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UNIT - 6 (Squares)

* **Type I : Square of number ending in 5**

"By one more than one before"

Eg : $(35)^2$

LHS → $(3 \times 4) = 12$

RHS → $(5)^2 = 25$

$(35)^2 = 1225$

Q.1) $(75)^2 = 5625$

2) $(115)^2 = 13225$

3) $(85)^2 = 7225$

4) $(25)^2 = 625$

5) $(15)^2 = 225$

6) $(125)^2 = 15625$

7) $(405)^2 = 164025$

8) $(135)^2 = 18225$

9) $(7215)^2 = 52058225$

10) $(725)^2 = 525625$

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* Type - II : Square of a number near the base

Case - I : Below the base :-

$(96)^2$ $\quad d = 4$

LHS	RHS
$(96-4)$	$(4)^2$
$= 92$	$= 16$ → The no. of digits on RHS should be equal to the no. of zeros in the base

$(96)^2 = 9216$

Eg: $(9997)^2$ $\quad d = 3$

LHS	RHS
$(9997-3)$	$(3)^2$

$(9997)^2 = 99940009$

Q.1) $(89)^2$ $\quad d = 11$

$(89)^2 = 78 \,/\, 121$

$(89)^2 = 7921$

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2) $(999988)^2$ $d = 12$

LHS RHS

999976 144

$(999988)^2 = 999976000144$

3) $(9999991)^2$ $d = 9$

$\rightarrow 99999820000081$

4) $(99999987)^2$ $d = 13$

$(99999987)^2 = 99999974000000169$

Case - II : Above the base :)

$(104)^2$ $8 = 4$ $= 10816$

LHS RHS

$(104+4)$ $(4)^2$

108 16

2) $(999988)^2$ $d = 12$

LHS: 999976 RHS: 144

$(999988)^2 = 999976000144$

3) $(9999991)^2$ $d = 9$

$\Rightarrow 99999820000081$

4) $(9999999987)^2$ $d = 13$

$(9999999987)^2 = 99999997400000169$

Case - II : Above the base :)

$(104)^2$ $8 = 4$ $= 10816$

LHS: $(104+4)$ 108

RHS: $(4)^2$ 16

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Q.1) $(100005)^2 = 10001000025$

2) $(111)^2 = 122/121 \rightarrow 12321$

3) $(1013)^2 = 1026169$

4) $(1000035)^2 = 1000070001225$.

5) $(100000125)^2 = 10000002500001 5625$

* Type - III : Duplex (Dwanda Yoga)

$D(a) = a^2$

↙ duplex

$D(ab) = 2ab$

Q.1) $D(15) = 10$

2) $D(23) = 12$

3) $D(73) = 42$

4) $D(87) = 112$

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$D(abc) = 2ac + b^2$

Q.1) $D(341) = 22$

2) $D(724) = 60$

3) $D(213) = 13$

4) $D(459) = 97$

$D(abcd) = 2(ad + bc)$

Q.1) $D(1346) = 36$

2) $D(7402) = 28$

3) $D(3842) = 76$

$D(abcde) = 2ae + 2bd + c^2$

$D(abcdef) = 2(af + be + cd)$

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Q.1) $D(72804) = 2(7\times4) + 2(2\times0) + (8)^2$

$= 56 + 0 + 64$

$= 120$

2) $D(320416) = 2(3\times6 + 2\times1 + 4\times0)$

$= 2(18+2)$

$= 40$

3) $D(4216435) = 2(4\times5 + 2\times3 + 1\times4) + 6^2$

$= 2(20 + 6 + 4) + 36$

$= 2(30) + 36$

$= 96$

Case - I : Finding square of 2-digit number

$(ab)^2 = D(a) / D(ab) / D(b)$

Eg: $(38)^2 = D(3) / D(38) / D(8)$

$= 9 / 48 / 64$

$= 1444$

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81) $(53)^2 = D(5) / D(53) / D(3)$

$= 25 / 30 / 9$

$(53)^2 = 2809$

2) $(74)^2 = 49 / 56 / 16$

$= 5476$

3) $(86)^2 = 64 / 56 / 36$

$= 7396$

4) $(27)^2 = 4 / 28 / 49$

$= 729$

5) $(42)^2 = 16 / 16 / 4$

$= 1764$

Case - II : Square of 3-digit number

$(abc)^2 = D(a) / D(ab) / D(abc) / D(bc) / D(c) /$

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Q.1) $(521)^2$ = D(5) / D(52) / D(521) / D(21) / D(1)

