

## **GANIT KREEDA MONDAY BATCH**

I am Preethi Rao. I am one of the facilitators at '**Ganit Kreeda**', **Vichar Vatika, India**. I worked collaboratively with a group of students from 4th grade to 8th grade, online, on "**WIPEOUT**". The names of the students are:

Abheer Deo, Anirved Mahanta, Aslesha Dubey, Ayansh Makwana, Dia Ramalingam, Divyaan Bordia, Eshaan Bajaj, Harshad Ganesh, Jaydeep Kothari, Naaysha Singh Patel, Neil Chinmulgund, Shubham Shah, Sidharth Sujesh, Siddhanth Adhavan, Vidhut Raghuraman.

Children noted down their observations when N is even and when N is odd:

<b>Sequence</b>	<b>Mean</b>	<b>Wipeout #</b>	<b>New Mean</b>
1,2,3,4	2.5	1,4	3,2
1,2,3,4,5,6	3.5	1,6	4,3
1,2,3,4,5,6,7,8	4.5	1,8	5,4
1,2,3,4,5,6,7,8,9,10	5.5	1,10	6,5
1,2,3,4,5,6,7,8,9,10,11,12	6.5	1,12	7,6
1,2,3,4,5,6,7,8,9,10,11,12,13,14	7.5	1,14	8,7
1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	8.5	1,16	9,8
1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18	9.5	1,18	10,9
1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20	10.5	1,20	11,10

<b>Sequence</b>	<b>Mean</b>	<b>Wipeout #</b>	<b>New Mean</b>
1,2,3	2	2	2
1,2,3,4,5	3	3	3
1,2,3,4,5,6,7	4	4	4
1,2,3,4,5,6,7,8,9	5	5	5
1,2,3,4,5,6,7,8,9,10,11	6	6	6
1,2,3,4,5,6,7,8,9,10,11,12,13,	7	7	7
1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	8	8	8
1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17	9	9	9
1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19	10	10	10

## WHEN N IS ODD

Children discovered that the Median of the sequence (when N is odd) is always the mean.

**Eshaan Bajaj explained it thus:**

“For a sequence, say 1,2,3,4 and 5, we can pair 1 and 5, 2 and 4. Each pair makes a 6. And then the Median can be shared equally between the two pairs  $3/2 = 1.5$  each. And so we have distributed the total equally between all the numbers, which is the definition of mean. Upon such distribution we see that we always get the Median as Mean. “

He also shows this distribution pictorially.

Q. Why Middle No. is always the mean = If we want to make <sup>equal</sup> pair of two no. from a sequence - 1, 2, 3, 4, 5 so we make first and last no. as a pair and second and second last no. as a pair -

1 2 3 4 5  
          1.5 1.5  
          6  
          6

and divide the middle no by 2 and give the two one part on one side and second half on another side.  
So in the case of mean, mean = average and average means to make all the no equal so in form of chart we pair and distribute -

+1	+1	1	2	3
+1	1	2	3	4
1	2	3	4	5

- This proves middle no. is always The Mean / Average

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Step 5-way ←→

## WHEN N IS EVEN

**Ayansh Makwana** explained why we get a whole number as mean when we Wipeout 1 or N, when N is even:

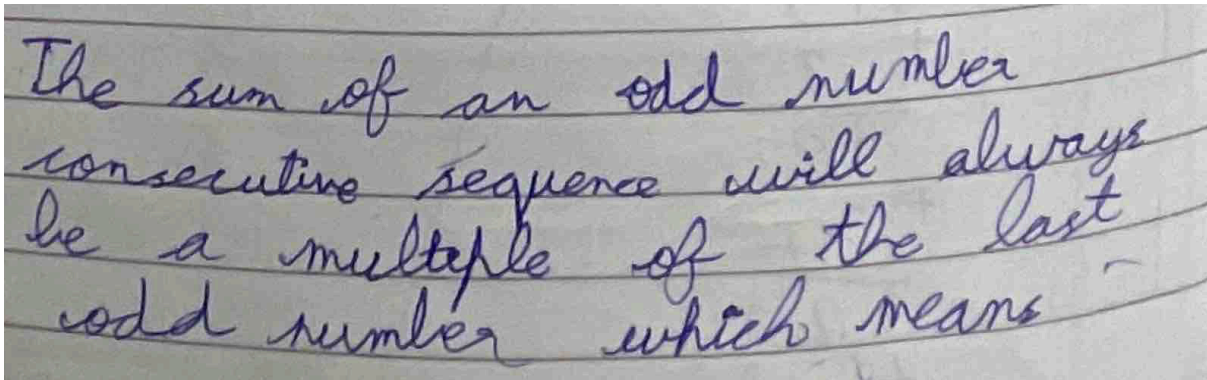
“ A sequence 1 to N has N numbers. When N is even and when we wipe out one number from the sequence we are left with N-1 numbers, and N-1 is odd. And the Mean of an odd set of consecutive numbers is always the median and a whole number.

