

**CMPE_CMSE371 Analysis of Algorithms
Problem Set 1**

Q.1. Analyze the run-time complexity ($T(n)$) of the algorithm given below.

Algorithm PreAverage(X,n)

1. For i=1 to n
2. S=X(1)
3. For j=2 to i
4. S=S+X(j)
5. A(i)=S/(i+1)
6. Return A

Q.2. Bubble Sort Algorithm: calculate runtime complexity by analyzing this algorithm.

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Algorithm bubbleSort (A[1..n])
n=length(A)
for i=1 to n
    for j = 1 to n-1
        if A[j-1] > A[j]
            Temp=A[i-1]
            A[i-1]=A[i]
            A[i]=Temp

Retrun A
```

Q.3. Analyze the run-time complexity ($T(n)$) of the algorithm given below.

Algorithm Sumofnumbers(n)

1. Sum=0
2. For i= 1 to n
3. For j=i+1 to n
4. Sum=Sum+i*j
5. Return Sum

Q.4. Analyze the run-time complexity ($T(n)$) of the algorithm given below.

Algorithm Control($A[1,\dots,n], B[1,\dots,m]$)

1. For $i=1$ to n
2. For $j=1$ to m
3. if $A[i] \neq B[j]$
4. Return False
5. End if
6. End for
7. End for
8. Return True

Q.5. If $f(n) = O(g(n))$ and $h(n) = \omega(g(n))$, what can you say about the asymptotic relationship between $f(n)$ and $g(n)$?

Q.6. Analyze the run-time complexity ($T(n)$) of the algorithm given below.

Algorithm QA($A[1,\dots,n], B[1,\dots,n]$)

1. $S=0$
2. For $i=1$ to n
3. $j=1$
4. While $j \leq i$
5. $S=S+A(i)*B(j)$
6. $j=j+1$
7. End for
8. Return S

Q.7. Analyze the run-time complexity ($T(n)$) of the algorithm given below.

Algorithm QB($A[1,\dots,n], B[1,\dots,n]$)

1. $M=1$
2. For $j=1$ to n
3. $i=1; L=0$
4. While $A(i) > B(j)$ AND $i \leq n$
5. $L=L+A(i)+B(j)$
6. $i=i+1$
7. $M=M+L$
8. End for
9. Return M

Q.8. Analyze the run-time complexity ($T(n)$) of the algorithm given below.

Algorithm A1(C,n)

1. Sum=0
2. For i=0 to (n+100)
3. For j=0 to i*n
4. Sum=Sum+j
5. For k=0 to (3n-1)
6. C(k) = k*Sum
7. Return C

Q.9. Analyze the run-time complexity ($T(n)$) of the algorithm given below.

Algorithm A2(n)

1. For (j=4; j<n; j=j+2)
2. Val=0
3. For (i=0; i<j; ++i)
4. Val=Val+i*j
5. For (k=0; k<n; k++)
6. Val=Val+1
7. Return Val

Q.10. Analyze the run-time complexity ($T(n)$) of the algorithm given below.

Algorithm A3(n,Toplam)

1. For (i=0; i<n*1000; i++)
2. Sum=(Sum*Sum)/(n*(i+1))
3. For (j=0; j<i; ++j)
4. Sum=Sum+j*i
5. Return Sum