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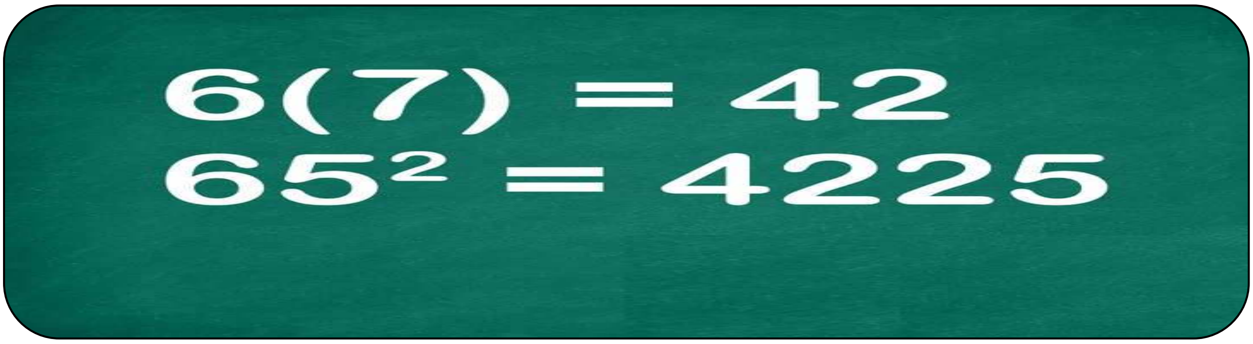
Golden Research Thoughts



SQUARING OF SIX AND SEVEN DIGIT NUMBERS

Kondekar S.N.
Assist.Prof., Department of Mathematics, Degloor College, Degloor.

Abstract :
There are different methods for squaring of numbers .In this paper result of squaring of six and seven digit numbers are discussed.

Keywords: Squaring , Digits

INTRODUCTION:

Squaring of Two and Three digit numbers is given bt J.Trachtenberg[1]. Also Squaring of four and five digit numbers is given and the result is also generalized in [2].Here same logic is used for squaring of six and seven digit numbers.

Preliminaries: If b_0 , b_1 are digits where $b_1 \neq 0$ then

$$(b_1 \; b_0)^2 = 10^2 b_1^2 + 10 (2 b_1 b_0) + b_0^2$$

Ex. $(69)^2 = (36)(108)(81)$
$= (36)(116)(1)$
$= (47)(61)$
$= 4761$

Step I : Result for six digit numbers

If b_5 , b_4 , b_3 , b_2 , b_1 , b_0 are six digits with $b_5 \neq 0$
Then

$(b_5b_4b_3b_2b_1b_0)^2 = (10^5 b_5+10^4 b_4+10^3 b_3+10^2 b_2+10 b_1+ b_0)^2$

$= (10^5 b_5+10^4 b_4+10^3 b_3)^2 + (10^2 b_2+10 b_1+ b_0)^2 + 2 (10^5 b_5+10^4 b_4+10^3 b_3) (10^2 b_2+10 b_1+ b_0)$

$= (10^5 b_5+10^4 b_4)^2 + 10^6 b_3^2 +2(10^5 b_5+10^4 b_4) 10^3 b_3 + (10^2 b_2+10 b_1)^2 + b_0^2 + 2 (10^2 b_2+10 b_1) b_0 + 2 .10^7 b_5 b_2 +2. 10^6 b_5 b_1 +2.10^5 b_5 b_0 +2.10^6 b_4 b_2 + 2. 10^5 b_4 b_1 +2. 10^4 b_4 b_0+2.10^5 b_3 b_2 +2.10^4 b_3 b_1 +2. 10^3 b_3 b_0$

$= 10^{10} b_5^2 + 10^8 b_4^2 +2.10^9 b_5 b_4 +10^6 b_3^2 +2.10^8 b_5 b_3 +2.10^7 b_4 b_3 +10^4 b_2^2 +10^2 b_1^2 +2.10^3 b_2 b_1 + b_0^2 + 2.10^2 b_2 b_0 +2.10 b_1 b_0 + 2.10^7 b_5 b_2 +2.10^6 b_5 b_1 +2.10^5 b_5 b_0 +2.10^6 b_4 b_2 + 2.10^5 b_4 b_1 + 2.10^4 b_4 b_0 + 2.10^5 b_3 b_2 + 2.10^4 b_3 b_1 + 2.10^3 b_3 b_0$

$= 10^{10} b_5^2 + 10^9 (2 b_5 b_4) + 10^8 (b_4^2+2 b_5 b_3)+10^7 (2 b_4 b_3 +2 b_5 b_2) + 10^6 (b_3^2 +2 b_5 b_1 + 2 b_4 b_2) + 10^5 (2 b_5 b_0 +2 b_4 b_1 + 2 b_3 b_2) + 10^4 (b_2^2+2 b_3b_1 +2 b_4 b_0) +10^3 (2 b_2 b_1 + 2 b_3 b_0) +10^2 (b_1^2 +2 b_2 b_0) + 2.10 b_1 b_0 + b_0^2$

Step II : Result for seven digit numbers

If $b_6 , b_5 , b_4 ,b_3 ,b_2 ,b_1 ,b_0$ are seven digits with $b_6 \neq 0$
Then

$(b_6b_5b_4b_3b_2b_1b_0)^2 = (10^6 b_6 + 10^5 b_5+10^4 b_4+10^3 b_3+10^2 b_2+10 b_1+ b_0)^2$

