CS225

EX 1. I use C++ code to represant the algorithm.

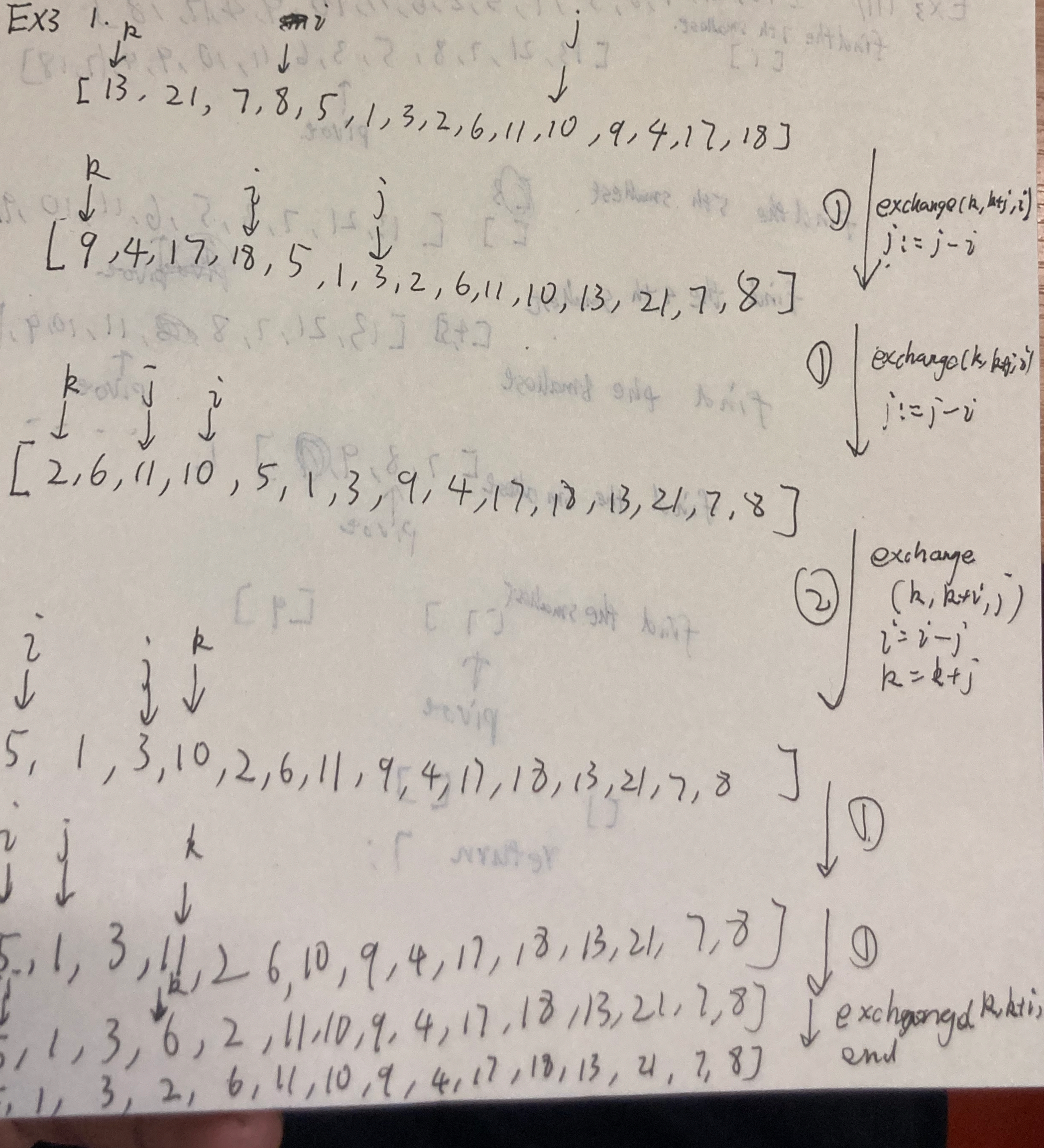
```
void extract( T key )
{  T temp;
   for ( int i = numitem; i > 0; --i )
   {
      temp = this -> popfront( );
      if (temp == key )
          continue;
      this -> push back (temp);
   }
}
```

in all caces, the time complexity is O(n) obviously.

EX2. Deques can turn insertion sort into an optimal sorting algorithm.

Since we can push the new value at the front and end of the sequence, the worst case will still be $O(n^2)$, but the single insertion will be $\frac{n}{2}$ instead of n.

EX3 1.



ans: [5, 1, 3, 2, 6, 11, 10, 9, 4, 17, 18, 13, 21, 7, 8]

~~Ex3, (i), (ii)~~

Ex4 (i) We need to ~~use its~~ send all its children to the root and ~~mark~~ mark its parent.

Ex3 (iii) [13, 21, 7, 8, 5, 1, 3, 2, 6, 11, 10, 9, 4, 12, 18]

pivot.

~~fixed~~

find the 7th smallest.

[ ] [13, 21, 7, 8, 5, 3, 6, 11, 10, 9, 4, 12, 18]

pivot.

find the 5th smallest

[ ] [13, 21, 7, 8, 5, 6, 11, 10, 9, 4, 12]

~~pivot~~ pivot

find the 4th smallest

[4,5] [13, 21, 7, 8, 11, 10, 9, 12, 18]

pivot.

find the smallest

[7, 8, 9] [. . .]

pivot

find the smallest

[7] [9]

pivot

[] []

return 7;