O(1) + O(max(3, 1)) \* (n-1)  
 O(1) + O(3) \* (n-1)  
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 O(1) + O(3n-3)  
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