Speed Up Your Calculation (Ganit Bodh Series)-04

Squaring:

Trick 1

To find square of any two digit number whose unit place digit is 5. For example $(25)^2$ obviously answer will be either in three digit or four digit. Then write from left 25 as a reserved number and then in left of 25, write the multiplication of the digit at ten's place in question with one more than that number as: assume four digits cancelled and then think over rest digits a maximum possible number which is perfect square.

In square root of $\sqrt{680625}$ write 25 as reserve number and then 0625 four digits assume cancelled and think maximum possible number whose square is less than or equal to 68. Here 8 is such number whose square is 64 which is less than 68.

Type I: Squaring of any two digit numbers quickly.

Suppose we have to square 43.

Step 1: Square the digit of unit place and write it at unit place. Incase after squaring put unit digit and tens digit carry in hand. In this case we may write $(43)^2$ we have to write 3^2 since 3^2 is 9 a unit digit number. So write down 9 at unit place. As $(43)^2$ = ...9.

Step 2: Then multiply digit of unit and tens place together and make double and if any carries add it and then write its unit place digit at tens place of squaring of numbers. Here multiplication of 4 and 3 is 12 and double of it is 24. Since no carries of step 1, so write down 4 at tens place of $(43)^2$ and carry 2 in hand $\Rightarrow$ $(43)^2$ = ...48.

Step 3*:* Squaring tens place digit as is in this case which is 16 and add carries of step 2 i.e. 2, so it become 18 and write it at hundred place. Hence, finally it become $(43)^2 = 1849$

Practice the following squares and analyse them

$(37)^2 = 1369$

$(62)^2 = 3844$

$(46)^2 = 1916$

$(71)^2 = 5041$

$(38)^2 = 1444$

$(93)^2 = 8649$ etc.

Type II. Squaring of any three digit numbers

Considering some advancement in Type I, we can square all three digit numbers in few seconds. Consider the following steps:

Suppose we have to find square of (432).

Step I: Write unit place digit of squaring of 2 at unit place and carry tens place in case of two digit number. In this case write $(432)^2$ = ... 4 as 2 is in unit place and $2^2 = 4$.

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Step 2: Multiply unit and tens place digit and double it and carries if any in step I then, write at tens place. Here write 2 (3 × 2) = 12 write 2 at place and carries 1 in hand so it comes as $(432)^2$ = ...24.

Step 3: Multiply unit and hundred place digit and double it and add square of ten's place digit which is 4 × 2 = 8, double of it is 16 and square of 3 is 9. So 16 + 9 = 25 and carries of step 2 is 1, so it comes out to be 26. So, write 6 at hundred place and carry 2 it becomes $(432)^2$ 624

Step 4: Multiply ten's and hundred place digit and double it. Add carries if any in step 3 and write down at thousand place of it. (as 4 × 3 = 12 double 24 add carries 2 = 26)

$(432)^2$ = ... 6624

Step 5: Square hundred place digit and add any carries in step 4 and write it at ten thousand place.

Here,

4^2 = 16 + 2 = 18

$(432)^2$ = 186624

Practice some more examples as:

$(623)^2$ = 388129 $(416)^2$ = 173056

$(231)^2$ = 53361 $(213)^2$ = 45369

$(342)^2$ = 116964 $(247)^2$ = 61009

$(641)^2$ = 410881 $(741)^2$ = 549081

$(134)^2$ = 17956 $(322)^2$ = 103684

Special Type I. (very short cut)

Squarring of numbers which is made of 3

Starting from the Right side.

Step 1: Write one 9 at unit place and write 8's one less than the number of 3's to be squared and write one 0. Then write 1's as many as 8's has been written.

$(33)^2$=1089 $(3333)^2$=11108889

$(333)^2$=110889 $(3333)^2$=1111088889

In squaring of (3333), write 9 at unit place. Since four 3's are given. So write three 8's and one zero. Then write three 1's as many as 8's has been written.

$(3333)^2$ = 11108889

Type II: Squaring of any number which is made of same digits:

(A) Squaring of number which is made of 2's only. For example $(22)^2$, $(222)^2$, $(2222)^2$, $(22222)^2$ etc.

Starting from the Right Side.

Step 1: Square of 2 that is 4. It taken as tool and then consider the following numbers which is to be squared.

Let $(2222)^2$

Since this number has four 2's. Therefore, start writing from right side 4×1=4

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at unit place.

4×2 = 8 at ten's place.
4×3 = 12, write 2 at hundred place and carry 1 in hand.
4×4 = 16+carry 1 of previous step
= 17, write 7 and carry 1 again and now revert it as.
4×3 = 12+1=13, write 3 and carry I.
4×2 = 8+1=9
4×1 = 4

Hence finally it becomes $(2222)^2=4937284$

Consider the following numbers:

$(22)^2 = 484$ (4×1, 4×2, 4×1)
$(222)^2 = 49284$
$(22222)^2 = 493817284$ etc.

(B) For squaring a digit which is made of 3's only: Consider 3^2 that is 9 as tool and operate it as we have done it above.

$(33)^2 = 1089$ $(3333)^2 = 11108889$
$(333)^2 = 110889$ $(33333)^2 = 1111088889$

(C) For digits made of 4's only. Consider 4^2 that is 16 as tool and operate it and so on.

$(44)^2 = 1936$ $(444)^2 = 197136$

(D) Digits made of 5. Consider $5^2=25$ as tool

$(55)^2 = 3025$ $(555)^2 = 308025$ etc.

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To be countinue.....

See tomorrow....