

Laboratorio 3

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Assume that A is an array of size n of distinct elements

1 Minimum number of inversions - instance

Para un arreglo A de tamaño n, la instancia donde el ordenamiento creciente tiene la cantidad minima de inversiones, es un arreglo ordenado, del tipo:

$A = [1, 2, \dots, n-2, n-1, n]$

2 Maximum number of inversions - instance

Para un arreglo A de tamaño n, la instancia donde el ordenamiento creciente tiene la cantidad Maxima de inversiones, es un arreglo completamente desordenado, done $n * (n - 1)/2$, del tipo: $A = [n, n-1, \dots, 3, 2, 1]$

3 Complexity (worst case number of comparisons) of the brute force counting on A

Para un arreglo A de tamaño n, mediante el conteo por "Fuerza Bruta", la instancia donde la complejidad es la mayor posible, es en un arreglo completamente desordenado, done $O(n^2)$, del tipo:

$A = [n, n-1, \dots, 3, 2, 1]$

4 Complexity (worst case number of comparisons) of the divide an conquer (mergesort) counting on A

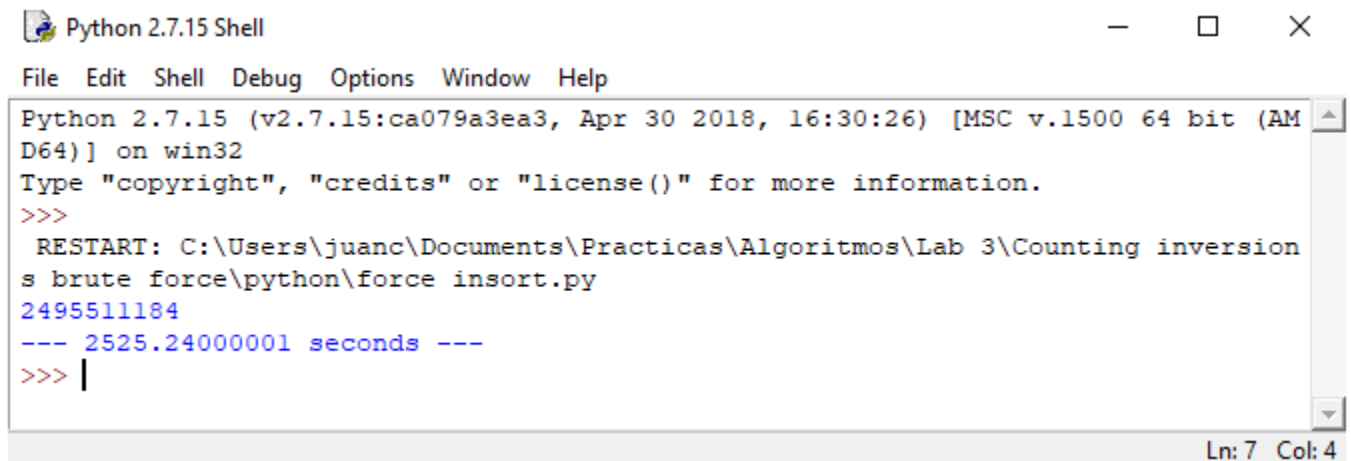
Para un arreglo A de tamaño n, mediante "MergeSort", la instancia donde la complejidad es la mayor posible, es en un arreglo completamente desordenado, done $O(n*\log(n))$, del tipo:

$A = [n, n-1, \dots, 3, 2, 1]$

5 Run in your local machine the brute force and divide and conquer algorithms in Python 2.7

calculate the time for the first 10^5 numbers of size instance from:

