

Mathematical Sequences

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Introduction:

During the school year, a friend gave us this sequence and told us to find the pattern. He said that someone has found the pattern before, so there is one present. We wanted to find out whether we could solve this problem or not. Occasionally during the school year, we would attempt to solve this problem.

Problem:

Find the pattern in this number sequence:

Pattern:

2 4 2 1 0 4 3 1 0 4 2 1 0 4 2 1 2 4 2 1 0 4 3 1 0 1 2 4 0 1 2 3 4 0 0 4 4 3 1 4 2 2 4 2 4 1 0 4 3

Pattern in Groups of 7:

2 4 2 1 0 4 3

1 0 4 2 1 0 4

2 1 2 4 2 1 0

4 3 1 0 1 2 4

0 1 2 3 4 0 0

4 4 3 1 4 2 2

4 2 4 1 0 4 3

Results:

Tried Processes:

- First we organized the sequence into seven groups of seven and tried to find if there was any relation between groups. When we added up all the numbers in each group, we got 16, 12, 12, 15, 10, 20, 18. There was no pattern here.

The groups were:

- Next, we noticed that “2 4 2 1 0 4 3” and “1 0 4 2” each repeated twice. We tried to find what these two number sequences meant or what significance they gave, but we found nothing.
- Next, we found the difference between every two numbers (For example, “4 2” would be -2, and “2 4” would be +2, and these would cancel out to 0.) to see if we would end up with 0. At the end, we got 1, so the difference between the numbers did not cancel out.
- Next, we tried adding the first number in every group together, second number in every group together, third, etc. We got 17, 15, 18, 12, 12, 13, 16. And this did not give us a pattern.
- Then we tried matching up numbers in groups. We matched them in groups of 8, 7, 6, 5, 4, 3, and 2. This didn’t lead us anywhere.
- We also counted the number of each number there were. There were nine 0s, ten 1s, eleven 2s, five 3s, and fourteen 4s. This did not provide us with much information.
- We saw that the largest number in the sequence was four, so the sequence possibly had something to do with dividing by five. We then tried to make the remainder of the numbers being divided by five become the sequence going in an ascending order. (For example, “2 4 2 1 0 4 3” would be “2 4 7 11 15 19 23”.) This is still a work in progress

Conclusion:

Though we did work on this project more than we needed to during the school year, we still haven’t found the pattern. Our results did give us some insight on how to improve next time we do this problem. Our friend said that it took a Caltech professor two weeks to find the pattern, so we hope that maybe we can find the pattern sometime. If we were to keep on going with this project, we would do more research and put more and more effort into it. For example, trying to find more ways to look at the pattern. Instead of trying to find the pattern by making more sequences, we could look at the pattern as a way to describe something, or, as our friend hinted us, something to do with music. In conclusion, we thought that this problem was a good challenge for us, and fitted us and our abilities quite well, even though we were unable to actually solve the problem.