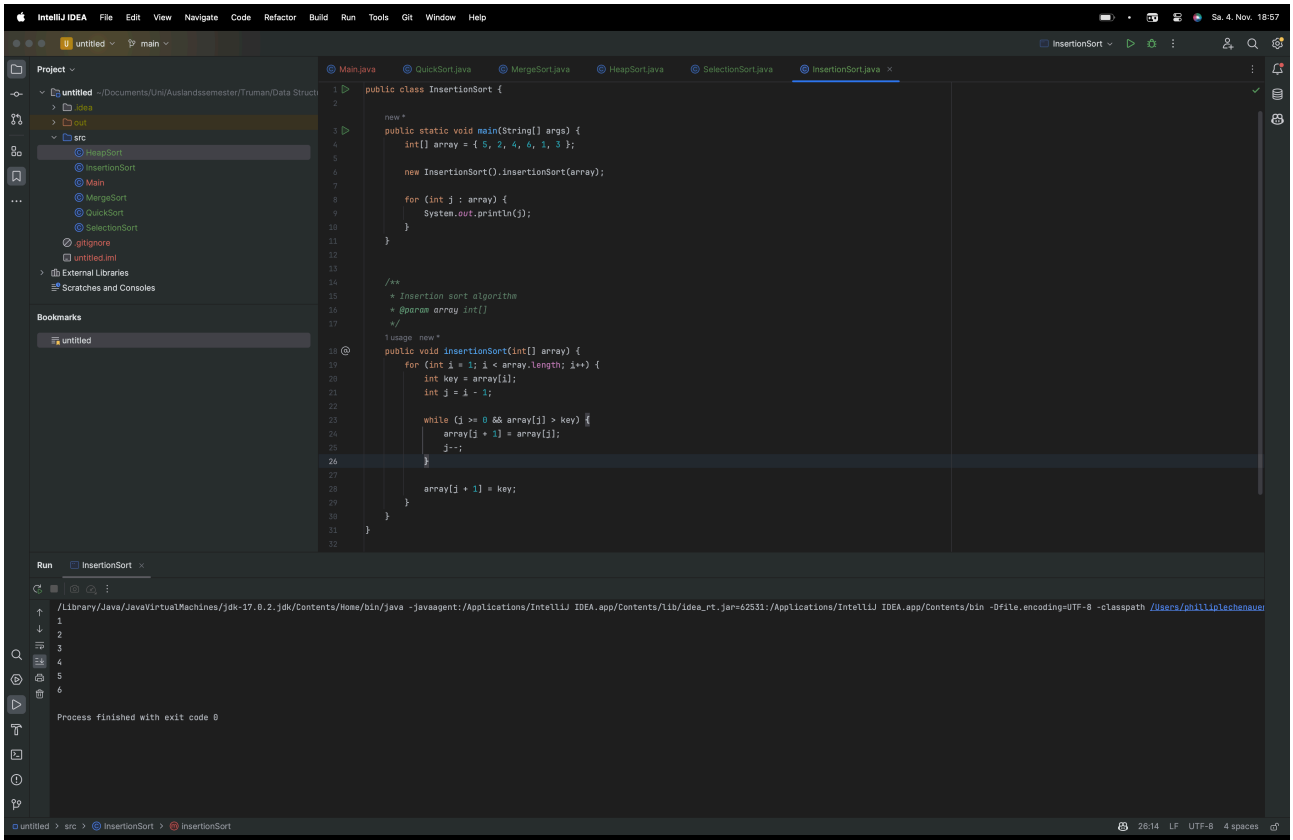
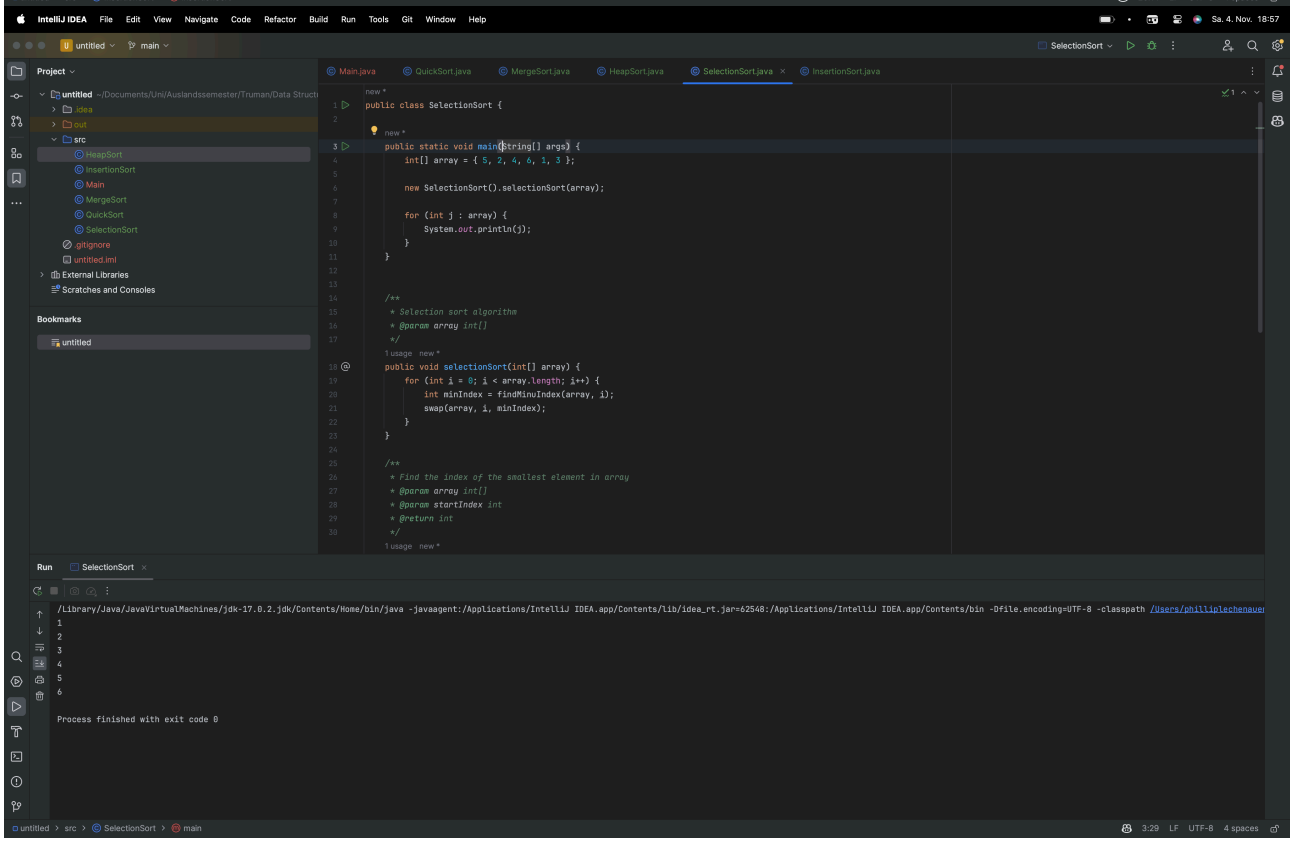
