(n)

1-) a ← 0

2-) for i ← 1 to n

3-) a ← a + i

4-) return a

$\sum_{i=1}^{n} 1 = n$

$O(n)$

(n)

1-) a ← 0

2-) for i ← 1 to n

3-) for j ← 1 to n

4-) a ← a + 1 → bu satır defalarca çalışıyor

5-) return a

$$\sum_{i=1}^{n} \sum_{j=1}^{n} 1 = \sum_{i=1}^{n} n = n^2 \qquad \Theta(n^2)$$

İç içe 2 adet döngü var ise

maliyet "$\Theta(n^2)$" olur

Ör

```
1-) a ← 0
2-) for i ← 1 to n
3-)     for j ← i to n
4-)         a ← a + 1
5-) return a
```

1. 5. adımlar hesaba katılmaz sayılır.

→ en çok çalışan yer

$$\sum_{i=1}^{n} \sum_{j=i}^{n} 1 = \sum_{i=1}^{n} \left(\underbrace{\sum_{j=i}^{n} 1}_{n} - \underbrace{\sum_{j=1}^{i-1} 1}_{i-1} \right) = \sum_{i=1}^{n} (n - i + 1)$$

$$= \sum_{i=1}^{n} (n+1) - \sum_{i=1}^{n} i = n(n+1) - \frac{n(n+1)}{2} = \frac{1}{2}n^2 + \frac{1}{2}n$$

$$= \Theta(n^2)$$

Ör

Sınavda böyle bir soru soracağız

1-) a ← 0
2-) for i ← 1 to n
3-) for j ← i to n
a ← a + 1
4-)
5-) return 0

$$\sum_{i=1}^{n} \sum_{j=1+i}^{n} 1 = \sum_{i=1}^{n} \Big(\underbrace{\sum_{j=1}^{n} 1}_{n} - \underbrace{\sum_{j=1}^{i} 1}_{i} \Big) = \sum_{i=1}^{n} (n-i) =$$

$$= \sum_{i=1}^{n} (n) - \sum_{i=1}^{n} i = n^2 - \frac{n(n+1)}{2} = \frac{1}{2}n^2 - \frac{1}{2}n$$

(1) c

```
1-) a ← 0
2-) for i ← 1 to n-1
3-)     for j ← i+1 to n
4-)         for k ← 1 to j
5-)             a ← a+2
6-) return a;
```

$$\sum_{i=1}^{n} \sum_{j=i+1}^{n} \sum_{k=1}^{j} 1 = \sum_{i=1}^{n-1} \left(\frac{1}{2} n(n+1) - \frac{1}{2} i(i+1) \right)$$

$$= \frac{1}{12} n(n-1)(4n+4)$$

$$= \Theta(n^3)$$

2023 Vize Sorusu

Or

1-) $s \leftarrow 0$

2-) for $i \leftarrow 1$ to $n-4$ → $n-4$ defa çalışır

3-) for $j \leftarrow i$ to $i+4$ → 5 defa çalışır

4-) for $k \leftarrow i$ to j → $i, i+1, i+2, i+3$ ve $i+4$'e kadar sayacı 1,2,3,4 defa, toplamda 15 defa çalışır.

5-) $s \leftarrow s + a_i$

$= \Theta(n)$