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MULTIPLES OF 5

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ABSTRACT

Mathematics tricks are very essential weapon for hooking the others' interest in mathematics. It motivates them to be excited in exploring, thinking, and discovering the possibilities of presumed concepts. It is also the best way of developing the creative and critical thinking skills of a person. Although technology nowadays, which is a product of a creative and critical thinking skills of human, may use algorithms in getting the fastest and accurate answers of a mathematical problem but discoveries of new concepts especially tricks is still more attractive that easily gets the interest of anyone. This study introduced some tricks in the multiples of 5. The results lead to two theorems containing equations that served as techniques in some multiplications with 5 as unit digits of both factors.

KEYWORDS: *Multiples of 5, Divisibility by 5, & Mathematics Tricks*

Article History

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INTRODUCTION

Multiplication is derived from addition. Similarly, any number can be expanded as sum of the values of its digits. This study initiated with the curiosity whether there is a possibility of obtaining the square of a given number divisible by 5 easily without using the usual multiplication. For instance, in the study of Solaiman (2018), the product of any number with 11's as multiplier is just the sum of the values of the digits of the multiplicand. This is how different approaches and techniques can be done to any product of two numbers using thorough observations of its digits. By using the expansion of a number with respect to its place value of each digit, distributive property of real numbers, and perfect square trinomial, this research leads to some formulation of equations made into theorems. These mathematical concepts are simple arithmetic topics in elementary level but they are useful in motivating students to learn, explore, discover, construct, and criticize some ideas in mathematics.

STATEMENT OF THE PROBLEM

This study was investigated to develop equations on the product of some numbers which are divisible by 5. It specifically sought answers to each of the following questions.

- What is the product of a square of a number divisible by 5 ?
- What is the product of two different integers m and n which are both divisible by 5?

CONCEPTUAL FRAMEWORK

This study initiated when squaring some multiples of 5 brought ideas on the relationship between the values of the digits of the products and the digits of the factors. It was observedthat the square of any multiples of 5 has 25 as its first two successive digits in the tens and unit digits. The highest value in the square of multiples of 5 is related from the highest value of the factor. Squaring other multiples of 5 give the same results. Exploring the concepts in this research using re-expression of numbers with respect to its place values lead to the formulation of two equations which are the shortest way of finding the products between multiples of 5.

THEORETICAL FRAMEWORK

The theories applied in this study are the division algorithm, distribution property of multiplication over addition, perfect square trinomial, and positive integral exponents.

The division of algorithm explained that for any integer m, there exists two positive integers q and r such that m is equal to the sum of nq and r for some positive integer n. It is applied in this study when the positive integer N, which is a multiple of 5, is re-expressed into sum of two integers using place values.

In formulating the equations of the squares of integer N and products of other multiples of 5, positive integral exponents were used in factoring out the common factor 10. In proving the two theorems, distributive property of multiplication over addition and perfect square trinomial were used.

DESIGN, SAMPLING TECHNIQUES, AND PROCEDURE

This research is a qualitative study particularly content analysis conducted to investigate and explore the multiples of 5 that have special characteristics because it gives shortest way of obtaining easily the products without using the usual multiplication. The sample participants were the mathematics textbooks. It was employed using the convenient sampling through selection of the data available.

The idea started from investigation of the squares of some multiples of 5 whose unit digit is 5. This lead to the formulation of the first equation called Theorem 1 which is about squaring multiples of 5 not divisible by 10. This was followed by investigating some products of different multiples of 5 whose unit digits are both 5 to verify whether it has relation to the first theorem. This resulted to the development of the second formulated equation called theorem 2 of this study. Two options of the theorem were provided for the guidance of getting the accurate products of the different multiples of 5 not divisible by 10.

RESULTS AND DISCUSSIONS

There are two theorems developed in this study. Theorem 1 explained the formulated first equation about squaring some multiples of 5. The equation in this theorem also shows the easiest and shortest way of getting the square of some multiples of 5.

Theorem 1

Let N be an integer divisible by 5 but not divisible by 10. Then $N^2 = 10^2 (n^2 + n) + 25$.

Proof: Let N be a positive integer. By Division Algorithm, there exists integers q and r such that N = nq + r for some positive integer n. Since N is divisible by 5 but not 10 then by for q = 10, r = 5. Thus, N can be written as 10n + 5 which is the same when N is written in place values of its digits.

By taking the square of N and applying distributive property of multiplication over addition and positive integral exponents,

$N^2 = (10n + 5)^2$

$= 10^2 n^2 + 10^2 n + 25$

$= 10^2 (n^2 + n) + 25.$

Conversely, assumed that $N^2 = 10^2 (n^2 + n) + 25$. Since it is a perfect square trinomial, it can be factored as $N^2 = (10n + 5)^2$.This implies that N = 10n + 5. Hence, N is divisible by 5 but not divisible by 10.

Examples. Evaluate each of the following.

- 15^2
- 25^2
- 55^2

Solutions: Let N be each of the given numbers and n be a positive integer. Then,

- 152 = 102 (n2 + n) + 25 = 102 (12 + 1) + 25 = 225.
- 252 = 102 (n2 + n) + 25 = 102 (22 + 2) + 25 = 625.
- 552 = 102 (n2 + n) + 25 = 102 (52 + 5) + 25 = 3025.

In the next theorem, it shows about the product of two different multiples of 5.

Theorem 2

Let N and M be two different integers that such that N = 10n + 5 and M = 10m + 5 for some positive integers n and m. Then $N \times M = 10^2 nm + 50(n + m) + 25$.

The same proof in Theorem 1 is applied here.

Examples. Find the product of each of the following.

- 15 x 25
- 45 x 35

Solutions: Let N and M be the two integers, respectively and n and m be integers. Then,

$15 \times 25 \quad = 10^2 nm + 50(n + m) + 25$

$= 10^2 (1)(2) + 50(1 + 2) + 25$

= 375.

$45 \times 35 = = 10^2\ nm + 50(n + m) + 25$

$= 10^2\ (4)(3) + 50(4 + 3) + 25$

$= 1575.$

Note that if m plus n is even or odd, the last two digit is 25, whereas if m plus n is odd then the last two digits is 75.

CONCLUSIONS AND IMPLICATION

Finding the products or multiples of integers in easiest way does not only show mastery of the concept but motivations and encouragements to others especially students who hate mathematics. It gives them fun in discovering more new concepts in mathematics. It is more challenging on their part when they are obliged to make equations based on the patterns of examples just like how this study was made. This investigation has great advantages to students not only it adds new knowledge to mathematics but a starting point of how mathematics teachers may use this study in developing the critical thinking skills of students. Thus, this study does not limit the concept of exploring more concepts about multiplication of integers and recommends for incorporating it in mathematics curriculum.

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