Let $(a_n) = (a_1, a_2, \dots, a_n)$ a sequence of positive and distinct integers.

We'll use the transitivity of the relations $<$ and $>$.

(1) $\forall a \forall b \forall c (if\ a < b\ and\ b < c\ then\ a < c)$.

We could also put $>$ instead of $<$.

Let $3 \leq i$

Observe a_{i-1}, a_i, a_{i+1}.

(2) Assume $a_{i-1} < a_i$ and $a_i < a_{i+1}$.

So, we can say that the ordering structure of the three integers is $a_{i-1} < a_i < a_{i+1}$

From (1), if we'll switch places between a_i and a_{i+1} we'll get the correct structure without changing the structure in **places** $i-1$ and i, thus we get $a_{i-1} < a_{i+1} > a_i$

(3) Assume $a_{i-1} > a_i$ and $a_i > a_{i+1}$.

The ordering structure of the three integers is $a_{i-1} > a_i > a_{i+1}$**.**

From (1), if we'll switch places between a_i and a_{i+1} we'll get the correct structure and without changing the structure of **places** $i-1$ and i , thus we get $a_{i-1} > a_{i+1} < a_i$.

We can iterate the elements of the sequence such that for any iteration $1 \leq j$:

> **(4)** if j is odd and $a_j > a_{j+1}$ then switch a_j and a_{j+1}
>
> **(5)** if j is even and $a_j < a_{j+1}$ then switch a_j and a_{j+1}

We know from (3) + (4) that for if $1 < j$ and we did a switch, then it didn't affect the ordering structure of previous elements in the sequence, therefore, if we finished iterating all elements in the sequence, we know that the sequence now has the required structure.

NOTE: the first index of the sequence is one.

In the implementation of the above pseudo-code indexes are starting from zero.

and in (4), I replaced odd with even and in (5) I replaced even with odd.