Smart Technology for Solving Numerical Problems in Algebra

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ABSTRACT

This research paper assessed and investigated the effectiveness of a new simple technique as an alternative solution to Algebraic problems. The new method proposed an easy and efficient way of solving number problems. This technique helps the learners in reducing their difficulties in using variables since the technique only uses basic arithmetic calculations. An algorithm is developed by the author so that the method can be implemented in any computer language. The effectiveness of the technique is demonstrated by comparing the time complexity with the traditional methods.

Keywords: Algebra, Linear Equations, Successive Number Problems.

1. Introduction

Algebra is one of the important divisions of mathematics dealing with alphabets or symbols and the rules for operating them. In elementary algebra, those alphabets written in English, Latin or Greek letters represent quantities without fixed values, called as variables [1]. There are two important categories of algebra: Elementary algebra and the abstract algebra. Elementary algebra is the core part of algebra which is generally considered to be important for studying mathematics, science, or engineering subject; whereas the abstract algebra or modern algebra is a major field in advanced mathematics, studied primarily by the people involved in studying mathematics [1]. Teaching mathematics, particularly teaching algebra is a difficult task due to the nature of the problems. In algebra, the numerical values are represented by alphabets, and these alphabets are mostly used to explore a problem. Hence teaching of algebra needs smart techniques, rather than the conventional techniques. It is an art of using innovative teaching methods, approaches or schemes to make the students to understand the problem. Hence mathematics teachers are requested to have funny and innovative methods of teaching the problem solving techniques for their students [2,3]. Innovative teaching methods are needed for teaching and make the students to easily understand Algebra where the students have negative thoughts towards it.

In this paper we discuss some interesting facts on algebra and we discuss one of the important and interesting problems in algebra which is called the successive integers problem. We can see by applying these methods, students can able to easily understand and will become familiar in solving algebraic problems. This paper is organized as follows: In section 2 we give some earlier literature on such concepts, in section 3 we discuss what is successive number problem and the innovative method of solving it. We discuss an algorithm and some pictorial representation of the problems. In section 4 we discuss the feedback from the student community and section 5 concludes the paper.

2. Literature Review

In [4] the authors explained how the linear algebra can be explained by using geometry. Geometrical figures and graphs can be used to explain the problems of linear algebra, and the students can easily understand the concepts with the help of graphs. In [5,7] the authors have illustrated a research project of the design and implementation of a virtual classroom for students of hearing disabilities. They have explained the importance of using ICT tools in

teaching mathematics. The results obtained by them showed the importance of technological tools in the teaching processes in the area of mathematics.

In [6] the authors have proposed a comprehensive teaching approach named "DECIMAL" - consisting of "Design of courses, Examples selection, Charm display, intelligent tools utilization, and miscellaneous resources, Arousal of interest and Linkage of different courses". Each of the factors is demonstrated by methodology explanations and detailed examples in various teaching scenarios. In [7] the authors presented the results of implementation of a visual support strategy for solving linear equation of a middle school student with high-functioning autism spectrum disorders (ASD).

3. Methods

In this section we will see what is called successive number problem in algebra, and the traditional method of solving the problem by giving some examples. Then we give the innovative methods of solving same problem easily so that an average and below average students also can understand and easily can solve the problem.

3.1 Problem Definition

Successive numbers or more properly, successive integers are integers n_1 n_2, n_3.. etc., such that $n_2 - n_1 = 1$ or $n_2 - n_1 = 2$, such that n_2 follows immediately after n_1. [8].

We can represent the successive numbers algebraically, by considering one of the numbers to be x. Then the next successive numbers would be x + 1, x + 2, and x + 3.

3.2 Examples of Successive Numbers

Suppose the sum of two successive numbers is 13. What are the numbers? To solve the problem, let the first number be x and the second number be x + 1.

Then:

    x + (x + 1) = 13
    2x + 1 = 13
    2x = 12
    x = 6

So, the numbers are 6 and 7.

Let us have another example with three successive numbers. Given the sum of three successive numbers be 81. Then we can find the individual numbers by applying the same method: Let one number be n. Then the other two numbers are n+1 and n+2. We need to solve an algebraic equation on n:

    n+(n+1)+(n+2)=81.

    3n + 3 =81

    3n =81-3 = 78

n = 78/3 =26

One number is 26. Therefore the other numbers are n+1 and n+2. i.e. 27 and 28. The method given here is the traditional method. Most of the average and low achieving students will feel difficulty in solving such problems, particularly, if the sum is given as a big number.

The same problem can be solved by using an easy method. Instead of solving an algebraic equation, we can simply perform some basic arithmetic operation. Since the given total is 78 and it is the sum of 3 successive integers, we can just divide 81 by 3.

❖ 81/3 =27, this will be the middle number of the 3 successive numbers. Hence the other two numbers are 27-1 and 27+1, therefore the 3 numbers are 26, 27 and 28.

This simple and easy method can be understandable by everyone.

Now let us give an algorithm for this method in order to implement the same technique using a computer program.

Algorithm 1: Solving successive number problem

Step 1: Start

Step 2: Read the sum S.

