Algorithmics	Student information	Date	Number of session
	UO: 277921	16/2/2021	1.2
	Surname: García López		
	Name: Rosa		

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Activity 1. Two algorithms with the same complexity

N	loop2(t)	loop3(t)	loop2(t)/loop3(t)
8	0	0	0
16	0	0	0
32	0	0	0
64	0	0	0
128	0	0	0
256	2	2	1
512	4	3	1,333333333
1024	9	6	1,5
2048	29	25	1,16
4096	117	112	1,044642857
8192	443	449	0,986636971
16384	1733	1718	1,008731083
32768	6977	6849	1,01868886
65536	28337	27553	1,028454252
131072	113073	110227	1,025819445

The time is in milliseconds. RAM: 8 GB, CPU: AMD Ryzen 7 2700X.

Having in mind that both algorithms have the same time complexity($O(n^2)$), except for a couple of cases, the division is ≈ 1. Thus, the results make sense.

Nevertheless, the implementation constant tends to be > 1 when *n* is small, which indicates that loop3 might be a bit better in those cases.

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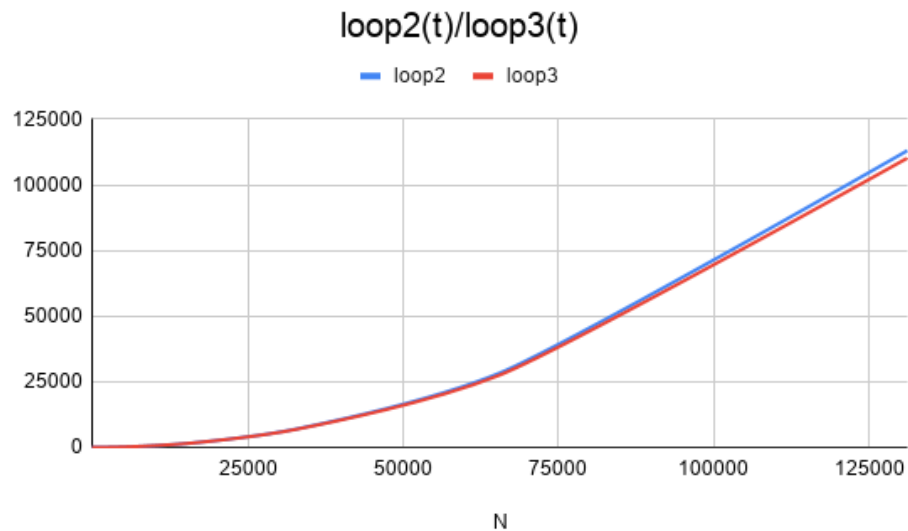
loop2(t)/loop3(t)

Activity 2. Two algorithms with different complexity

N	loop1(t)	loop2(t)	loop1(t)/loop2(t)
8	0	0	0
16	1	1	1
32	0	1	0
64	0	4	0
128	1	12	0,08333333333
256	3	43	0,06976744186
512	4	174	0,02298850575
1024	8	672	0,0119047619
2048	16	2648	0,006042296073
4096	34	10584	0,00321239607
8192	74	42441	0,001743596993
16384	158	168973	0,000935060631

The time is in milliseconds. RAM: 8 GB, CPU: AMD Ryzen 7 2700X.

Time complexities:

- **loop1**: $O(nlog(n))$

- **loop2**: $O(n^2)$

Having in mind that the time complexity if the loop1 is better, the result of the division is always less than 1. Thus, the results make sense.
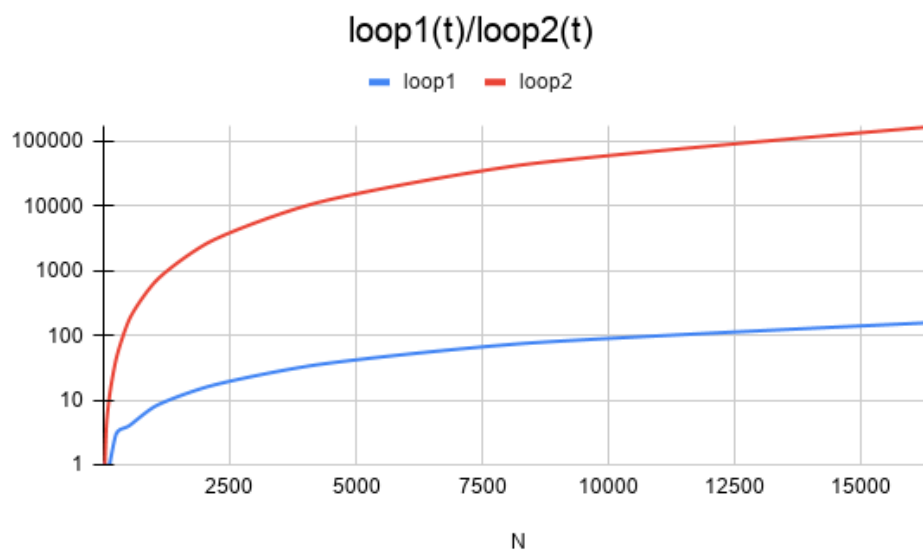

Activity 3. Complexity of other algorithms

N	loop4(t)	loop5(t)	loop4(t)/loop5(t)
8	1	1	1
16	2	2	1
32	7	3	2,333333333
64	55	17	3,235294118
128	1695	158	10,7278481
256	55375	1395	39,6953405

The time is in milliseconds. RAM: 8 GB, CPU: AMD Ryzen 7 2700X.

The measurements and results obtained make sense, because the time complexity of the algorithm in loop5 is better than the one in loop4. Therefore, the constant is always greater than or equal to (in small sizes) 1.

loop4(t) / loop5(t)
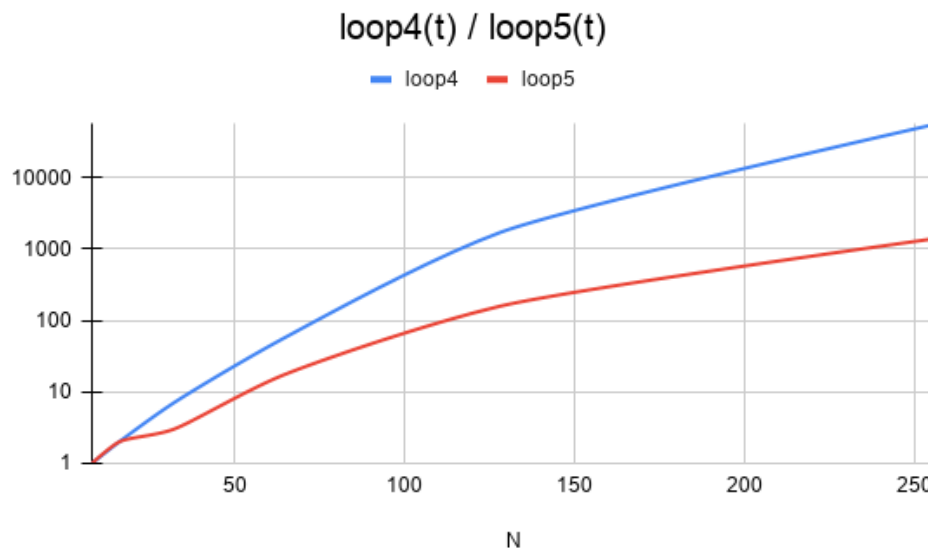
Activity 4. Study of Unknown.java

N	unkown(t)
8	0
16	0
32	1
64	1
128	4
256	1
512	12
1024	65
2048	375
4096	2142
8192	13614
16384	92576

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The time is in milliseconds. RAM: 8 GB, CPU: AMD Ryzen 7 2700X.

The results obtained do not make sense, because the time complexity is $O(n^3)$ and the time measurements do not match the theoretical results when applying the formula.

Calculations:

- t1 = 12 ms, n1 = 512, n2 = 1024, then, t2 = n2^3/n1^3 * t1 = 96 ms

- t1 = 375 ms, n1 = 2048, n2 = 4096, then, t2 = n2^3/n1^3 * t1 = 3000 ms