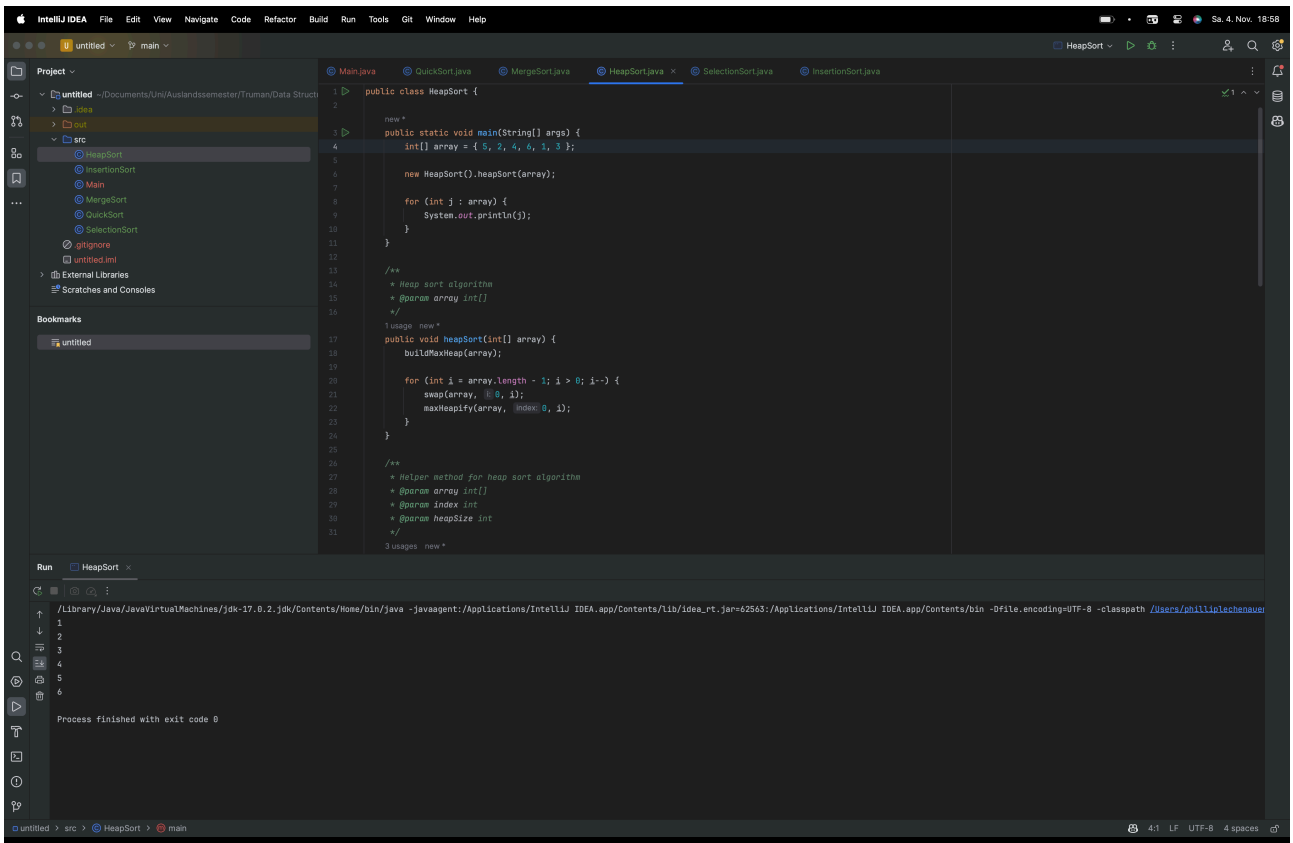
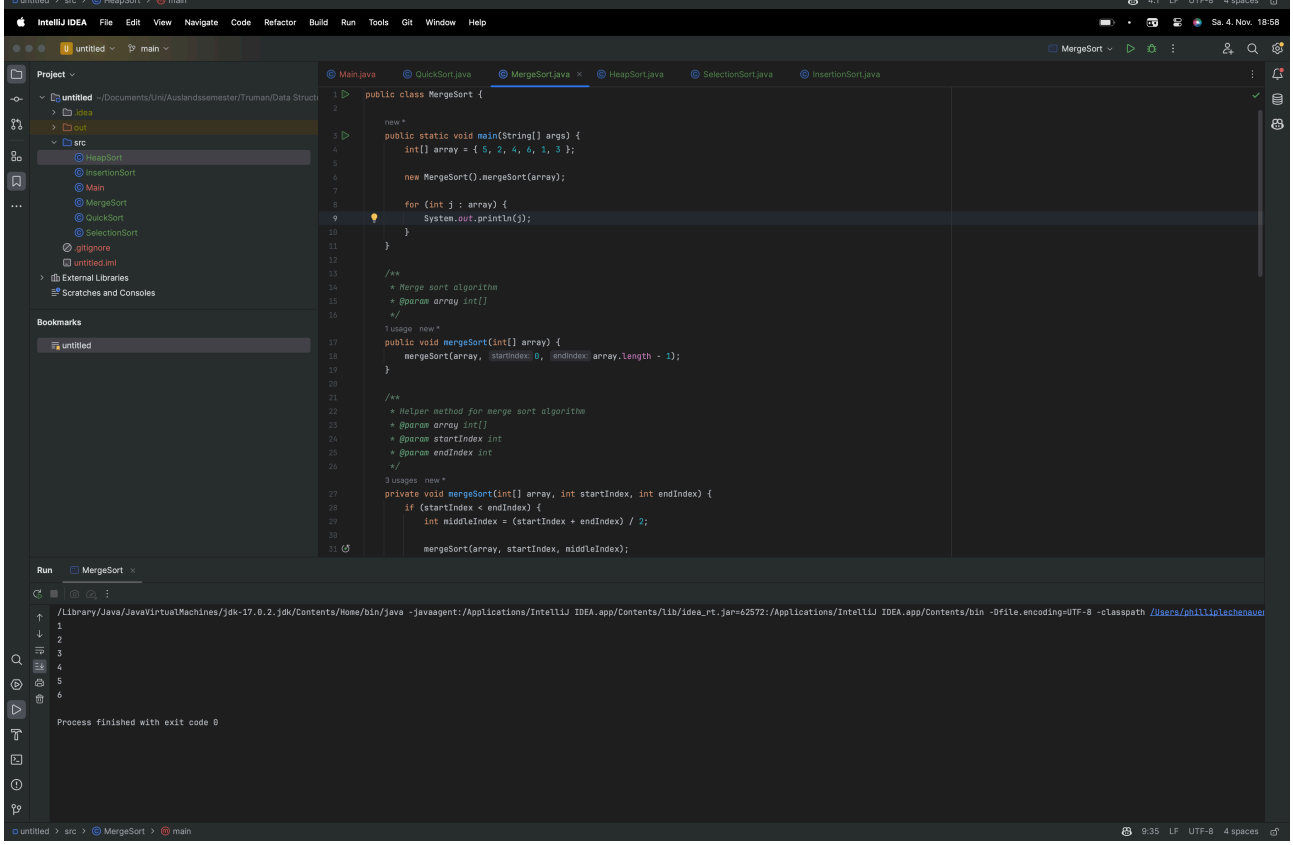