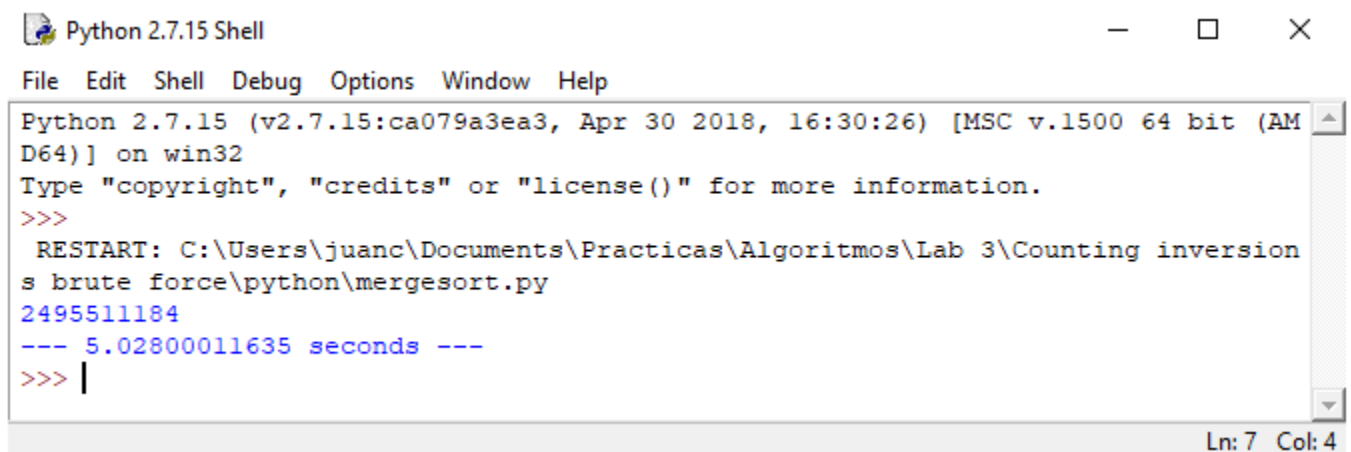
Hackearth BruteForce:



```
Python 2.7.15 Shell
File Edit Shell Debug Options Window Help
Python 2.7.15 (v2.7.15:ca079a3ea3, Apr 30 2018, 16:30:26) [MSC v.1500 64 bit (AMD64)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
RESTART: C:\Users\juanc\Documents\Practicas\Algoritmos\Lab 3\Counting inversion s brute force\python\force insort.py
2495511184
--- 2525.24000001 seconds ---
>>> |
```

Ln: 7 Col: 4

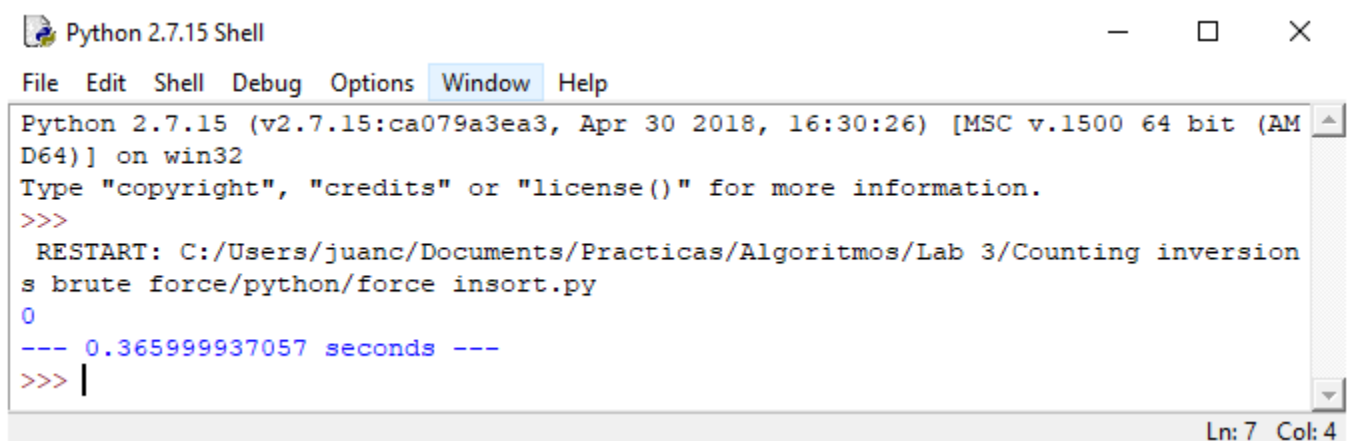
Hackearth MergeSort:



```
Python 2.7.15 Shell
File Edit Shell Debug Options Window Help
Python 2.7.15 (v2.7.15:ca079a3ea3, Apr 30 2018, 16:30:26) [MSC v.1500 64 bit (AMD64)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
RESTART: C:\Users\juanc\Documents\Practicas\Algoritmos\Lab 3\Counting inversion s brute force\python\mergesort.py
2495511184
--- 5.02800011635 seconds ---
>>> |
```

