NUMERICAL APTITUDE – I

METHODS OF FINDING THE SQUARE OF TWO-DIGIT NUMBERS:

To find the square of any two digit number one can use $(a+b)^2 = a^2 + 2ab + b^2$.

Treat that b^2, 2ab and a^2 respectively are the values obtained in the addition. While finding the square of a two digit number take the first digit as 'a' and the second digit as 'b' and then get the value of b^2. If b^2 is a digit write it as the unit digit of the result. If b^2 is a two or three digit number write down only the last digit and the remaining value is the carry to the previous place. Similarly find the values of 2ab and a^2 and write down the values in the tens place and hundreds place respectively.

Ex 1: Find the square of 83?

Sol: Here a = 8 and b = 3

$\Rightarrow b^2 = 9$ (write '9'in units place and no carry to previous place)

2ab = $2\times8\times3$ = 48 (write '8' in tens place and'4' the carry to the previous place)

$a^2 = 8^2 = 64$ + carry 4 = 68

$\therefore$ The value of $83^2 = 6889$

NOTE: To find the square of a number having 5 in the units place the following method can also be used. If the square of number is of the form K5 is to be found first write 5^2 i.e 25. Then find the value of K (K+1) and prefix this value to 25. The value so obtained is the value of $(K5)^2$.

E.g. (1) Find the value of 65^2

Sol: The number is of the form $(K5)^2$ where K = 6

$\therefore (65)^2 = 6(6+1) | 5^2 = 4225$

METHOD OF FINDING THE SQUARE OF A THREE DIGIT NUMBER:

To find the square of a three digit number, use $a^2 - b^2 = (a + b)(a - b) + b^2$

If a^2 is to be found where 'a' is a three digit number first get the nearest hundreds value to 'a' and find the difference between 'a' and the hundreds value (say it is 'b') then write a^2 as $a^2 = a^2 - b^2 + b^2 = (a + b)(a - b) + b^2$.

Ex 2: Find the value of $(217)^2$?

Sol: a = 217 the nearest hundreds value to 217 is 200

$\therefore b = 217 - 200 = 17$

$\Rightarrow 217^2 = 217^2 - 17^2 + 17^2$

$= (217 + 17)(217 - 17) + 17^2$

$= 234 \times 200 + 289$

$= 46800 + 289 = 47089$

Some facts about perfect square(s):

(i) A perfect square can never end with 2, 3, 7, 8 or odd number of zeros.

(ii) The square of an even number is an even number and that of an odd number is an odd number.

(iii) If a perfect square has an odd digit in the units place then the digit in tens place is even.

(iv) The number of decimal places of a decimal square is even.

Method of finding the square root of a perfect square 'P':

<u>Step I</u>: First arrive at the possible unit digits of the square root depending on the unit digit of the square (P)

Unit digit of square	Unit digit of square root
1	1 or 9
4	2 or 8
9	3 or 7
6	4 or 6
5	5

<u>Step II</u>: Now strike off the last two digits of 'P' and look at the perfect square (K) which is less than or equal to the left out value. Then prefix the square root of 'K' to the unit digits to get the two possible values for $\sqrt{P}$.

<u>Step III</u>: Then eliminate one of the possible values by using the square of the number which is in between the two possible values and ends with 5.

Ex 3: If $(74)^2$ is subtracted from the square of a number, the answer so obtained is 3740.

What is the number?

Sol: 'x' be the number then

$$x^2 - 74^2 = 3740 \quad \Rightarrow x^2 = 3740 + 74^2$$

But $74^2 = 7^2 \mid 2\times7\times4 \mid 4^2$

$$= 49 \mid 56 \mid 16 \quad = \quad 49 \mid \underset{1}{56} \mid 6$$

$$= \underset{5}{49} \mid 7 \mid 6 \quad = \quad 5476$$

$$\therefore \; x^2 = 3740 + 5476 = 9216$$

$$x = \sqrt{9216}$$

Step I: The perfect square ends with 6. Therefore its square root will end with 4 or 6.

Step II: strike off the last two digits of 9216 (i.e $92\cancel{1}\cancel{6}$).Then the left out value is 91.

The perfect square less than or equal to 92 is 81 and its square root is 9.

Prefix 9 to both 4 and 6 to get two possible values 94 or 96.

