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Solution Review: Nested Loop with Multiplication (Intermediate)

This review provides a detailed analysis of the different ways to solve the nested loop with multiplication in an advanced problem!

We'll cover the following ^

- Solution
 - Time Complexity

Solution

```
1 n = 10 # can be anything, this is just an example
 2
    sum = 0
 3 pie = 3.14
 4 for var in range(1, n, 3):
        j = 1
 6
        print(pie)
 7
        while j < n:
 8
             sum += 1
 9
             j *= 3
10 print(sum) # 0(1)
11
                                                                                            \leftarrow
\triangleright
```

- Outer Loop: $1+3+6+9+\cdots+n=rac{n}{3}$
- Inner Loop: $1 + 3 + 9 + 27 + \cdots + n = log_3 n$

Statement	Number of Executions
n = 10	1
sum = 0	1
pie = 3.14	1
for var in range(1,n,3):	$\frac{n}{3}$
j=1	$\frac{n}{3}$
print(pie);	$\frac{n}{3}$

Statement	Number of Executions	
while j < n:	$rac{n}{3} imes \log_3(n)$	
sum+=1	$rac{n}{3} imes \log_3(n)$	
j*=3	$rac{n}{3} imes \log_3(n)$	
print(sum)	1	

Time Complexity

Running Time Complexity

$$egin{aligned} &= 1 + 1 + 1 + rac{n}{3} + rac{n}{3} + rac{n}{3} + rac{n}{3} + rac{n}{3} imes \log_3(n) + rac{n}{3} imes \log_3(n) + rac{n}{3} imes \log_3(n) + 1 \ &= 4 + rac{3n}{3} + 3 * rac{n}{3} log_3(n) \ &= 4 + n + n log_3(n) \end{aligned}$$

Now to find the Big O complexity,

- 1. Drop the leading constants $\Rightarrow n + nlog_3(n)$
- 2. Drop lower order terms $\Rightarrow nlog_3(n)$

Hence, Big O time complexity: $O(nlog_3(n))$



Challenge 5: Nested Loop with Multipl...

Challenge 6: Nested Loop with Multipl...



? Ask a Question

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