Ln: 7 Col: 4

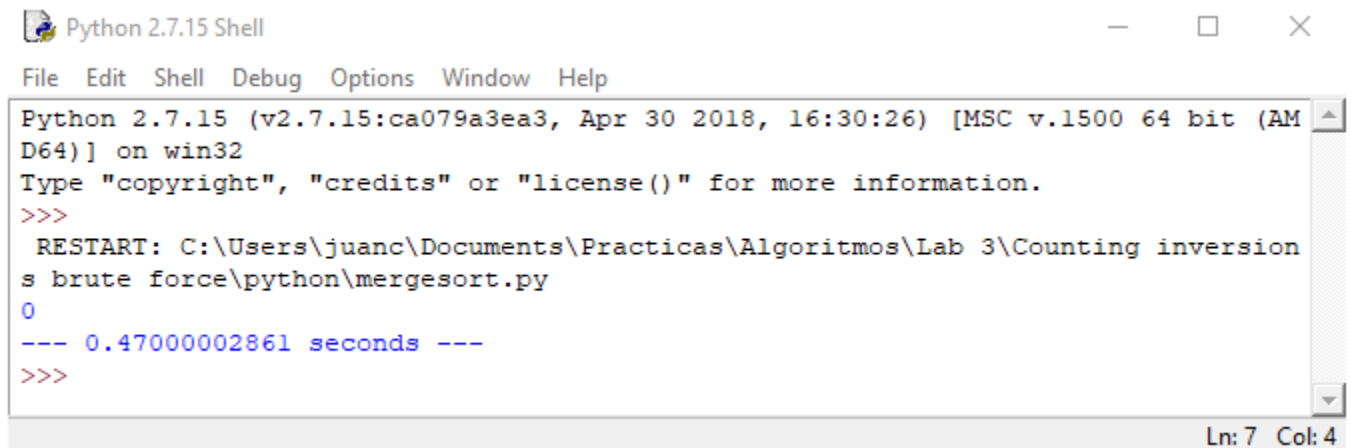
Sorted increasing BruteForce:



```
Python 2.7.15 Shell
File Edit Shell Debug Options Window Help
Python 2.7.15 (v2.7.15:ca079a3ea3, Apr 30 2018, 16:30:26) [MSC v.1500 64 bit (AMD64)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
RESTART: C:/Users/juanc/Documents/Practicas/Algoritmos/Lab 3/Counting inversion s brute force/python/force insort.py
0
--- 0.365999937057 seconds ---
>>> |
```

Ln: 7 Col: 4

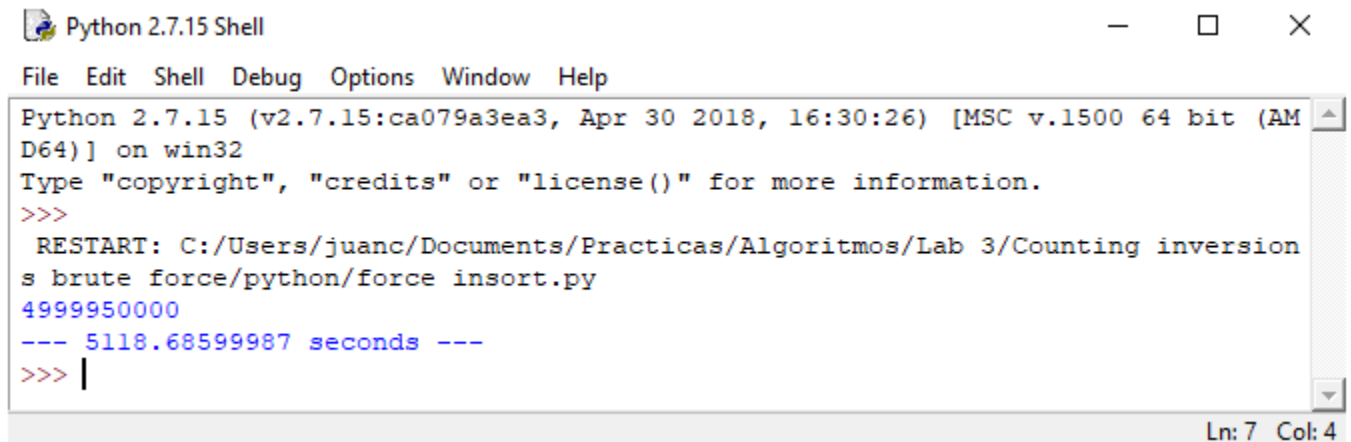
Sorted increasing MergeSort:



```
Python 2.7.15 Shell
File Edit Shell Debug Options Window Help
Python 2.7.15 (v2.7.15:ca079a3ea3, Apr 30 2018, 16:30:26) [MSC v.1500 64 bit (AMD64)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
RESTART: C:\Users\juanc\Documents\Practicas\Algoritmos\Lab 3\Counting inversions brute force\python\mergesort.py
0
--- 0.47000002861 seconds ---
>>>
```