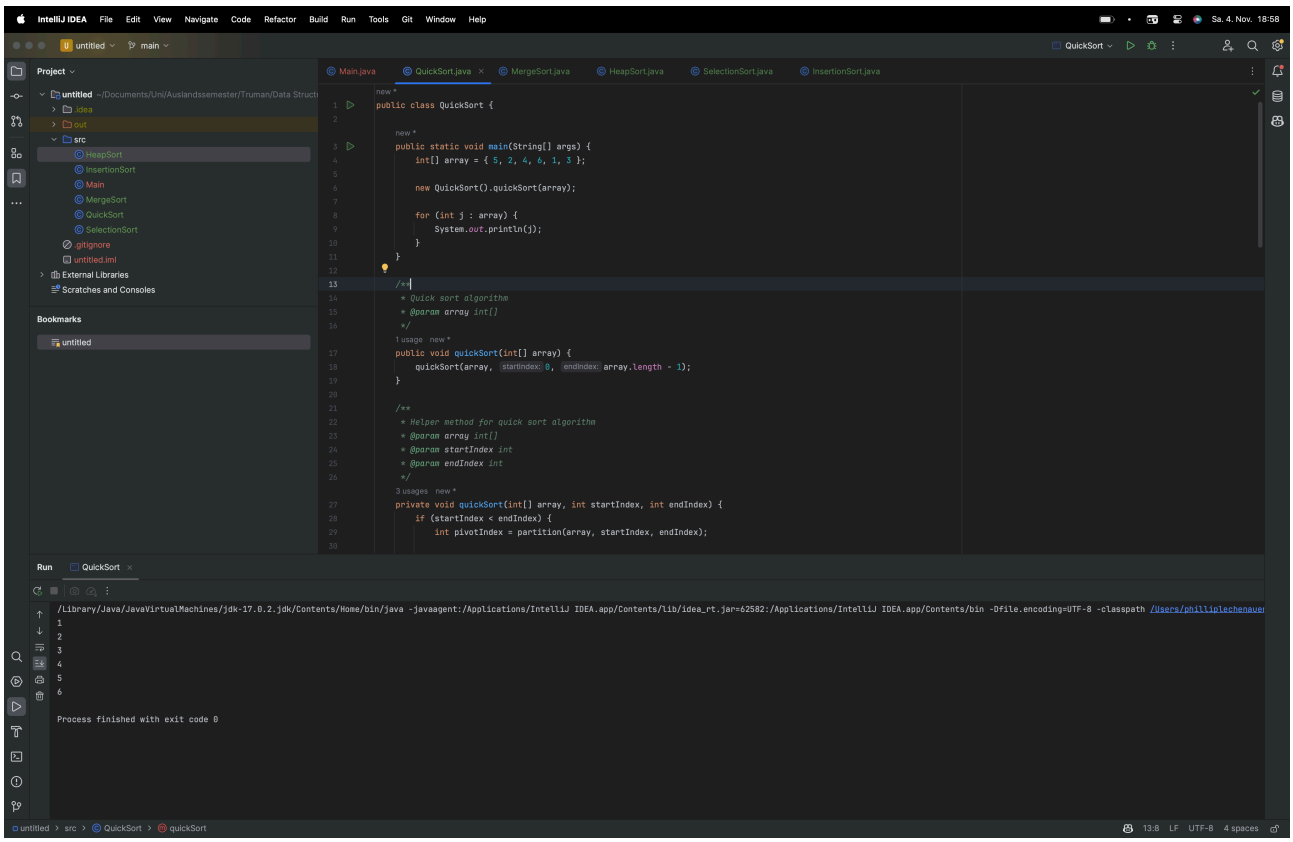
Deliverable 1



