Algorithmics	Student information	Date (DD/MM/YYYY)	Number of session
	UO: UO300535	13-02-2025	1-2
	Surname: Cabo Stroup		
	Name: José David		

Escuela de Ingeniería Informática
Universidad de Oviedo

Universidad de Oviedo
Universidá d'Uviéu
University of Oviedo

Activity 1. Loop.java 1-4

n	Loop1.java	Loop2.java	Loop3.java	Loop4.java
100	0,0081	0,17	0,87	0,69
200	0,0235	0,63	3,64	4,64
400	0,0504	2,71	14,41	34,98
800	0,1181	12,44	66	276
1600	0,2346	49,47	275	2176
3200	0,5166	217	1156	17106
6400	1,16	868	4857	135952
12800	2,446	3931	20095	OoT
25600	5,35	17364	84212	OoT
51200	11,86	70281	344567	OoT

- Explain whether the different times obtained agree with what was expected, according to the theoretical complexity of the four cases.

They do. Loop1 is O(nlogn), Loop2 and Loop3 are both $O(n^2 \log n)$, and Loop4 is $O(n^3)$.

Activity 2. Loop.java 5-7

n	Loop5.java	Loop6.java	Loop7.java
	3,93	56	57
100	18,79	451	453
200	96	3832	3821
400	429	32326	32340
800	1972	277339	OoT
1600	9044	OoT	OoT
3200	41222	OoT	OoT
6400	OoT	OoT	OoT
12800	OoT	OoT	OoT
25600	OoT	OoT	OoT
51200	OoT	OoT	OoT

- Explain whether the different times obtained agree with what was expected, according to the theoretical complexity of the four cases.

They do. Loop5 is $O(n^2 \log^2 n)$, Loop6 is $O(n^3 \log n)$ and Loop7 is $O(n^4)$.

Algorithmics	Student information	Date (DD/MM/YYYY)	Number of session
	UO: UO300535	13-02-2025	1-2
	Surname: Cabo Stroup		
	Name: José David		

Activity 3. Two algorithms with different complexity

n	Loop1.java	Loop2.java	t1/t2
100	0,0081	0,17	0,04764706
200	0,0235	0,63	0,03730159
400	0,0504	2,71	0,01859779
800	0,1181	12,44	0,00949357
1600	0,2346	49,47	0,00474227
3200	0,5166	217	0,00238065
6400	1,16	868	0,00133641
12800	2,446	3931	0,00062223
25600	5,35	17364	0,00030811
51200	11,86	70281	0,00016875

- Explain whether the different times and their quotient agree with what was expected according to the theoretical complexity.

Most definitely. Since Loop2 is worse than Loop1, and it's in the denominator, t1/t2 approaches zero.

Activity 4. Two algorithms with the same complexity

n	Loop3.java	Loop2.java	t3/t2
100	0,87	0,17	5,11764706
200	3,64	0,63	5,77777778
400	14,41	2,71	5,31734317
800	66	12,44	5,30546624
1600	275	49,47	5,5589246
3200	1156	217	5,32718894
6400	4857	868	5,59562212
12800	20095	3931	5,11193081
25600	84212	17364	4,84980419
51200	344567	70281	4,90270486

- Explain whether the different times and their quotient agree with what was expected according to the theoretical complexity.

Yes, they do. Both Loop2 and Loop3 are $O(n^2 \log n)$, but since t3/t2 approaches an implementation constant of 5 (which is > 1), we know Loop2 is more efficient.

Algorithmics	Student information	Date (DD/MM/YYYY)	Number of session
	UO: UO300535	13-02-2025	1-2
	Surname: Cabo Stroup		
	Name: José David		

Activity 5. Same algorithm in different environments

	Time (ms)				
n	t41	t42	t43	t42/t41	t43/42
100	3,52	0,69	0,091	0,19602273	0,13188406
200	25,26	4,64	0,542	0,18368963	0,11681034
400	211	34,98	3,61	0,16578199	0,10320183
800	1671	276	24,952	0,16517056	0,0904058
1600	13922	2176	195	0,15629938	0,08961397
3200	126364	17106	1393	0,13537083	0,08143342
6400	OoT	135952	10845		0,0797708

- Explain whether the different times and their quotient agree with what was expected according to the theoretical complexity.

This is indeed the case; t42/t41 approaches zero because Java is faster than Python in general, a fact that is especially noticeable when executing complex algorithms, while with t43/t42 the same result is explained by the optimization in t43, which has an increasingly large effect on the execution time as the problem size gets bigger.