

заг 1 Да се определу аритметичка

$n = 100$

$sum = 0$

```
for (i = 0; i < n; i++)  
    for (j = 0; j < n; j++)  
        sum++;
```


$$\begin{aligned}
 O &= a + b + c + n(d + e + f + n(g + h + k)) = \\
 &= a + b + c + nd + ne + nf + n^2g + n^2h + n^2k = \\
 &= \boxed{O(n^2)}
 \end{aligned}$$

↪ най-высокая степень на "n"

заг 2.

```

fact = 1; a
for(i = 1; i <= n; i++)
    fact *= i; e
    
```

$$O = a + b + n(c + d + e) \quad \boxed{O(N)}$$

заг 3

```

sum = 0; a
for(i = 0; i < n; i++)
    for(j = 0; j < n; j++)
        sum++;
    
```

$$\begin{aligned}
 O &= a + b + n(c + d + e + n(f + g + h)) = \\
 &= a + b + nc + nd + ne + n^2f + n^2g + n^2h = \\
 &\boxed{O(N^2)}
 \end{aligned}$$

3ag 4

```
sum = 0;  
for (i = 0; i < n * n; i++)  
    sum++;
```

$$O = a + b + n^2(c + d + e) = \boxed{O(N^2)}$$

3ag 5

```
for (i = 0; i < n; i++)  
    for (j = 0; j < n; j++)  
        if (i == j)  
            break;
```

$$\begin{aligned} O &= a + n(b + c + d + n(e + f + g)) = \\ &= a + nb + nc + nd + n^2e + n^2f + n^2g \\ &\Rightarrow \boxed{O(N^2)} \end{aligned}$$

3ag 6

```
sum = 0;  
for (i = 0; i < n - 1; i++)  
    for (j = i + 1; j < n; j++)  
        sum++;
```


$$O = a + b + (n-1)(c + d + e + n(f + g + h)) = a + b + nc + nd + ne + n^2f + n^2g + n^2h - c - d - e - nf - ng - nh = \boxed{O(N^2)}$$

zag 7

```

a      b      c
for(i=0; i<n; i++)
  for(j=0; j<n; j++)
    for(k=0; k<n; k++)

```

$$\begin{aligned}
 O &= a + n(b + c + d + n(e + f + g + n(h + l))) = \\
 &= \cancel{a + nb + nc + nd + ne + nf + ng} \\
 &= a + n(b + c + d + ne + nf + ng + n^2h + n^2l) \\
 &= a + nb + nc + nd + n^2e + n^2f + n^2g + \textcircled{n^3h} + \textcircled{n^3l} \\
 \textcircled{n^3e} &= \boxed{O(N^3)} \text{ кубичная сложность}
 \end{aligned}$$

zag 8

```

sum = 0
a
for(i=1; i<=n; i++)
  c
  for(j=1; j<=i; j++)
    d
    sum++
    g
    h

```

$i = n$

$i = n$

$j <= n \times n$

$\boxed{O(N^3)}$


```

zag 9
sum = 0a
for(i = 1b; i <= nc; i++)d
    for(j = 1e; j <= mf; j++)g
        sum++;h

```

$$\begin{aligned}
 O &= a + b + n(c + d + e + m(f + g + h)) = \\
 &= a + b + nc + nd + ne + \underbrace{(n \cdot m)}_f + \underbrace{(nm)}_g + \underbrace{(m \cdot n)}_h \\
 &= \boxed{O(n \cdot m)}
 \end{aligned}$$

* ^{применили} циклопочетото на 2 ~~этапа~~ може да
 пацне симвалентно обозначение: $O(N^2)$

zag 10

```

for(sum = 0, h = 1; h < n; h *= 2)
    sum++;

```

1, 2, 4, 8, 16, ...

$\log_2 N = \text{број умнож.}$

$\log_2 16 = 4 \quad // \quad n = 16$

$O(\log_2 n)$

или $O(\log n)$

справимся с этим линейно или
лог-арифметична сложность

zag 11

```
long fibonacci(int n) {
```

```
    if (n == 0)
```

```
        return 1;
```

```
    else if (n == 1)
```

```
        return 1;
```

```
    else return (fibonacci(n-1) + fibonacci(n-2));
```

```
}
```

$$T(n) = T(n-1) + T(n-2) + O(1)$$

$n=3$

$$T(3) = T(2) + T(1) + O(1)$$

$$T(2) = T(1) + T(0)$$

$$T(1) = O(1) \quad T(0) = O(1)$$

$$T(1) = O(1)$$

$$T(n) = O(2^{n-1}) + O(2^{n-2}) + O(1) = \boxed{O(2^n)}$$

4-mu usage
na chud
on 8/10