= 27 / 21 / 14 / 4 / 1

= 271441

2) $(314)^2$ = 9 / 6 / (25) / 8 / 16

= 98596

3) $(743)^2$ = 49 / 56 / 58 / 24 / 9

= 552049

4) $(629)^2$ = 36 / 24 / 112 / 36 / 81

= 395641

5) $(426)^2$ = 16 / 16 / 52 / 24 / 36

= 181476

Case - III : Square of a 4- digit number

$(abcd)^2$ = D(a) / D(ab) / D(abc) / D(abcd) / D(bcd) / D(cd) / D(d)

$(abcde)^2$ = D(a) / D(ab) / D(abc) / D(abcd) / D(abcde) / D(bcde) / D(cde) / D(de) / D(e)

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Q.1) $(3425)^2 = 9|24|28|$

2) $(12345)^2 =$

3) $(4321)^2 =$

4) $(2806)^2 =$

5) $(23142)^2 =$

6) $(10405)^2 =$

24|4|23

Case - II : Finding cube of a 2- digit numbers :

$$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

$$a^2 + a^2b + ab^2 + b^2 + 2a^2b + 2ab^2$$

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Eg : $(12)^3$

$a = 1$ $\quad$ $b = 2$

1	2	4	8
		4	8
1	7	2	8

$(12)^3 = 1728$

8.1) $(23)^3$

8	12	18	27
		24	36
8	36	54	27

$(23)^3 = 12167$

2) $(74)^3$

343	196	112	64
	392	224	
343	588	336	64

$(74)^3 = 405224$

Case - IV : Finding cube of a 3- digit Number

Sub- Case I : Absolute base

$(104)^3$ $\quad s = 4$

LHS	MT	RHS
$104 + (4 \times 2)$	48	64
	$3 \times (4)^2$	$(4)^3$

$LHS = 104 + 2 \times (4)^1$

$= 112$

Q.1) $(100008)^3$

$s = 8$

LHS	M.T.	R.H.S
100024	00192	00512

$(100008)^3 = 1000240019200512$

2) $(112)^3$

$s = 12$

LHS	M.T.	RHS
136	432	1728

$(112)^3 = 1404928$

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Sub-Case II : below the base

$(97)^3$, $d = -3$

LHS	MT	RHS
$97 + 2\times(-3)$	$3\times(-3)^2$	$(-3)^3$
91	27	$\overline{27}$ → compliment

$(97)^3 = 912673$

Q.1) $(9989)^3$

$d = -11$

LHS	MT	RHS
9967	0363	−1331

$(9989)^3 = 996703628669$

2) $(984)^3$

$d = 16$

LHS	MT	RHS

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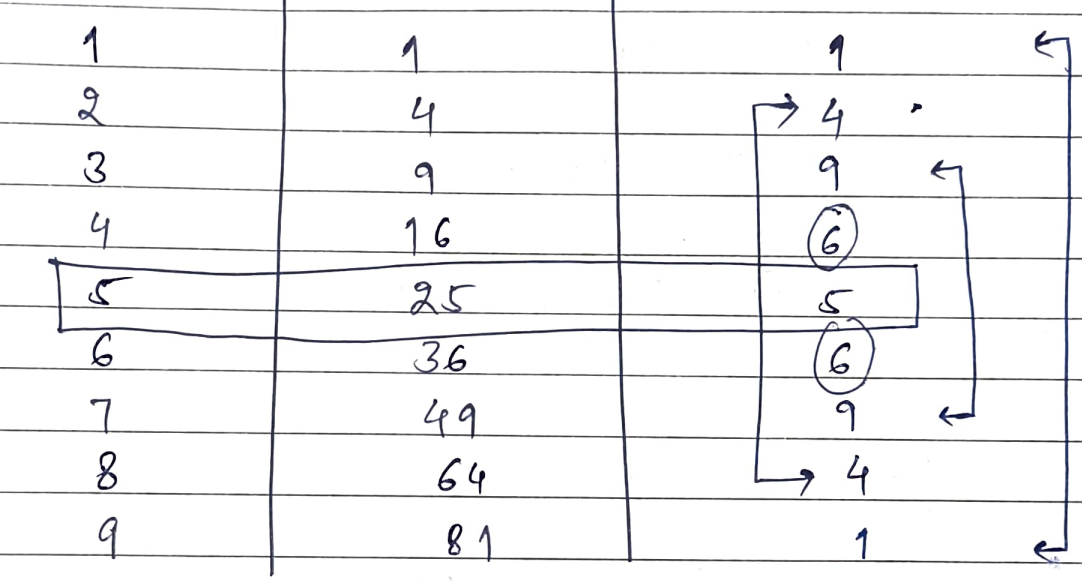
(For Perfect square root of 2-digits)