$= (10^6 b_6 + 10^5 b_5+10^4 b_4+10^3 b_3)^2 + (10^2 b_2+10 b_1+ b_0)^2 + 2 (10^6 b_6 + 10^5 b_5+10^4 b_4+10^3 b_3) (10^2 b_2+10 b_1+ b_0)$

$= (10^6 b_6 +10^5 b_5)^2 + (10^4 b_4 +10^3 b_3)^2 +2(10^6 b_6+10^5 b_5) (10^4 b_4+10^3 b_3) + (10^2 b_2+10 b_1)^2 + b_0^2 + 2 (10^2 b_2+10 b_1) b_0 + 2 (10^6 b_6 + 10^5 b_5+10^4 b_4+10^3 b_3) (10^2 b_2+10 b_1+ b_0)$

$= 10^{12} b_6^2 + 10^{10} b_5^2 +2. 10^{11} b_6 b_5 + 10^8 b_4^2 +10^6 b_3^2 +2. 10^7 b_4 b_3 + 2. 10^{10} b_6 b_4 + 2. 10^9 b_6 b_3 + 2. 10^9 b_5 b_4 +2. 10^8 b_5 b_3 + 10^4 b_2^2 + 10^2 b_1^2 + 2. 10^3 b_2 b_1 + b_0^2 + 2. 10^2 b_2 b_0 + 2. 10 b_1 b_0 +2. 10^8 b_6 b_2+ 2. 10^7 b_6 b_1 + 2. 10^6 b_6 b_0 + 2. 10^7 b_5 b_2 +2. 10^6 b_5 b_1 +2. 10^5 b_5 b_0 + 2. 10^6 b_4 b_2 + 2. 10^5 b_4 b_1 + 2. 10^4 b_4 b_0 + 2. 10^5 b_3 b_2 + 2. 10^4 b_3 b_1 + 2. 10^3 b_3 b_0$

$= 10^{12} b_6^2 + 10^{11} (2. b_6 b_5) + 10^{10} (b_5^2 +2. b_6 b_4) +10^9 (2. b_6 b_3 + 2. b_5 b_4) + 10^8 (b_4^2 + 2. b_5 b_3 + 2. b_6 b_2) + 10^7 (2. b_4 b_3 + 2. b_6 b_1 + 2. b_5 b_2) + 10^6 (b_3^2 + 2. b_6 b_0 + 2. b_5 b_1 + 2. b_4 b_2) + 10^5 (2. b_5 b_0 + 2.b_4 b_1 + 2. b_3 b_2) + 10^4 (b_2^2 + 2. b_4 b_0 + 2. b_3 b_1) + 10^3 (2. b_2 b_1 + 2. b_3 b_0) + 10^2 (b_1^2 + 2. b_2 b_0) +10 (2 b_1 b_0) + b_0^2$

Examples : 1] Now We find the square of six digit number 324571
$(3\ 2\ 4\ 5\ 7\ 1)^2$

= (9) (2.3.2)(4+2.3.4)(2.2.4+2.3.5)(16+2.3.7+2.2.5)(2.3.1+2.2.7+2.4.5)
(25+2.4.7+2.2.1) (2.5.7+2.4..1)(49+2.5.1)(2(7.1)) (1)

= (9)(12)(28)(46)(78)(74)(85)(78)(59)(14)(1)

= (9)(12)(28)(46)(78)(74)(85)(78)(60) 41

= (9)(12)(28)(46)(78)(74)(85)(84) 041

= (9)(12)(28)(46)(78)(74)(93) 4041

= (9)(12)(28)(46)(86) 334041

= (9)(12)(28) (54) 6334041

= (9)(12)(33) 46334041

= (9)(15) 346334041

= (10) 5346334041

= 105346334041

2] Now We find the square of seven digit number 2343562

$(2\ 3\ 4\ 3\ 5\ 6\ 2)^2$ =

(4)(2.2.3)(9+2.2.4)(2.2.3+2.3.4)(16+2.3.3+2.2.5)(2.4.3+2.2.6+2.3.5)(9+2.2.2+2.3.6+2.4.5)
(2.3.2+2.4.6+2.3.5)(25+2.4.2+2.3.6)(2.5.6+2.3.2)(36+2.5.2)(2.6.2)(4)

= (4)(12)(25)(36)(54)(78)(93)(90)(77)(72)(56)(24)(4)

= (4)(12)(25)(36)(54)(78)(93)(90)(77)(72)(58) 44

= (4)(12)(25)(36)(54)(78)(93)(90)(77)(77) 844

= (4)(12)(25)(36)(54)(78)(93)(90)(84) 7844

= (4)(12)(25)(36)(54)(78)(93)(98) 47844

= (4)(12)(25)(36)(54)(78)(102) 847844

= (4)(12)(25)(36)(54)(88) 2847844

= (4)(12)(25)(36)(62) 82847844

= (4)(12)(25)(42) 282847844

= (4)(12)(29) 2282847844

= (4)(14) 92282847844

= (5) 492282847844

= 5492282847844

CONCLUSION:

We have obtained the result for six and seven digit numbers which can be extended for more digits and for solving the examples result is obtained by capping the numbers.

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