Maths class : VIII

Chapter 3 : Square and Square Root; Cube and Cube Root

Ex : 3.1 P.NO : 25

1 Find the squares of the following numbers:

a) 16 b) 45 c) 92 d) 218

a) 16

we take AB = 16

where, A = 1 and B = 6

Step I : make three columns and write A^2, 2xAxB, and B^2

A^2	2xAxB	B^2
$(1)^2$	2x1x6	$(6)^2$
1	12	36

Step II : Now underline the ones digit of B^2, and add its tens digit, if any to 2xAxB

Step III : now underline the ones digit in 2xAxB, and add the number formed by the remaining digit/s to A^2

A^2	2xAxB	B^2
1	12	36
+1	+ 3	
2	15	

This is column method you may use any method for this

Ans : 256 //

2 which of the following numbers are not perfect squares?

a) 1,849

A perfect square leaves a remainder of 0 or 1 when devided by 3

$$3\overline{)1849} = 616$$

18

4

3

19

18

1

so it is perfect square

b) 7,000

A number ending with an odd number of zeros is never a perfect square.

3 The possible number of digits in the squares of the following number.

17

Here number of digit $n = 2$

Hence $(2n-1) = 2 \times 2 - 1 = 4 - 1 = 3$

In 17 Square, 3 digits are possible

4. with out actual Addition

a) $1+3+5+7$

Take the center (median) number

In between 3 and 5

$$\frac{3+5}{2} = \frac{8}{2} = 4$$

Hence $1+3+5+7 = 4^2 = 16$.

Here number are even so we take the median inbetween 3 & 5, odd number mean take the center number.

5 Find the ones place in the square.

a) 19

Hence 1 is present in the ones place.

$6\times6=36$ $2\times2=4$

$7\times7=49$ $3\times3=9$

$8\times8=64$ $4\times4=16$

$9\times9=81$ $5\times5=25$

b) $11\frac{1}{4}$ = 6 in ones place.

6 a) 64 as the sum of 8 odd numbers

$1+3+5+7+9+11+13+15$

Take the center (median) numbers

$$\frac{7+9}{2} = \frac{16}{2} = 8$$

Hence, $8^2 = 64$

7 The sum of two consecutive positive numbers.

a) $25^2 = 25\times25 = 625$ $\frac{625}{2} = 312.5$

$25^2 = 312 + 313$

b) $17^2 = 289$

$$\frac{289}{2} = 144.5$$

Hence $17^2 = 144 + 145$

8 The numbers lie between the squares

a) 5^2 and 6^2

$5^2 = 25$

$6^2 = 36$

between 36 & 25

$= 26, 27, 28, 29, 30, 31, 32, 33, 34, 35$

10 numbers lie between 5^2 and 6^2

9 Find the squares by using column method.

a) 24

A = 2

B = 4

Column I	Column II	Column III
A^2	$2 \times A \times B$	B^2
2^2	$2 \times 2 \times 4$	4^2
4	16	16
+1	+1	
5	17	

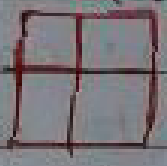
Hence $24^2 = 576$

10 Find the squares by using diagonal method

a) 41

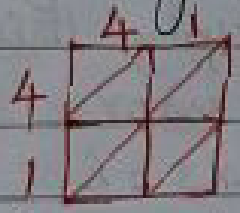
Step 1 : No of digit in 41 = 2

Step 2 : Draw a table with n(2) rows and n(2) columns

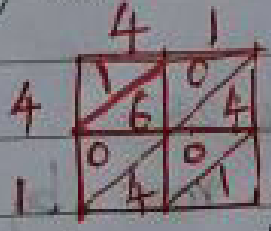


Step 3 :

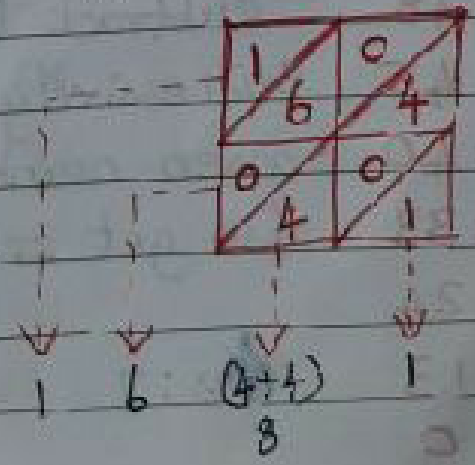
Draw the diagonal of each small Squares.



