Algorithmics	Student information	Date	Number of session
	UO: 258220	18-02-21	1.2
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Activity 1. Two algorithms with the same complexity

n	loop2(µs)	loop3(µs)	loop2(µs)/loop3(µs)
128	216	110	1,96
256	759	413	1,83
512	3030	1526	1,99
1024	12102	6169	1,96
2048	49068	24522	2,00
4096	195530	99752	1,96

The complexity of both algorithm is O(n^2). As they both have the same trend, the proportion remains constant (for every value, loop2 takes aproximately twice the time of loop3)

Activity 2. Two algorithms with different complexity

n	loop1(µs)	loop2(µs)	loop1(µs)/loop2(µs)
256	41	759	0,054
512	70	3030	0,023
1024	149	12102	0,012
2048	304	49068	0,006
4096	632	195530	0,003
8192	1335	7844791	0,002

Escuela c

The complexity of loop1 is O(nlogn). That is quite better than loop2, and as the size increases the difference is doubled exactly by the rate n increases (times two).

Activity 3. Complexity of other algorithms

n	*loop4(ms)*	*loop5(ms)*	*loop4(ms)/loop5(ms)*
64	201	32	6,28
128	3100	201	15,42
256	50458	1773	28,46
512	795378	15665	50,774
1024	-	136014	-

The complexity of loop4 is $O(n^2)$, and the complexity of loop5 is $O(n^3 \log n)$. This becomes apparent dividing their resulting times, with that division increasing by the same rate size goes up (times two each iteration). Results resemble those of the previous exercise a lot, with loop4's tendency to run out of memory fast being the only notable thing.

Activity 4. Study of Unknown.java

n	*unknown(µs)*
64	37
128	179
256	1104
512	8847
1024	65715
2048	526745

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Execution time in this case increases aproximately by a factor of 8 with each increase of n. Tentatively this would lead us to a complexity of $O(n^3)$. Checking the code (that has three loops) also seems to back up this hypothesis. We can further check the results by taking some random values and seeing if the expected value concurs with the obtained one:

$$\frac{n1^3}{t1} = \frac{n2^3}{t2} \; ; \; t2 = t1\frac{n2^3}{n1^3}$$

$$t = 1104 * \frac{1024^3}{256^3} = 70656 \approx 65715$$

$$t = 526745 * \frac{512^3}{2048^3} = 8230{,}39 \approx 8847$$

Values are, indeed, adequate to the expected for $O(n^3)$.