


Algorithmics	Student information	Date	Number of session
	UO: 300047	17/02/2025	3
	Surname: Rodríguez Torres	 Escuela de Ingeniería Informática Universidad de Oviedo	
	Name: Luisa Natalia		



## Activity 1: Some iterative models

Iterations	tLoop1	TLoop2	TLoop3	TLoop4
100	0,00009	0,04	0,2	0,2
200	0,00007	0,02	0,2	0,2
400	0,00014	0,07	0,7	0,5
800	0,00019	0,35	2,8	2,6
1600	0,00036	1,09	13,0	18,3
3200	0,00069	4,14	53,2	120,0
6400	0,00135	15,64	226,6	815,2
12800	0,00269	66,58	993,5	5809,4
25600	0,00559	298,46	4106,0	OoT
51200	0,01113	1197,31	OoT	OoT

Loop1 has complexity  $O(n * \log(n))$

Loop2 has complexity  $O(n^2 \log n)$

Loop3 has complexity  $O(n^2 \log n)$

Loop4 has complexity  $O(n^3)$

In practice we can see that despite having the same theoretical complexity, loop2 and loop3 have different growths, perhaps because of the different ways in which their loops are structures.

## Activity 2. Creation of iterative models of a given time complexity

Iterations	tLoop5	TLoop6	TLoop7
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100	0,7	3,7	56
200	2,1	27,2	709
400	8,8	238,6	12206
800	39,5	2032,5	OoT
1600	180,6	OoT	OoT
3200	824,1	OoT	OoT
6400	3721,2	OoT	OoT
12800	OoT	OoT	OoT
25600	OoT	OoT	OoT
51200	OoT	OoT	OoT

## Activity 3. Two algorithms with different complexity

Two algorithms with different complexity

Iterations	tLoop1	TLoop2	T1/t2
100	0,00009	0,04	0,00225
200	0,00007	0,02	0,0035
400	0,00014	0,07	0,002
800	0,00019	0,35	5,42 e-4
1600	0,00036	1,09	3,30 e-4
3200	0,00069	4,14	1,66 e-4
6400	0,00135	15,64	8,63 e-5
12800	0,00269	66,58	4,04 e-5
25600	0,00559	298,46	1,87 e-5

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51200	0,01113	1197,31	9,29 e-6
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We can see that two algorithms of different complexity grow at different rates, every time the difference in the division between the times of the two becomes bigger.

## Activity 3. Two algorithms with the same complexity

Two algorithms with the same complexity

Iterations	TLoop3	TLoop2	T3/t2
100	0,2	0,04	0,5
200	0,2	0,02	1
400	0,7	0,07	10
800	2,8	0,35	8
1600	13,0	1,09	11,9
3200	53,2	4,14	12,8
6400	226,6	15,64	14,48
12800	993,5	66,58	14,92
25600	4106,0	298,46	13,75
51200	OoT	1197,31	OoT

We can see that two algorithms of the same complexity don't always give the same results, but when we divide the times between the two, the division stays consistent (in this case approx 13).

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## Activity 5. Same algorithm in different environments

Iterations	TLoop4 (Python)	TLoop4	TLoop4	T42/T41	T43/T42
	T41	T42	T43		
100	4	0,2	0,2	0,05	1
200	28	0,2	0,1	0,007	0,5
400	216	0,5	0,5	0,002	1
800	1800	2,6	2,7	0,0008	1,38
1600	22596	18,3	18,1	0,0008	0,99
3200	OoT	120,0	118,9	OoT	0,91
6400	OoT	815,2	810,1	OoT	0,99
12800	OoT	5809,4	5773,6	OoT	0,99
25600	OoT	OoT	OoT	OoT	OoT
51200	OoT	OoT	OoT	OoT	OoT

As we have established, Python is much slower than Java. Java with and without optimization is nearly identical in terms of speed.