Square roots in one line

number	Square	Last digit in Square
1	1	1
2	4	4
3	9	9
4	16	6
5	25	5
6	36	6
7	49	9
8	64	4
9	81	1



Q. $\sqrt{3481}$

34 | 81 — this is greater

take less no. 5

9/1

51 | 59

$(55)^2 = 3025$

$\therefore \left(\sqrt{3481}\right) = 59$

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2) $\sqrt{4096}$

40 / 96 ← less

6 — 6 or 4

66 or 64

$(65)^2 = 4225$

$\therefore \sqrt{4096} = 65$

3) $\sqrt{2704}$

27 / 04 ← less

5 — 2 or 8

52 or 58

$(55)^2 = 3025$

$\therefore \sqrt{2704} = 52$

Q.1) $\sqrt{784} \rightarrow 8 / 2 \text{ or } 8 \rightarrow 88$

2) $\sqrt{6889} \rightarrow 8 / 3 \text{ or } 7 \rightarrow 83$

3) $\sqrt{8281} \rightarrow 9 / 9 \text{ or } 1 \rightarrow 91$

4) $\sqrt{5476} \rightarrow 7 / 4 \text{ or } 6 \rightarrow 74$

5) $\sqrt{4624} \rightarrow 6 / 2 \text{ or } 8 \rightarrow 68$

6) $\sqrt{576} \rightarrow 2 / 4 \text{ or } 6 \rightarrow 24$

7) $\sqrt{961} \rightarrow 3 / 1 \text{ or } 9 \rightarrow 31$

8) $\sqrt{1369} \rightarrow 3 / 3 \text{ or } 7 \rightarrow 37$

9) $\sqrt{3249} \rightarrow 5 / 3 \text{ or } 7 \rightarrow 57$

10) $\sqrt{2116} \rightarrow 4 / 4 \text{ or } 6 \rightarrow 46$

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* Square root of a random numbers :

$\sqrt{58347}$

No. of square root digits = $\frac{n}{2}$ (even)

$\frac{n+1}{2}$ (odd)

write sq. root of the no. or no less than this

$4 \mid \overline{5}\,\overline{83}\,\overline{47}\,\overline{00}$

$2x \leftarrow 2 : 4\ 1\ 5\ 5$ ---

$S_1 \rightarrow$ G.D. = N.D. = $18 \div 4$; $Q = 4, R = 2$

$S_2 \rightarrow$ G.D. = 23, N.D. = $23 - D(4)$ [duplex of digit after colon]

$= 23 - 16 = 7 \div 4$; $Q = 1; R = 3$

$S_3 \rightarrow$ G.D. = 34, N.D. = $34 - D(41) = 34 - 8 = 26 \div 4$

$Q = 6; R = 2$

(case of failure)

$S_4 \rightarrow$ G.D. = 27, N.D. = $27 - D(416)$

$= 27 - (49) = -22 < 0$

* $S_4 \rightarrow$ G.D. = 67, N.D. = $67 - D(415)$

$= 67 - 41 = 26 \div 4, Q = 6, R = 2$

$S_5 \rightarrow$ G.D. = 60, N.D. = $60 - D(4155) = 60 - 50 = 10$

$\sqrt{58\,347} = 241.551$

Q.1) $\sqrt{8342 \cdot 564}$

2) $\sqrt{2304}$

3) $\sqrt{519841}$

4) $\sqrt{37}$

5) $\sqrt{28 \cdot 356}$

1) $18 \overline{)83 : 42 \cdot 564}$

$9 : 1 \cdot 3 \cdot 37$

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* Cube Root of a number :-

eg : $\sqrt[3]{373248} = (373248)^{1/3} = 72$

Number	Cube	Last Digit
1	1	(1)
2	8	8
3	27	7
4	64	(4)
5	125	(5)
6	216	(6)
7	343	3
8	512	2
9	729	(9)

373 | 248 (2

7 2

$\Rightarrow \sqrt[3]{373248} = 72$

Q.1) $\sqrt[3]{79507} = 43$

2) $\sqrt[3]{636056} = 86$

3) $\sqrt[3]{21952} = 28$

4) $\sqrt[3]{531441} = 81$

5) $\sqrt[3]{175616} = 56$

6) $\sqrt[3]{2197} = 13$

7) $\sqrt[3]{59319} = 39$

8) $\sqrt[3]{681472} = 88$

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9) $3\overline{)857375} = 95$

10) $3\overline{)474552} = 78$

11) $3\overline{)250047} = 63$

12) $3\overline{)4913} = 17$