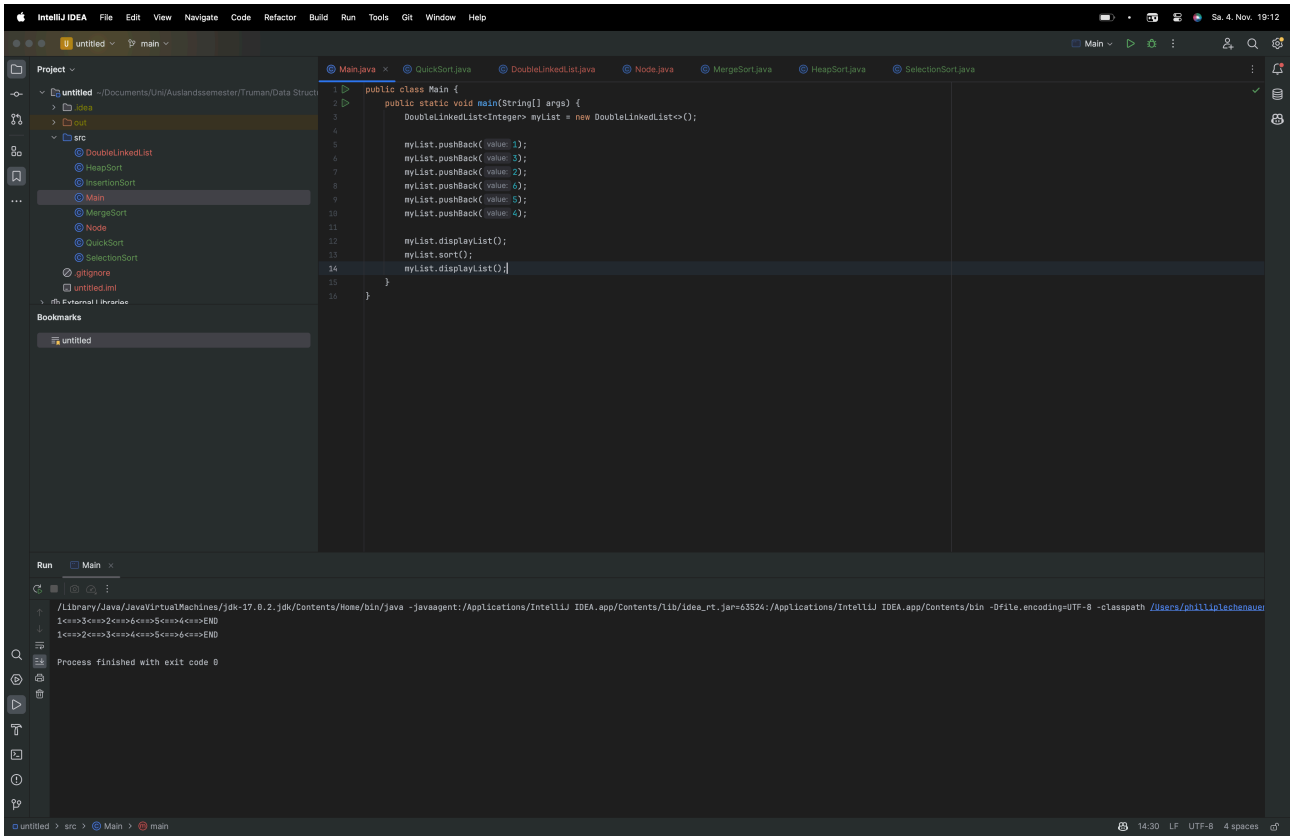



IntelliJ IDEA File Edit View Navigate Code Refactor Build Run Tools Git Window Help
Sa. 4. Nov. 18:58
untitled main
HeapSort
Project
untitled ~/Documents/Uni/Auslandssemester/Truman/Data Structi
idea
out
src
HeapSort
InsertionSort
Main
MergeSort
QuickSort
SelectionSort
.gitignore
untitled.iml
External Libraries
Scratches and Consoles
Bookmarks
untitled
Main.java
QuickSort.java
MergeSort.java
HeapSort.java
SelectionSort.java
InsertionSort.java
public class HeapSort {
new *
public static void main(String[] args) {
int[] array = { 5, 2, 4, 6, 1, 3 };
new HeapSort().heapSort(array);
for (int j : array) {
System.out.println(j);
}
}
/**
* Heap sort algorithm
* @param array int[]
*/
1 usage new *
public void heapSort(int[] array) {
buildMaxHeap(array);
for (int i = array.length - 1; i > 0; i--) {
swap(array, i: 0, i);
maxHeapify(array, index: 0, i);
}
}
/**
* Helper method for heap sort algorithm
* @param array int[]
* @param index int
* @param heapSize int
*/
3 usages new *
Run HeapSort
/Library/Java/JavaVirtualMachines/jdk-17.0.2.jdk/Contents/Home/bin/java -javaagent:/Applications/IntelliJ IDEA.app/Contents/lib/idea_rt.jar=62563:/Applications/IntelliJ IDEA.app/Contents/bin -Dfile.encoding=UTF-8 -classpath /Users/phillipl
1
2
3
4
5
6
Process finished with exit code 0
untitled src HeapSort main
4:1 LF UTF-8 4 spaces


