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A SHORTCUT METHOD TO COMPUTE THE SQUARE OF NUMBERS ENDING IN 2: A CASE STUDY WITH 32

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ABSTRACT

Squaring numbers is a basic math operation that is useful in arithmetic, algebra, and computer science. While traditional multiplication methods work well, mental math and shortcuts can offer quicker options in certain situations. This paper presents an easy shortcut for calculating the squares of numbers that end in the digit 2. We will use the example of 32 to illustrate this method. The approach is based on algebra, confirmed with examples, and applies to all numbers of the form 10a+2. Our analysis shows that this shortcut significantly cuts down the number of steps needed, making it especially helpful for mental math and teaching math.

1. INTRODUCTION

Mathematical computation is essential in both school learning and competitive exams. Mental arithmetic improves speed, accuracy, and problem-solving skills. Techniques based on Vedic mathematics often break down complicated operations into simple, easy-to-remember steps. This study introduces a shortcut method for numbers that end in the digit 2. The method is backed by algebra, works efficiently in calculations, and is easy to use in mental math problems. A detailed case study involving the number 32^2 is included, along with validation using other numbers that end in 2.

2. Methodology

Let The Number Be:

$n=10a+2$,

where a is the tens digit. Expanding,

$n^2=(10a+2)^2=100a^2+40a+4$..

The Shortcut Procedure Can Be Summarized As:

1. Start with n.
2. Add 2 → (n+2).
3. Multiply by the tens digit a.
4. Append the digit **4** to the result.

3. Worked Example: Square of 32

- **Step 1:** n=32.
- **Step 2:** 32+2=34.
- **Step 3:** 34×3=102.
- **Step 4:** Append **4** → 1024.

32^2=1024

32	34	34 × 3 = 102	Append 4	1024

4. Validation With Other Numbers

Number n	Step 1: n+2	Step 2: Multiply by a	Step 3: Append 4	Result (n^2)
12	14	14×1= 14	144	144
22	24	24×2=48 = 48	484	484
42	44	44×4=176	1764	1764
52	54	54×5=270	2704	2704

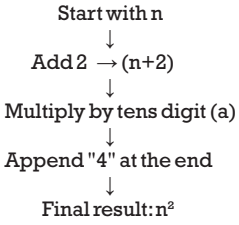
This confirms that the shortcut holds true for all numbers ending in 2.

5. Comparison With Traditional Method

Number	Traditional Multiplication Steps	Shortcut Steps
32^2	32×32=1024 → requires full multiplication	(32+2)=34 → 34×3=102 → Append 4 → 1024
42^2	42×42 = 1764 → requires full multiplication	(42+2)=44 → 44×4=176 → Append 4 → 1764

Clearly, the shortcut reduces **cognitive effort** and the number of **intermediate calculations**.

6. Flow Diagram of the Shortcut



(**Figure 1:** Flow of the shortcut method for numbers ending in 2)

7. DISCUSSION

The shortcut is mathematically sound, as it directly stems from the binomial expansion of $(10a+2)^2$. Its novelty lies in breaking down the process into **predictable arithmetic patterns**, thereby enhancing mental efficiency.

Pedagogically, it strengthens number sense and demonstrates how algebraic structures can be harnessed for computational shortcuts. In practice, this approach is valuable in:

- Mental arithmetic competitions
- Time-bound examinations
- Mathematics teaching (to build intuition and confidence)

8. CONCLUSION

This study presented a simple yet powerful shortcut method to square numbers ending with the digit 2. Using the case study of 32^2, the method was explained, validated, and compared with conventional multiplication. The findings confirm its **general applicability** to all numbers of the form 10a+2. Beyond practical utility, the method exemplifies the role of **pattern recognition** and **mathematical creativity** in education.

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