Ln: 7 Col: 4

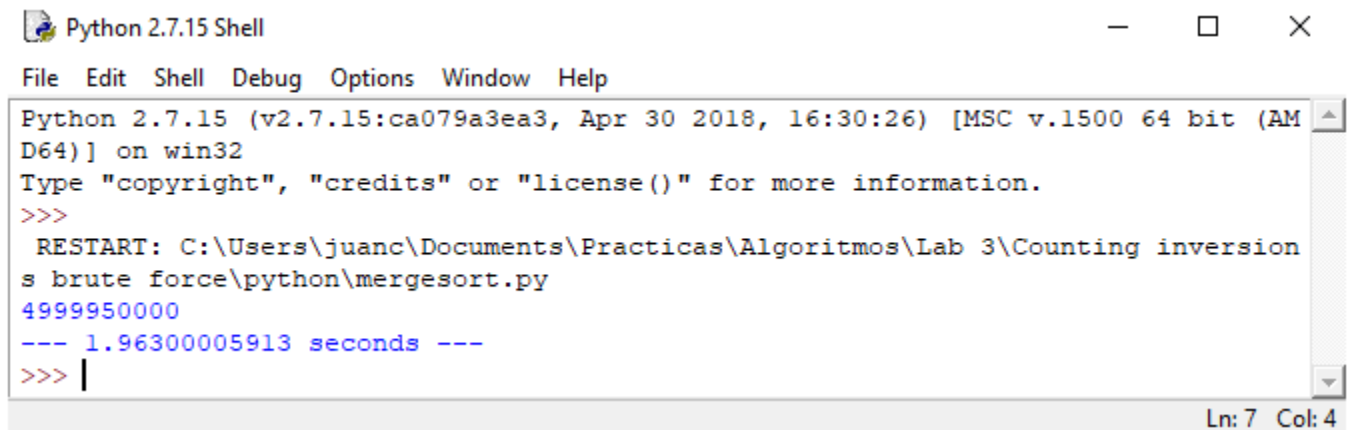
Sorted decreasing BruteForce:



```
Python 2.7.15 Shell
File Edit Shell Debug Options Window Help
Python 2.7.15 (v2.7.15:ca079a3ea3, Apr 30 2018, 16:30:26) [MSC v.1500 64 bit (AMD64)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
RESTART: C:/Users/juanc/Documents/Practicas/Algoritmos/Lab 3/Counting inversions brute force/python/force insort.py
4999950000
--- 5118.68599987 seconds ---
>>> |
```

Ln: 7 Col: 4

Sorted decreasing MergeSort:



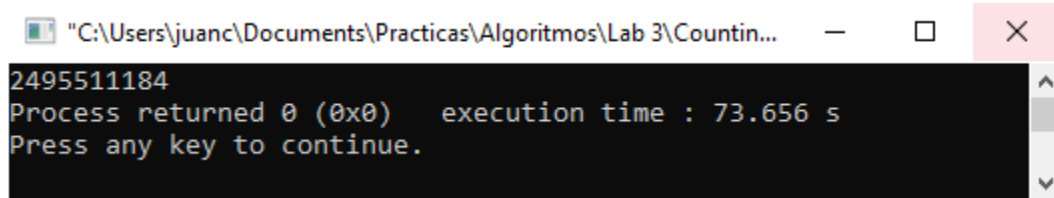
```
Python 2.7.15 Shell
File Edit Shell Debug Options Window Help
Python 2.7.15 (v2.7.15:ca079a3ea3, Apr 30 2018, 16:30:26) [MSC v.1500 64 bit (AMD64)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
RESTART: C:\Users\juanc\Documents\Practicas\Algoritmos\Lab 3\Counting inversions brute force\python\mergesort.py
4999950000
--- 1.96300005913 seconds ---
>>> |
```

Ln: 7 Col: 4

6 Run in your local machine the brute force and divide and conquer algorithms in C or C++

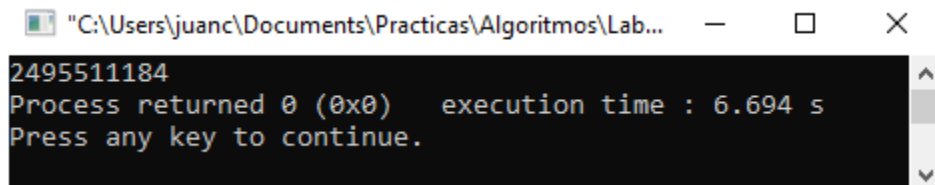
calculate the time for the first 10^5 numbers of size instance from:

Hackearth BruteForce:



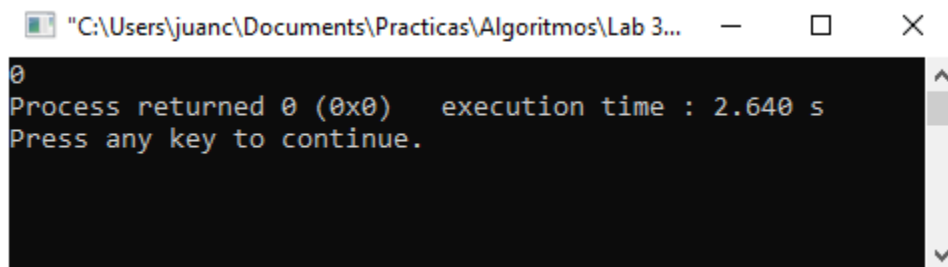
```
"C:\Users\juanc\Documents\Practicas\Algoritmos\Lab 3\Countin...  
2495511184  
Process returned 0 (0x0) execution time : 73.656 s  
Press any key to continue.
```

Hackearth MergeSort:



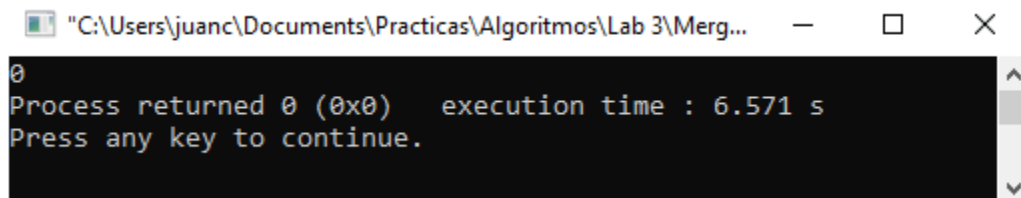
```
"C:\Users\juanc\Documents\Practicas\Algoritmos\Lab...  
2495511184  
Process returned 0 (0x0) execution time : 6.694 s  
Press any key to continue.
```

Sorted increasing BruteForce:



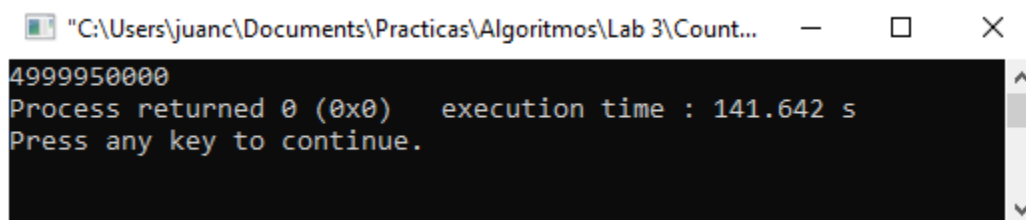
```
"C:\Users\juanc\Documents\Practicas\Algoritmos\Lab 3...  
0  
Process returned 0 (0x0) execution time : 2.640 s  
Press any key to continue.
```

Sorted increasing MergeSort:



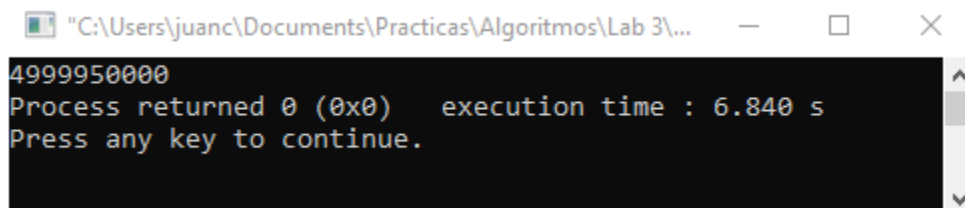
```
"C:\Users\juanc\Documents\Practicas\Algoritmos\Lab 3\Merg...  
0  
Process returned 0 (0x0) execution time : 6.571 s  
Press any key to continue.
```

Sorted decreasing BruteForce:



```
"C:\Users\juanc\Documents\Practicas\Algoritmos\Lab 3\Count...  
4999950000  
Process returned 0 (0x0) execution time : 141.642 s  
Press any key to continue.
```

Sorted decreasing MergeSort:



```
"C:\Users\juanc\Documents\Practicas\Algoritmos\Lab 3\...  
4999950000  
Process returned 0 (0x0) execution time : 6.840 s  
Press any key to continue.
```