Algorithmics	Student information	Date	Number of session
	UO: 301022	06/02/2025	1
	Surname: Canga		
	Name: Martín		

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Activity 1. [Bubble algorithm]

n	T ordered	T reversed	T random
10000	845	1878	1622
20000	2740	6266	6109
40000	10201	33770	OoT
80000	OoT	OoT	OoT
160000	OoT	OoT	OoT

The algorithm aligns with the times obtained since It swaps with its neighbor the value when this one is lower than the original one. What will happen is that in the ordered execution no swap will occur and in the reversed execution we will have to loop not as many as in the random.

Activity 2. [Selection algorithm]

n	T ordered	T reversed	T random
10000	939	685	895
20000	2397	2093	3462
40000	9135	9365	24058
80000	OoT	OoT	OoT
160000	OoT	OoT	OoT

The times match what we expect because it does not matter whether the elements are sorted or not it will always loop trough them.

Activity 3. [Insertion algorithm]

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n	T ordered	T reversed	T random
10000	LoR	992	518
20000	LoR	3502	1600
40000	LoR	18414	6018
80000	LoR	OoT	24464
160000	LoR	OoT	OoT
320000	LoR	OoT	OoT
640000	LoR	OoT	OoT
1280000	66	OoT	OoT
2560000	117	OoT	OoT
5120000	127	OoT	OoT
10240000	285	OoT	OoT
20480000	640	OoT	OoT
40960000	1078	OoT	OoT
81920000	2187	OoT	OoT

The times obtained agree with what is expected since the ordered insertion will perform the least swaps, the reversed insertion is the worst one performing the most swaps and the random one is a middle term

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Activity 4. [Quicksort algorithm]

n	T ordered	T reversed	T random
250000	114	113	278
500000	210	251	475
1000000	509	253	932
2000000	761	525	1742
4000000	1197	1143	3350
8000000	2577	2305	7594
12000000	5150	4898	19552

T ordered and T reversed have the same complexity since the pivot selection is more efficient.

Activity 5. [Quicksort with insertion]

n	T random
QuickSort	15154
QuickSort Insertion k = 5	14994
QuickSort Insertion k = 10	16243
QuickSort Insertion k = 20	15318
QuickSort Insertion k = 30	15216
QuickSort Insertion k = 50	13350
QuickSort Insertion k = 100	13350
QuickSort Insertion k = 200	11392
QuickSort Insertion k = 500	16280
QuickSort Insertion k = 1000	32469

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We can see that when sorting small clusters insertion works better than QuickSort so in this particular case for the size of clusters k O(Insertion) < O(QuickSort).