IntelliJ IDEA File Edit View Navigate Code Refactor Build Run Tools Git Window Help
Sa. 4. Nov. 18:58
untitled main
MergeSort
Project
untitled ~/Documents/Uni/Auslandssemester/Truman/Data Structi
idea
out
src
HeapSort
InsertionSort
Main
MergeSort
QuickSort
SelectionSort
.gitignore
untitled.iml
External Libraries
Scratches and Consoles
Bookmarks
untitled
Main.java
QuickSort.java
MergeSort.java
HeapSort.java
SelectionSort.java
InsertionSort.java
public class MergeSort {
new *
public static void main(String[] args) {
int[] array = { 5, 2, 4, 6, 1, 3 };
new MergeSort().mergeSort(array);
for (int j : array) {
System.out.println(j);
}
}
/**
* Merge sort algorithm
* @param array int[]
*/
1 usage new *
public void mergeSort(int[] array) {
mergeSort(array, startIndex: 0, endIndex: array.length - 1);
}
/**
* Helper method for merge sort algorithm
* @param array int[]
* @param startIndex int
* @param endIndex int
*/
3 usages new *
private void mergeSort(int[] array, int startIndex, int endIndex) {
if (startIndex < endIndex) {
int middleIndex = (startIndex + endIndex) / 2;
mergeSort(array, startIndex, middleIndex);
Run MergeSort
/Library/Java/JavaVirtualMachines/jdk-17.0.2.jdk/Contents/Home/bin/java -javaagent:/Applications/IntelliJ IDEA.app/Contents/lib/idea_rt.jar=62572:/Applications/IntelliJ IDEA.app/Contents/bin -Dfile.encoding=UTF-8 -classpath /Users/phillipl
1
2
3
4
5
6
Process finished with exit code 0
untitled src MergeSort main
9:35 LF UTF-8 4 spaces


IntelliJ IDEA File Edit View Navigate Code Refactor Build Run Tools Git Window Help
Sa. 4. Nov. 18:58
untitled main
QuickSort
Project
untitled ~/Documents/Uni/Auslandssemester/Truman/Data Structi
idea
out
src
HeapSort
InsertionSort
Main
MergeSort
QuickSort
SelectionSort
.gitignore
untitled.iml
External Libraries
Scratches and Consoles
Bookmarks
untitled
Main.java
QuickSort.java
MergeSort.java
HeapSort.java
SelectionSort.java
InsertionSort.java
new *
public class QuickSort {
new *
public static void main(String[] args) {
int[] array = { 5, 2, 4, 6, 1, 3 };
new QuickSort().quickSort(array);
for (int j : array) {
System.out.println(j);
}
}
/**
* Quick sort algorithm
* @param array int[]
*/
1 usage new *
public void quickSort(int[] array) {
quickSort(array, startIndex: 0, endIndex: array.length - 1);
}
/**
* Helper method for quick sort algorithm
* @param array int[]
* @param startIndex int
* @param endIndex int
*/
3 usages new *
private void quickSort(int[] array, int startIndex, int endIndex) {
if (startIndex < endIndex) {
int pivotIndex = partition(array, startIndex, endIndex);
Run
QuickSort
/Library/Java/JavaVirtualMachines/jdk-17.0.2.jdk/Contents/Home/bin/java -javaagent:/Applications/IntelliJ IDEA.app/Contents/lib/idea_rt.jar=62582:/Applications/IntelliJ IDEA.app/Contents/bin -Dfile.encoding=UTF-8 -classpath /Users/phillipchenauer
1
2
3
4
5
6
Process finished with exit code 0
untitled src QuickSort quickSort
13:8 LF UTF-8 4 spaces

