Algorithmics	Student information	Date	Number of session
	UO: UO269412		1-2
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Activity 1. Two algorithms with the same complexity

N	loop2(µs)	loop3(µs)	loop2(µs)/loop3(µs)
8	141	47	3
16	297	234	1,269230769
32	1234	703	1,755334282
64	5182	2807	1,846099038
128	20357	11574	1,758856057
256	81702	45218	1,806846831

The CPU has 4 cores and 4 logic processors. The memory consisted of a 4GB RAM.

In order to see if the obtained times are consistent, we should calculate the theorical values. We know both loop2 and loop3 are quadratic and as such, t2 = n2^2/n1^2 * t1. Let's look at the theorical t2 obtained from n1 = 16 and n2 = 32. In loop2 we got that tht2 = 1188, close to the real t2 which is 1234. In loop 3, such value is 936, compared to the real 703.

Taking another n1, 128, and another n2, 256; we calculate other couple of t2. In loop2, the value calculated is 81428, close to the obtained 81702. In loop3, such number is 46296, close to the experimental time 45218.

We can discuss further the data looking at the table. The column loop2/loop3 displays the information about one time divided by the other. Thus, we can see that even though the two method have the same complexity, the values of the table tend to go to 2, since the content of the for loops differ.

Activity 2. Two algorithms with different complexity

N	loop1(µs)	loop2(µs)	loop1(ms)/loop2(µs)
8	78	141	0,553191489

16	140	297	0,471380471
32	250	1234	0,202593193
64	594	5182	0,114627557
128	1356	20357	0,066610994
256	3278	81702	0,040121416

The CPU has 4 cores and 4 logic processors. The memory consisted of a 4GB RAM.

In order to see if the obtained times are consistent, we should calculate the theorical values. We know loop1 has a n log n complexity (so then t2 = n2logn2/n1logn1 * t1), while loop3 is quadratic (and as such t2 = n2^2/n1^2 * t1).

Let's look at the theorical t2 obtained from n1 = 16 and n2 = 32. In loop1 we got that tht2 = 350, close to the real t2 which is 250. In loop 2, such value is 1188, compared to the real 1234.

Taking another n1, 128, and another n2, 256; we calculate other couple of t2. In loop1, the value calculated is 3099, close to the obtained 3278 In loop2, such number is 81428, close to the experimental time 81702.

We can discuss further the data looking at the table. The column loop1/loop2 displays the information about one time divided by the other. As we know, both methods have different complexities, and even though at first the division is only 0.5; we can see how the loop2 has a larger complexity and as such, makes the value go to 0.

Activity 3. Complexity of other algorithms

N	loop4(ms)	loop5(ms)	loop4(ms)/loop5(ms)
8	47	22	1,51612903
16	761	243	2,85670732
32	11837	2230	5,39279147
64	191494	20756	9,01386718

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The CPU has 4 cores and 4 logic processors. The memory consisted of a 4GB RAM.

In order to see if the obtained times are consistent, we should calculate the theorical values. We know loop4 has a n ^4 complexity (so then t2 = n2^4/n1^4 * t1), while loop3 is n^3 log n (and as such t2 = n2^2/n1^2 * t1).
Let's look at the theorical t2 obtained from n1 = 16 and n2 = 32. In loop4 we got that tht2 = 14992, close to the real t2 which is 14663. In loop5, such value is 2430, compared to the real 2230.
Taking another n1, 32, and another n2, 64; we calculate other couple of t2. In loop4, the value calculated is 234608, close to the obtained 224905. In loop5, such number is 21408, close to the experimental time 20756.

We can discuss further the data looking at the table. The column loop4/loop5 displays the information about one time divided by the other. As we know, both methods have different complexities, having the dividend the larger complexity. As its growth is much higher than the one of the divisor, we can see that the values keep getting higher, tending to infinity.

Activity 4. Study of Unknown.java

N	unknown(µs)	unknown(ns)
64	125	125000000
128	656	656000000
256	4390	4390000000
512	34420	34420000000
1024	245142	2,45142E+11
2048	1603392	1,60339E+12

The CPU has 4 cores and 4 logic processors. The memory consisted of a 4GB RAM.

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As we know, the complexity of the method unknown is n^3. Let's check if the obtained values are similar to the theorical values we should have obtained.

We will calculate t2, having n2 = 1024, n1 = 512. In order to calculate the theorical t2, we use the formula t2 = n2^3/n1^3 * t1. Using this formula, we obtain tht2 = 275360, close to the obtained 245360.

Using other n2 = 2048, n1 = 1024, we will calculate another tht2, with the value obtained being 1961136, close to the one measured being 1603392.