Step III: Now find $(95)^2 = 9(9+1) \mid 5^2 = 9025$

$$\because 9216 > 9025$$

$$\sqrt{9216} > \sqrt{9025} = 95$$

$$\therefore \sqrt{9216} = 96$$

PROBLEMS

1. $\sqrt{54\times5+150+21}=(?)^2$

1) 21 2) $\sqrt{21}$ 3) 441^2 4) 441 5) – 441

ANSWER: 2

54 × 5 + 150 + 21 = 270 + 150 + 21 = 441

∴ $\sqrt{54\times5+150+21}=\sqrt{441}=21$

∴ $21=(?)^2$

⇒ $?=\sqrt{21}$

2. $\sqrt{1764}\times\sqrt{576}+(4)^2=(?)^2$

1) 32 2) 36 3) 28 4) 24 5) 26

ANSWER: 1

$\sqrt{1764}=42$ $\sqrt{576}=24$

∴ $\sqrt{1764}\times\sqrt{576}+4^2=(?)^2$

$42\times24+16=(?)^2$

$1008+16=(?)^2$

∴ $?=\sqrt{1024}=32$

3. $(74\times\sqrt{676})-(42\times\sqrt{?})=496$

1) 1024 2) 1296 3) 1156 4) 1089 5) None of these

ANSWER: 3

$\sqrt{676}=26$ ∴ $74\times\sqrt{676}=74\times26=1924$

⇒ $\left(74\times\sqrt{676}\right)-(42\times\sqrt{?})=496$

∴ $(42\times\sqrt{?})=1924-496=1428$

∴ $\sqrt{?}=\frac{1428}{42}=34$

∴ $?=34^2=1156$

4. If $(17)^2$ is subtracted from the square of a number, the answer so obtained is 1232. What

is the number?

1) 36 2) 42 3) 37 4) 39 5) 32

ANSWER: 4

Let x be the number then $x^2 - 17^2 = 1232$

$\therefore$ $x^2 = 1232 + 17^2 = 1232 + 289 = 1521$

$\Rightarrow$ $x = \sqrt{1521} = 39$

5. $\sqrt{\sqrt{2500} + \sqrt{961}} = (?)^2$

1) 81 2) 3 3) 6561 4) 9 5) None of these

ANSWER: 2

$\sqrt{2500} = 50$ $\sqrt{961} = 31$

$\therefore$ $\sqrt{\sqrt{2500} + \sqrt{961}} = \sqrt{50 + 31} = \sqrt{81} = 9$

$\therefore$ $9 = (?)^2 \Rightarrow ? = \sqrt{9} = 3$

6. $\sqrt{97344} = ?$

1) 302 2) 322 3) 292 4) 342 5) None of these

ANSWER: 5

The perfect square 97344 ends with 4 so its square root should end with either 2 or 8

After striking off last two digits the left out value will be 973 and the perfect square

immediately less than 973 is 961.

But $\sqrt{961} = 31$. Now prefixing 31 to both 2 and 8 the possible numbers will be 312 and

318.

But $315^2 = 99225 \Rightarrow \sqrt{99225} = 315$

But 97344 < 99225 ⇒ $\sqrt{97344} < \sqrt{99225}$

∴ $\sqrt{97344}$ should be 312

7. $\frac{5103}{?} = \frac{?}{1575}$

1) 2725 2) 2835 3) 2885 4) 2945 5) 2975

ANSWER: 2

$\frac{5103}{?} = \frac{?}{1575}$

⇒ ? × ? = 5103 × 1575

∴ $?^2$ = 5103 × 1575

∴ ? = $\sqrt{5103 \times 1575}$

But 5103 = 63 × 81 and 1575 = 63×25

∴ ? = $\sqrt{63 \times 81 \times 63 \times 25} = 63 \times 9 \times 5 =$ 2835

8. $\frac{972}{?} = \frac{?}{75}$

1) 250 2) 260 3) 270 4) 280 5) 320

ANSWER: 3

$\frac{972}{?} = \frac{?}{75}$

⇒ ? × ? = 972 × 75

$? = \sqrt{972 \times 75}$

But 972 = 3 × 324 and 75 = 3 × 25

∴ ? = $\sqrt{3 \times 324 \times 3 \times 25} = 3 \times 18 \times 5 = 270$

9. $\sqrt{?} + 45 = \sqrt{6561}$

1) 784 2) 1024 3) 1156 4) 1296 5) 1444

ANSWER: 4

$\sqrt{?}$ + 45 = $\sqrt{6561}$

But $\sqrt{6561}$ = 81

∴ $\sqrt{?}$ + 45 = 81

$\Rightarrow \sqrt{?} = 81 - 45 = 36$

$\therefore\ ? = 36^2 = 1296$

10. $(94)^2 + (?)^2 = (145)^2 - (56)^2 - 3869$

1) 5184 2) 72 3) 84 4) 7056 5) None of these

ANSWER: 2

$(94)^2 = 8836$

$(145)^2 = 21025$

$(56)^2 = 3136$

$\therefore\ (94)^2 + (?)^2 = (145)^2 - (56)^2 - 3869$

$8836 + (?)^2 = 21025 - 3136 - 3869$

$(?)^2 = 21025 - 3136 - 3869 - 8836 = 5184$

$\therefore\ ? = \sqrt{5184} = 72$