Deliverable 2

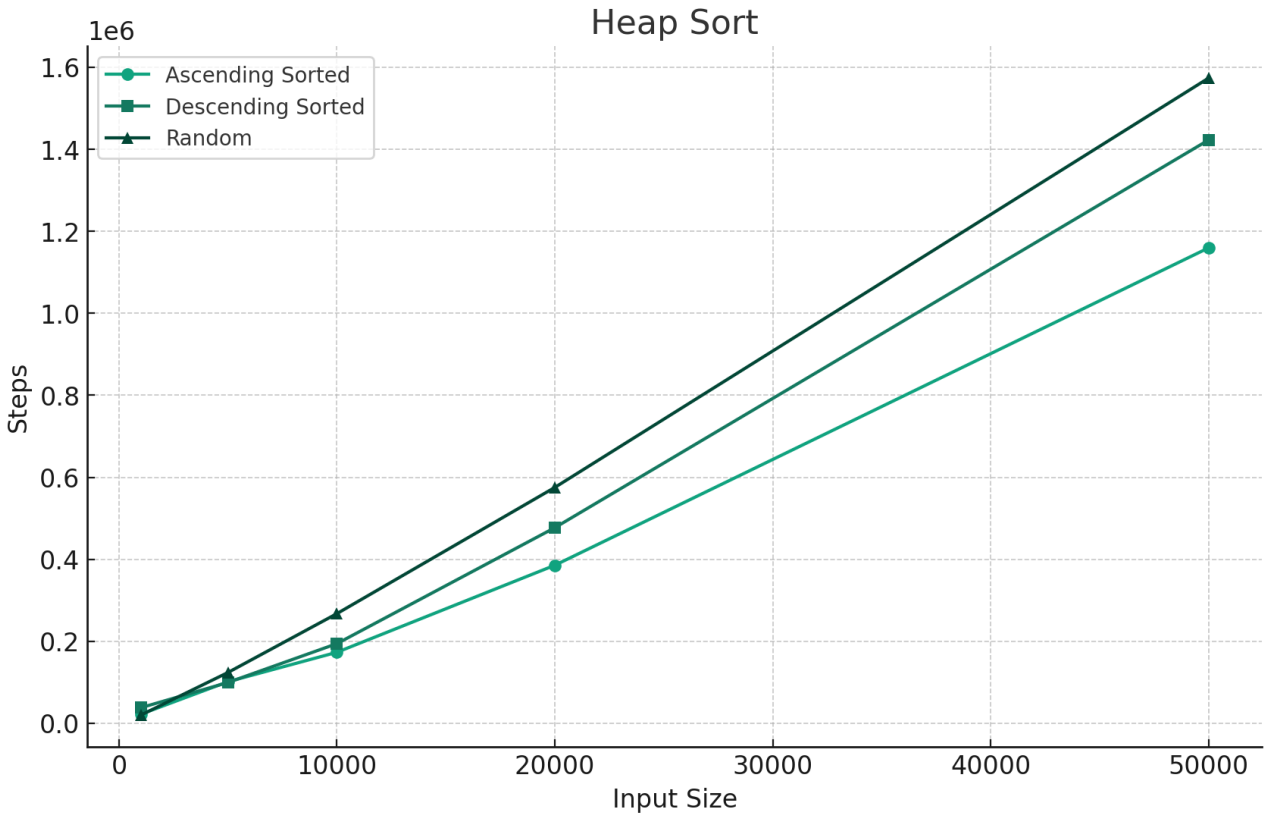


Deliverable 3

I did it with only 1.000 steps, my computer was to slow for 10.000
Quicksort with 50.000 elements ran into an stack overflow error. so I skipped 50.000 for some of the simulations.

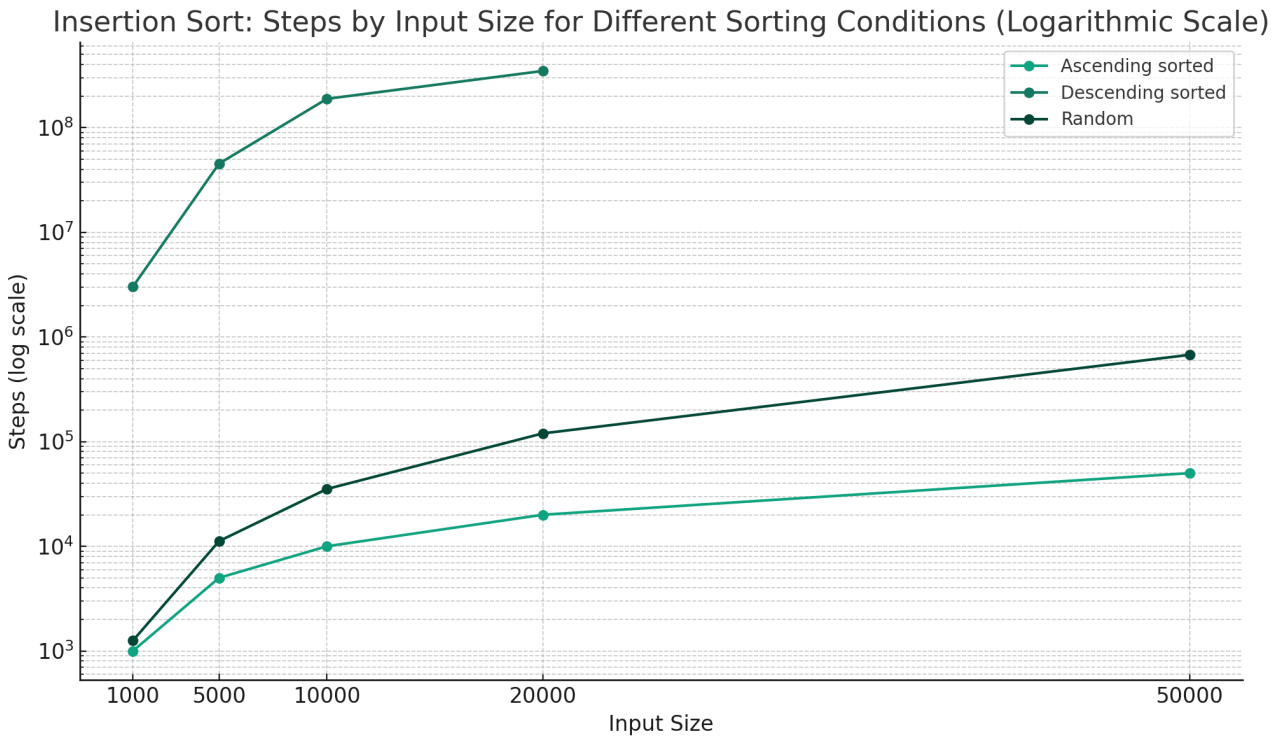
Heap Sort

Input Size	Ascending sorted	Descending sorted	Random
1k	21973	37857	19803
5k	101272	99435	123733
10k	173079	194178	267339
20k	385350	476992	575172
50k	1159458	1422621	1573603



