

American Computer Science League

2021-2022 • Finals Program #1: Waves • Junior Division

PROBLEM: Given a list of integers, arrange the numbers into a wave-like pattern: numbers in ascending order, followed by numbers in descending order, then ascending order, then descending, and so on. Given a number, N , and a list of numbers, create a new list with the first N numbers rearranged into ascending order; the next $N-1$ numbers rearranged into descending order; the next $N-2$ in ascending order; then next $N-3$ in descending order. Stop this process when the wave has a single element, and rearrange the remaining numbers as a final wave in the opposite order from the previous or next to last wave. However, if there are not enough numbers in the list for a complete wave, append another copy of the original list, and continue until coming to a wave with a length of 1.

EXAMPLES: Consider the following list of numbers:

3 14 1 59 26 535 8 97 932 38 462 64 3 3 83 279 50 288 4 19 716 939 9 37510

When $N=6$ the result would be the following. The highlights show the increasing waves. Note that the final wave has the 3 elements remaining in the array after a wave of a single element.

1 3 14 26 59 535 932 462 97 38 8 3 3 64 83 288 279 50 4 19 716 9 939 37510

When $N=5$ the result is as follows:

1 3 14 26 59 932 535 97 8 38 64 462 3 3 83 37510 939 716 288 279 50 19 9 4

Now consider the following list of numbers:

3 1 4 1 5 9 2 6

When $N=6$ the result is as follows. Note that one copy of the initial list was added when trying to build a wave of size 5 and another copy was added when trying to build the wave of size 3.

1 1 3 4 5 9 6 4 3 2 1 1 2 5 9 6 3 1 1 4 5 2 6 9

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INPUT: A positive integer N (the length of the first wave) and a string of integers each separated by a single space. The maximum number of integers in the string will be 100.

OUTPUT: A string representing the new list as described above with each integer separated by a single space.

SAMPLE INPUT:

```
1. 6 3 14 1 59 26 535 8 97 932 38 462 64 3 3 83 279 50 288 4 19 716
   939 9 37510
2. 5 3 14 1 59 26 535 8 97 932 38 462 64 3 3 83 279 50 288 4 19 716
   939 9 37510
3. 8 3 14 1 59 26 535 8 97 932 38 462 64 3 3 83 279 50 288 4 19 716
   939 9 37510
4. 6 3 1 4 1 5 9 2 6
5. 9 3 141 5926 535 89 72 3 846 26 43 383 27
```

SAMPLE OUTPUT:

```
1. 1 3 14 26 59 535 932 462 97 38 8 3 3 64 83 288 279 50 4 19 716 9
   939 37510
2. 1 3 14 26 59 932 535 97 8 38 64 462 3 3 83 37510 939 716 288 279
   50 19 9 4
3. 1 3 8 14 26 59 97 535 932 462 83 64 38 3 3 4 19 50 279 288 716
   37510 939 14 9 3 1 26 59 535 932 97 8 38 462 64 3 3 4 9 19 50 83
   279 288 716 939 37510
4. 1 1 3 4 5 9 6 4 3 2 1 1 2 5 9 6 3 1 1 4 5 2 6 9
5. 3 3 26 72 89 141 535 846 5926 5926 535 383 141 89 43 27 3 3 26
   27 43 72 383 846 5926 535 141 89 72 3 3 26 43 383 846 5926 141
   27 3 72 89 535 846 3 26 383 43 27
```

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TEST DATA

TEST INPUT:

1. 3 2 718 2 8 18 28 45 90 452 3 5 3 6028 74 7 135 27
2. 5 2 718 2 8 18 28 45 90 452 3 5 3 6028 74 7 135 27
3. 7 2 718 2 8 18 28 45 90 452 3 5 3 6028 74 7 135 27
4. 9 2 718 2 8 18 28 45 90 452 3 5 3 6028 74 7 135 27
5. 4 1 2 3 4
6. 5 1 2
7. 5 1
8. 3 1 2 3 4 5 6
9. 1 1 2 3 4 5
10. 1 1

TEST OUTPUT:

1. 2 2 718 18 8 28 6028 452 135 90 74 45 27 7 5 3 3
2. 2 2 8 18 718 452 90 45 28 3 3 5 6028 74 7 135 27
3. 2 2 8 18 28 45 718 6028 452 90 5 3 3 2 7 27 74 135 718 18
8 2 28 45 90 452 3 5 6028 135 74 27 7 3
4. 2 2 8 18 28 45 90 452 718 6028 135 74 27 7 5 3 3 2 2 8 18
28 45 718 6028 452 90 5 3 3 2 7 27 74 135 718 18 8 2 28
45 90 452 3 5 6028 135 74 27 7 3
5. 1 2 3 4 3 2 1 1 4 2 3 4
6. 1 1 1 2 2 2 2 1 1 1 2 2 2 1 1 2
7. 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
8. 1 2 3 5 4 6
9. 1 5 4 3 2
10. 1