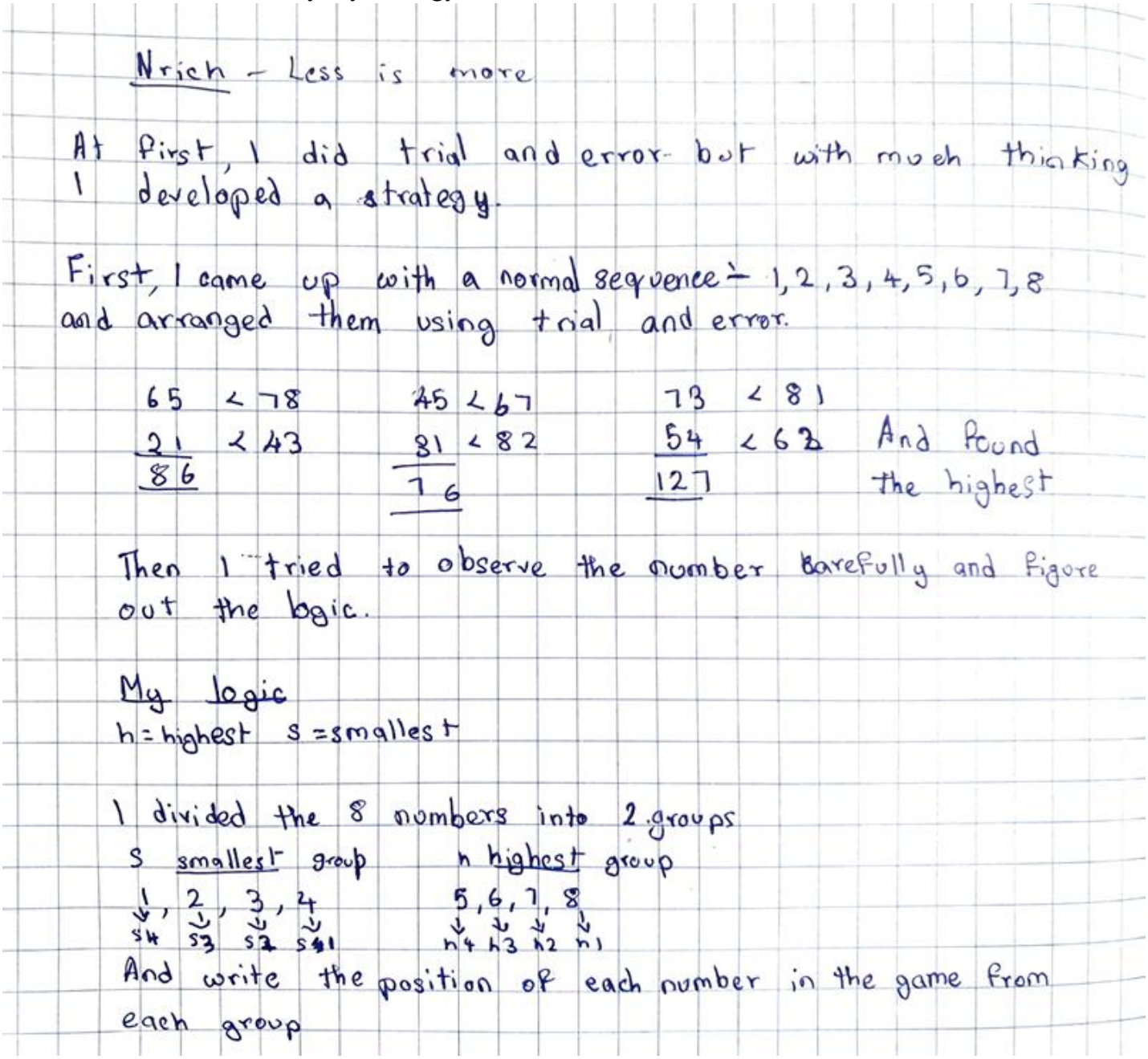
Solution for Less is More NRICH primary live problem

Hello NRICH team,

This is Meera Sriram from Chennai, India.

I worked on Less is More (https://nrich.maths.org/problems/less-more) NRICH primary live problem as part of the STEPS IN MATH program conducted by The GYM Foundation. (https://thegymfoundation.com/stepsinmath)

Please find my scanned copy of handwritten solution below for the Less is More problem. It was a very interesting game to find the highest score and to find my own strategy to form numbers that get highest score. I also understood why my strategy will not work for some set of numbers.



Nrich – Less is more

At first, I did trial and error but with much thinking I developed a strategy.

First, I came up with a normal sequence – 1, 2, 3, 4, 5, 6, 7, 8 and arranged them using trial and error.

65 < 78
21 < 43
86

45 < 67
81 < 82
76

73 < 81
54 < 63
127

And found the highest

Then I tried to observe the number carefully and figure out the logic.

My logic

h = highest s = smallest

I divided the 8 numbers into 2 groups

s smallest group: 1, 2, 3, 4 → s4, s3, s2, s1

h highest group: 5, 6, 7, 8 → h4, h3, h2, h1

And write the position of each number in the game from each group

Approach to form 2-digit numbers

73 < 81 — h2, s2 < h1, s4

54 < 62 — h4, s1 < h3, s3

This approach wouldn't work if it was in random order, like 3, 8, 2, 1, 5, 7, 6, 4. So I Realised, the numbers should be arranged in ascending order at the first itself.

Steps to find four 2-digit numbers

N1 < N2

N3 < N4

1) Arrange the numbers in ascending order.
2) Divide the first four numbers as 's' group, and the other four numbers as 'h' group.

's'

s4, s3, s2, s1

'h'

h4, h3, h2, h1

3) The highest four numbers should be placed in the tens place value, the smallest four numbers should be placed in the ones place value like below.

h2, s2 < h1, s4

h4, s1 < h3, s3

Check

1) 5, 3, 9, 7, 0, 2, 1, 4

0, 1, 2, 3, 4, 5, 7, 9

72 < 90

43 < 51

115 = highest

It works but what if the numbers repeat?

2) 5, 5, 6, 5, 4, 4, 1, 6

1, 4, 4, 5, 5, 5, 6, 6

64 < 61

55 < 54

Oh, it does not work because the tens are mostly same and the ones place value and its digits matter the most. So in this case, the approach should be -

h2, s4 < h1, s2

h4, s3 < h3, s1

Check

5, 5, 6, 5, 4, 4, 1, 6

1, 4, 4, 5, 5, 5, 6, 6

61 < 64

54 < 55

115 = highest

When all the number except one is same, the rule cannot be satisfied.