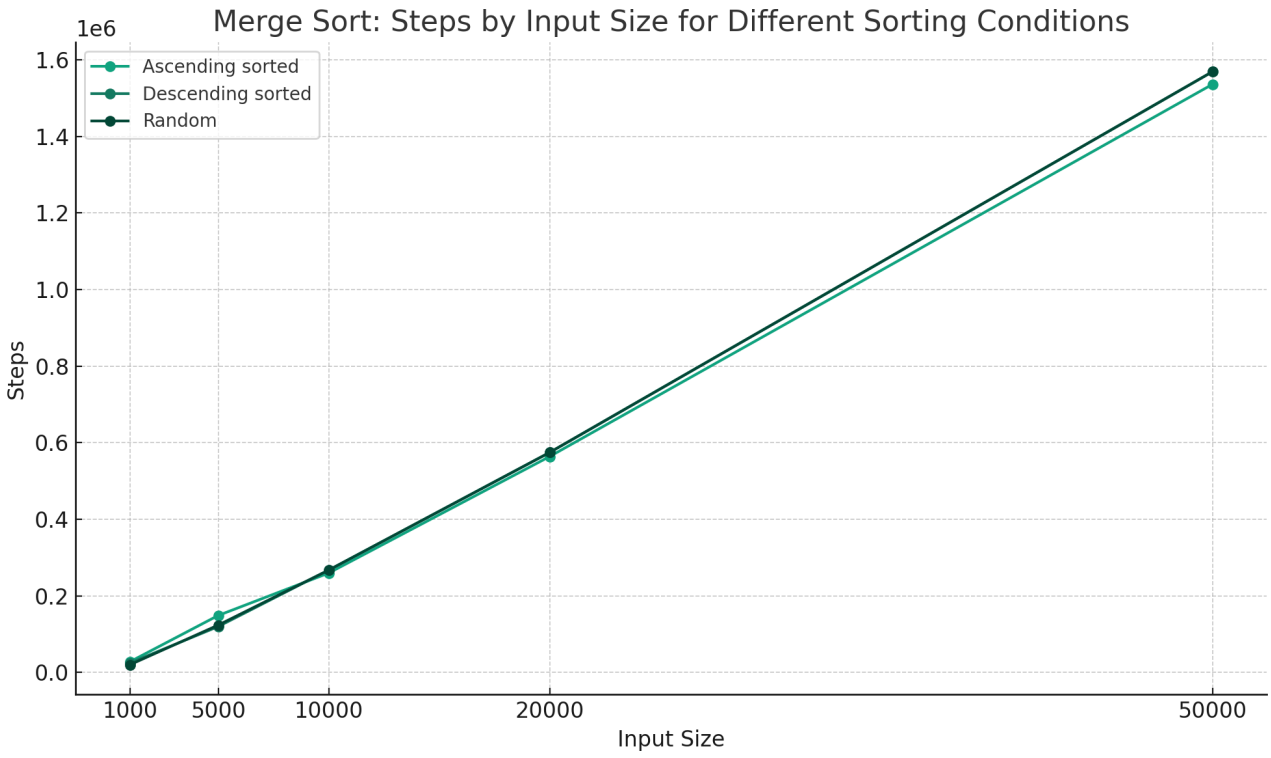
Insertion Sort

Input Size	Ascending sorted	Descending sorted	Random
1k	999	3013321	1254
5k	4999	45252676	11213
10k	9999	188107833	35264
20k	19999	346942403	119680
50k	49999		674542