For example in the sequence 1,2 ,3 and 4 ,

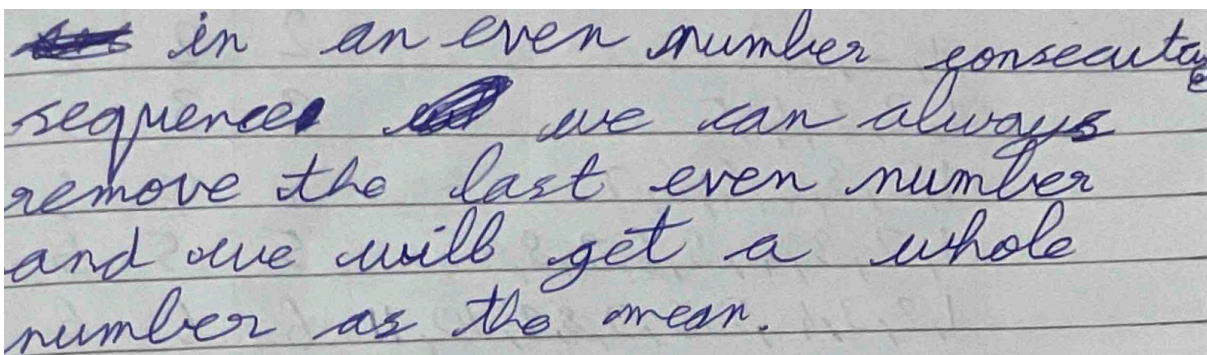
- a) when we wipe out 4, we are left with 3 numbers (an odd number) in the sequence i.e 1, 2 and 3. And in this sequence  $1 < 2 < 3$ . 1 is one less than 2. And 3 is one more than 2. And so the Mean of this sequence is the median 2.
- b) When we wipeout 1, we are left with 3 numbers(an odd number) in the sequence i.e 2,3 and 4. And in this sequence  $2 < 3 < 4$ . 2 is one less than 3. And 4 is one more than 3. And so the Mean of this sequence is the median 3.

**Sidharth Sujesh** discovered in a sequence 1 to N, where the numbers are consecutive and N is odd, the sum of that sequence is always a multiple of N.

Therefore in the sequence 1 to N, where the numbers are consecutive and N is even, if we remove N we get a sequence that ends with an odd number. And as mentioned above the sum of such a sequence is always a multiple of the last odd number (N-1<sup>th</sup> number in this case) and so the Mean will be a whole number.



The sum of an odd number consecutive sequence will always be a multiple of the last odd number which means



~~in~~ in an even number consecutive sequences we can always remove the last even number and we will get a whole number as the mean.

**Dia Ramalingam** observed that when we wipe out one number at a time in the sequence the totals are consecutive. She also explained why it is possible to wipe out two numbers in the sequence (when N is even) and hence get two different Means that are whole numbers:

- When we wipe out the last number, we are adding consecutive numbers starting from 1 and so the total is bound to be a multiple of n numbers that we are adding. And so when divided by n, we get a mean which is whole.
- When we wipe out 1, again we are adding consecutive numbers, and so it is bound to be a multiple of the n numbers that we are adding. And so when divided by n, we get a mean which is whole.
- And because these totals are consecutive multiples of (N-1), the difference in the Means is always 1.

1, 2, 3, 4

$$1+2+3 = 6$$

$$1+2+3 = 7$$

$$1+3+4 = 8$$

$$2+3+4 = 9$$

1, 2, 3, 4, 5, 6

$$1+2+3+4+5 = 15$$

$$1+2+3+4+6 = 16$$

$$1+2+3+5+6 = 17$$

$$1+2+4+5+6 = 18$$

$$1+3+4+5+6 = 19$$

$$2+3+4+5+6 = 20$$

Totals are consecutive

**Anirved Mahanta** shared his observations about the original mean and the one you get after the Wipeout when N is even:

2 The difference of the new mean obtained by removing 1 from the sequence on by removing N from the sequence is always 1.

3 The difference of the new mean and the original mean is always 0.5.

STEP 1

**Naaysha Singh Patel** observed that when we wipeout the last number in the sequence (when N is even) the new Mean is always half of the wiped out number.