Step 3: Divide the number by 3; n=S/3

Step 4: Three numbers are n-1, n and n+1

Step 5: Print n-1, n and n+1

Step 4: Stop

In the above example we have seen the method of solving 3 successive numbers. In the same way we can solve a 5 or 7 successive numbers problem. Let us see an example for each one. Now consider the number 65 which is the sum of 5 successive integers. In the traditional method we need to form an algebraic equation such as

m+m+1+m+2+m+3+m+4 = 65

5m + 10 = 65

5m = 65-10 = 55

m=55/5 = 11

One integer is 11. Therefore the other integers are 12, 13, 14 and 15. But the same problem can be easily solved by our new algorithm. The given integer is 65 which is the sum of 5 successive integers. Therefore divide 65 by 5 we get 13 which will be the middle of the 5 integers. Hence the other numbers are 13-2, 13-1, 13+1 and 13+2. Finally we get the answer as 11, 12, 13, 14 and 15.

Now we can take one example for 7 successive numbers. Consider the integer 63 which is the sum of 7 successive integers. Let us solve the problem first using the traditional method.

Let x be one number. The other numbers will be computed by taking x+1, x+2, x+3, x+4, x+5 and x+6. So,

$$x+x+1+x+2+x+3+x+4+x+5+x+6$$

$$7x+21 = 63$$

$$7x= 63-21 = 42$$

$$7x = 42, x= 42/7 = 6$$

Hence x=6, the other numbers are x+1, x+2, x+3, x+4, x+5 and x+6. So all the 7 numbers are 6, 7, 8, 9, 10, 11 and 12. Now by the new method, divide 63 by 7 since 63 is the sum of 7 numbers.

63/7 = 9 will be the middle number of the seven numbers.

Therefore the other number can be calculated by subtracting 3 numbers from left of 9 and by adding 3 numbers from right side of 9. So the integers are 6. 7. 8. 9. 10. 11 and 12.

The algorithm given above can be simply modified for calculating 5 and 7 successive numbers problem.

Now let us discuss the method of finding the missing odd or even number by using the same technique.

Consider the problem of odd numbers. For example let the sum of 5 odd integers be 75 then by the traditional method, we consider the numbers be p, p+2, p+4, p+6 and p+8. Therefore

$$p+p+2+p+4+p+6+p+8 = 75$$

$$5p+20 = 75$$

$$5p=75-20$$

$$= 55$$

$$p=55/5$$

$$p=11$$

Therefore, the other numbers are 13, 15, 17 and 19.

The same problem can be solved by our simple method. The given sum is the sum of 5 odd numbers. Therefore in our simple method, 75/5 = 15 is the middle number.

Hence the other numbers are 15-4, 15-2, 15, 15+2 and 15+4, which gives the answer as 11, 13, 15, 17 and 19.

In the similar way we can find the individual numbers when the sum of n even numbers are given. The time consumption for solving the problems by our new method will be very lesser than the traditional linear algebra formation method.

4. Results and feedback

The new method is explained to some students and discussed the effectiveness of the technique. Figure 1 illustrates the timing efficiency of the new method while comparing with the traditional method.
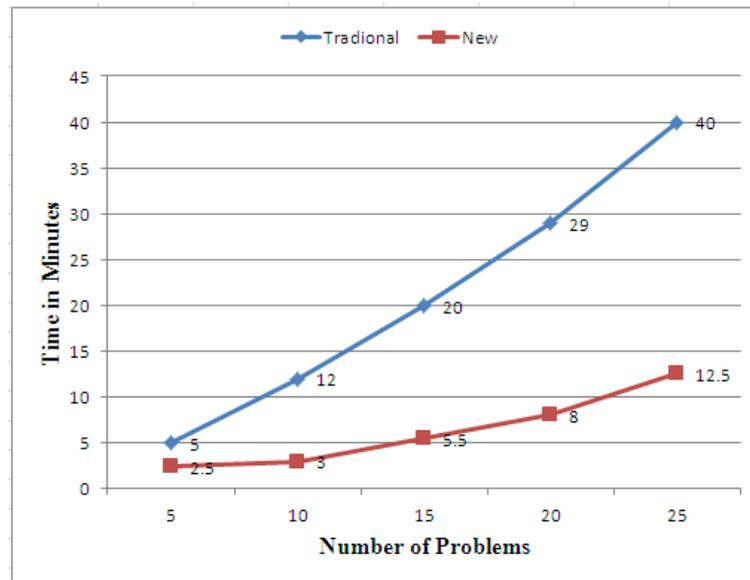
Figure 1. Comparing time complexity between traditional and new methods

All the students have felt that this method is very easy and effective. The feedback collected from the students are summarized below:

✔ The method is less time consuming and applicable.

✔ The method is very easier

✔ The method is useful to the learner who does not like Mathematics

✔ The method is pleasurable.

✔ The method is new and innovative.

5. Conclusion

This paper explored and analyzed a simple method as an alternative and easy way in solving successive number problems in Algebra. It can be used as a shortcut way of solving successive number problems when participating in Math quiz programs or attending board examinations where time is of very important. The author can explain the problem to more number of students and general public for their academic and daily activities. Further in future, any other new technologies can be invented for other kind of problems.

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