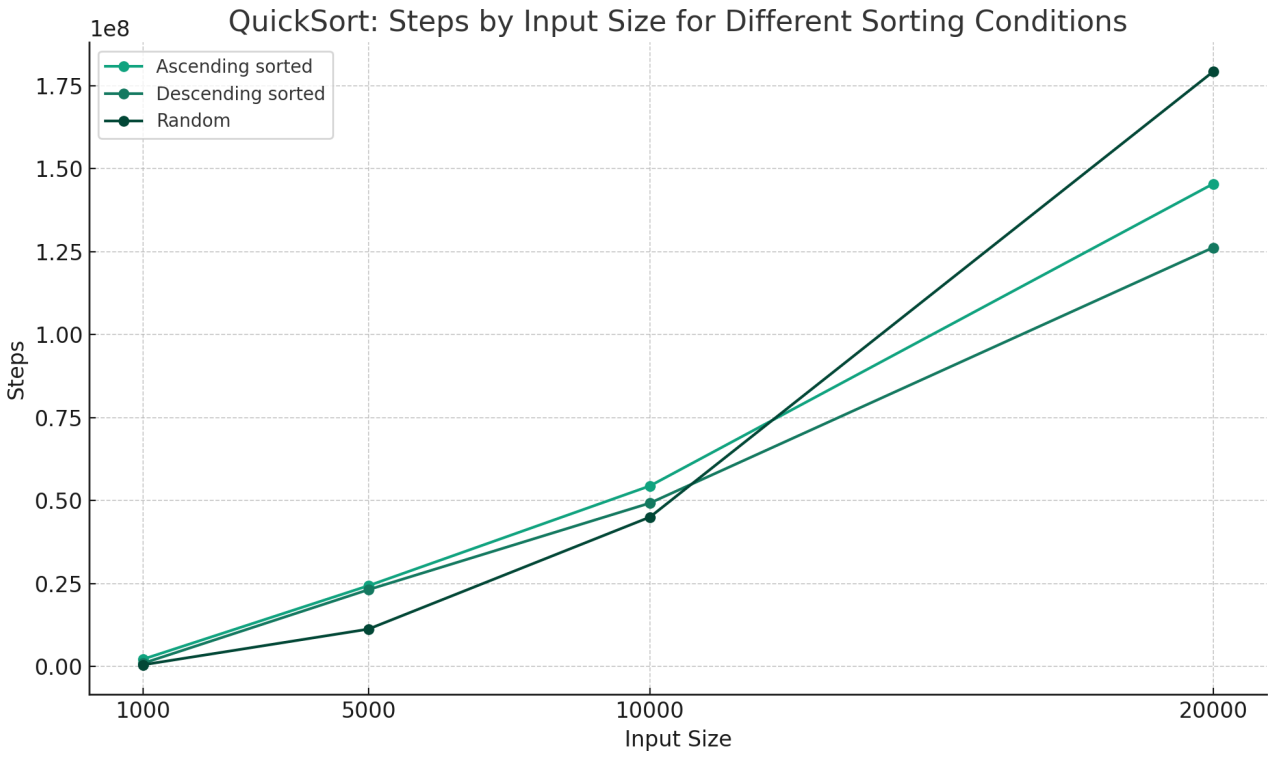
Merge Sort

Input Size	Ascending sorted	Descending sorted	Random
1k	27807	24521	19952
5k	148768	119868	123616
10k	259496	267232	267232
20k	563805	574464	574464
50k	1535905		1568928



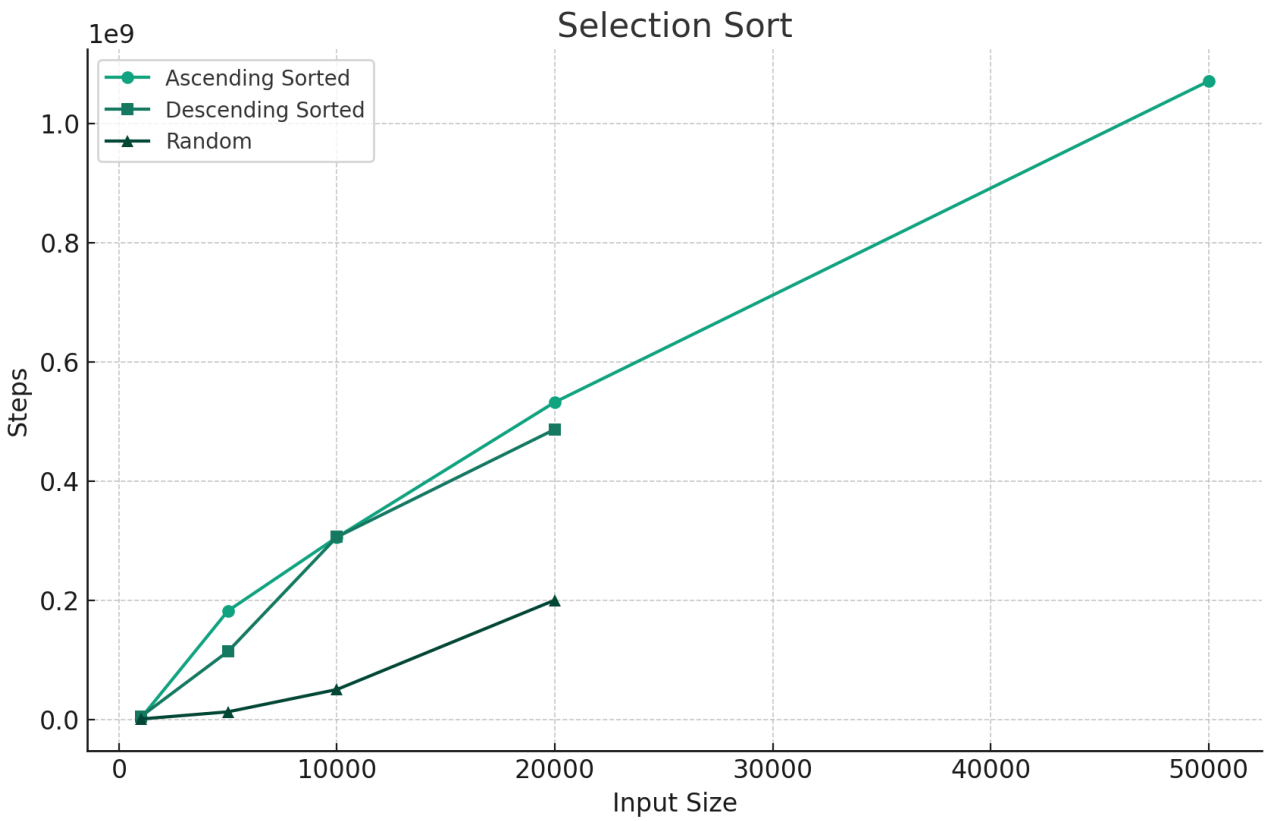
Quick Sort

Input Size	Ascending sorted	Descending sorted	Random
1k	2141391	912530	461047
5k	24288104	23094211	11211483
10k	54375444	49208635	44980789
20k	145428387	126219805	179241066
50k			



Selection Sort

Input Size	Ascending sorted	Descending sorted	Random
1k	1671499	4414140	501500
5k	182044720	113833624	12507500
10k	305555611	305982970	50015000
20k	532339842	486728370	200030000
50k	1071140318		



Deliverable 4

A) Quick Sort because we always select the first element as pivot
B) Selection Sort due to its quadratic time complexity
C) Merge Sort due to its stable divide-and-conquer approach
D) Selection Sort due to its quadratic time complexity