Algorithmics	Student information	Date	Number of session
	UO: 284185	15/2/2022	1.2
	Surname: Fernández-Catuxo Ortiz		
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SESSION 1.2

Activity 1. Two algorithms with the same complexity

N	loop2(t) milliseconds	loop3(t) milliseconds	loop2(t)/loop3(t)
128	155	152	1,02
256	609	422	1,44
512	2460	1310	1,88
1024	8485	5004	1,70
2048	35414	20067	1,76
4096	138127	82519	1,67
8192	683707	322653	2,12

These two algorithms have the same complexity (O(n^2)) but different code. This means that the ratio tends to a constant (implementation constant. In this case the constant is more less 1,6). Then, as the results of the divisions are the same constant number, we can conclude that the results make sense from the point of view of the complexities of the algorithms as they are exactly equal.

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Activity 2. Two algorithms with different complexity

N	loop1(t) milliseconds	loop2(t) milliseconds	loop1(t)/loop2(t)
128	10	155	0,0645
256	23	609	0,0378
512	69	2460	0,0280
1024	147	8485	0,0173
2048	266	35414	0,0075
4096	519	138127	0,0038
8192	1212	683707	0,0018

These two algorithms have different complexity. Loop1 has complexity O(nlogn) and Loop2 has complexity O(n^2).

It is clear that the most efficient and faster algorithm is Loop1 (as its complexity is lower than the complexity of Loop2) and the times obtained are much better.

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Activity 3. Complexity of other algorithms

N	loop4(t) milliseconds	loop5(t) milliseconds	loop4(t)/loop5(t)
64	499	500	0,9980
128	1611	3628	0,4440
256	17136	27273	0,6283
512	107366	240372	0,4467
1024	868245	1780105	0,4877

On the one hand, I created the Loop 4 algorithm with a complexity of O(n^4). On the other hand, Loop5 has a complexity of O(n^3 log n). This complexity is better than the one of Loop 4. However, it is still very complex to take huge values.

With these results, we can conclude that the bigger the complexity of the algorithm, the bigger the number of iterations and the bigger the execution time. In this case, the least complex complexity (n^3 log n) is placed in the denominator. Then, the results we should obtain should tend to infinity.

Activity 4. Study of unknown.java

N	unknown(t) milliseconds
64	48
128	334
256	1344
512	9765
1024	81975
2048	583344

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According to the following result, we can conclude that the values obtained meet the expectations:

This algorithm, has complexity n^3 (as it is composed by 3 linear for loops)

We know that **t2 = (f(n2) / f(n1)) x t1**, being f(n) = n^3

<u>Taking this values:</u>

n1 = 256 t1 = 1344

n2 = 512 t2 = 9765

t2 = (512^3 /256^3) x 1244 = 9952 ≈ 9765

<u>Taking this values:</u>

n1 = 1024 t1 = 81975

n2 = 2048 t2 = 583344

t2 = (2048^3 /1024^3) x 81975= 655800 ≈ 583344