Algorithmics	Student information	Date	Number of session
	UO: 297383	17/02/2025	1.2
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Activity 1. [Iterative Models]

Table 1. In milliseconds and without optimization. CHANGE THIS USING THE CORRECT THING

N	tLoop1	tLoop2	tLoop3	tLoop4
100	61*10^-4	176*10^3	120*10^-2	123*10^-2
200	125*10^-4	588*10^-3	399*10^-2	760*10^-2
400	203*10^-4	2862*10^-3	1514*10^-2	5534*10^-2
800	588*10^-4	166*10^-1	6906*10^-2	451
1600	1159*10-4	505*10^-1	302	3408
3200	264*10^-3	2251*10^-1	1124	28931
6400	422*10^-3	915	4964	OoT
12800	1042*10^-3	4153	20107	OoT
25600	231*10^-2	18902	OoT	OoT
51200	461*10^-2	OoT	OoT	OoT

For Loop1 it has a complexity of O(n*log(n)), and it does full fill it.

For Loop2 it has a complexity of O(n^2*log(n)), it follows it.

Loop 3 has a complexity of O(n^2*log(n)), it follows the complexity.

Loop 4 has a complexity of O(n^3), it follows it as it increases very quickly.

Activity 2. [Create models of given complexity]

N	tLoop5	tLoop6	tLoop7
100	507*10^-3	275*10^-1	794
200	2042*10^-3	256	11390
400	144*10^-1	1660	OoT
800	575*10^-1	15562	OoT
1600	340	4777	OoT

3200	1206	42739	OoT
6400	5933	OoT	OoT

Loop5 complexity is O(n^2*log^2(n))

Loop6 complexity is O(n^3*log(n))

Loop7 complexity is O(n^4)

They all follow the expected complexity.

Activity 3. [Comparison of two algorithms]

n	tLoop1	tLoop2	t1/t2
100	61*10^-4	176*10^3	0,035
200	125*10^-4	588*10^-3	0,021
400	203*10^-4	2862*10^-3	0,007
800	588*10^-4	166*10^-1	0,003
1600	1159*10-4	505*10^-1	0,0023
3200	264*10^-3	2251*10^-1	1,17*10^-3
6400	422*10^-3	915	0,0004
12800	1042*10^-3	4153	0,0011
25600	231*10^-2	18902	1,22*10^-4
51200	461*10^-2	OoT	OoT

The algorithm used in Loop1 is clearly better, as the ratio tends to 0. And this is correct as the complexity of O(n*log(n)) is better than O(n^2*log(n)).

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n	tLoop3	tLoop2	t3/t2
100	120*10^-2	176*10^3	6,81
200	399*10^-2	588*10^-3	6,78
400	1514*10^-2	2862*10^-3	5,29
800	6906*10^-2	166*10^-1	4,16
1600	302	505*10^-1	5,98
3200	1124	2251*10^-1	4,99
6400	4964	915	5,42
12800	20107	4153	4,84
25600	OoT	18902	OoT
51200	OoT	OoT	OoT

This time we can see that Loop2 is a better algorithm than Loop3 even though they have the same complexity.

TABLE 5

n	tLoop4 (Python)-t41	tLoop4 (Java without optimization) – t42	tLoop4 (Java with optimization) – t43	t42/t41	t43/t42
100	3	123*10^-2	173*10^-4	0,41	0,01
200	24	760*10^-2	789*10^-4	0,316	0,01
400	189	5534*10^-2	3980*10^-4	0,29	7,19*10^-3
800	1557	451	232*10^-2	0,289	0,005
1600	12843	3408	1603*10^-2	0,26	4,7*10^-3
3200	OoT	28931	10909*10^-2	OoT	3,77*10^-3
6400	OoT	OoT	111	OoT	OoT

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Java is better than python, as we saw it is a compiler language. Java with optimization is better as it takes advantage of the aspect of java being a compiler language.