Step 4 : Multiply each digit on the left of the square with each digit on top of the columns one by one



Step 5 : Starting at the lowermost diagonal, write the ones digit of the sum and take the tens digit if any to the diagonal above



Ans = 1681

11 Shortcut method

Squares of numbers ending with 5 can be found in the shortcut method

a) 25

Step 1: Cross out 5 from the number to obtain a new number

So, we get 2 from 25

Step 2: multiply this new number by its successor.

So, $2 \times 3 = 6$.

Step 3: Suffix 25 to the product to obtain the square

Ans = 625

EX: 3.2 P.No: 25

1. Find the square root by successive Subtraction.

a) 49

Successive subtraction of odd numbers

① 49 - 1 = 48
② 48 - 3 = 45
③ 45 - 5 = 40
④ 40 - 7 = 33
⑤ 33 - 9 = 24
⑥ 24 - 11 = 13
⑦ 13 - 13 = 0

Subtract the odd numbers successively from the given number till we get zero.

Ans: 7

2. Find the square root by using their ones and tens digit

a) 529

The ones digit of the number is 9. so the ones digit of the square root is either 3 or 7

because: $2 \times 2 = 4$ $\quad 6 \times 6 = 36$

$3 \times 3 = 9$ $\quad 7 \times 7 = 49$

$4 \times 4 = 16$ $\quad 8 \times 8 = 64$

$5 \times 5 = 25$ $\quad 9 \times 9 = 81$

Let us strike out two digits from the right we get the number 5

$(2^2 = 4 < 5)$ whereas $(3^2 = 9 > 5)$

Hence the tens digit of the square root is 2

so the square root is either

23 or 27

The square of 23 is 529.

3. Find the square root by prime factorization

a) 1936

2	1936
2	968
2	484
2	242
11	121
	11

$2 \times 2 \times 2 \times 2 \times 11 \times 11 = 1936$

$(2 \times 2 \times 11)^2 = 1936$

$44^2 = 1936$

Ans = 44

4

5	2025
5	405
9	81
	9

$5 \times 5 \times 9 \times 9 = 2025$

$(5 \times 9)^2 = 2025$

$45^2 = 2025$

The number of plants in each row $= 45$

It is similar to Ex 3.3, q.no: 6, 7, 8

5

4, 5, 6 and 12

LCM $= 2 \times 3 \times 2 \times 5$

$= 60$

2	60
2	30
3	15
	5

2	4, 5, 6, 12
3	2, 5, 3, 6
2	2, 5, 1, 2
5	1, 5, 1, 1
	1, 1, 1, 1

$2 \times 2 \times 5 \times 3$ here 5 & 3 are not appearing in pairs so to make this pairs we have to multiply the given numbers by 5 & 3

that is $5 \times 3 = 15$

$60 \times 15 = 900$ (perfect square)

Ans: 900

6 The smallest number by which numbers should be multiplied to get perfect square.

a) 1280

We have to find which number should be multiplied to get perfect square

2	1280
2	640
2	320
2	160
2	80
2	40
2	20
2	10
	5

$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 5$

Here 5 is unpaired

To make 1280 as a perfect square, we have to multiply 5 with 1280

$1280 \times 5 = 6400$

Ans : 5

7 The smallest number by which number should be divided so as to get perfect squares.

a) 6336

2	6336
2	3168
2	1584
2	792
2	396
2	198
3	99
3	33
	11

$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 11$

Here 11 is unpaired.

If we remove 11 from the pairs we can get the perfect square.

So, we have devide the 11.

EX : 3.3 P.NO : 31

1. How many digits are there in the square root

a) 841

(i) $\frac{n}{2}$ digits, if n is even

(ii) $\frac{n+1}{2}$ digits, if n is odd

841 ⇒ number of digits $n = 3$.

n is odd, so, $\frac{n+1}{2} = \frac{3+1}{2} = \frac{4}{2} = 2$ digits

d) 1369 ⇒ number of digits $n = 4$

so, $\frac{n}{2} = \frac{4}{2} = 2$ digits

2 Use the division method to find the square root

a) 729

Use the table

2 x 2 = 4

3 x 3 = 9

4 x 4 = 16

5 x 5 = 25

6 x 6 = 36

7 x 7 = 49

8 x 8 = 64

9 x 9 = 81

	27
2	729
⊕2	4
47	329
	329
	0

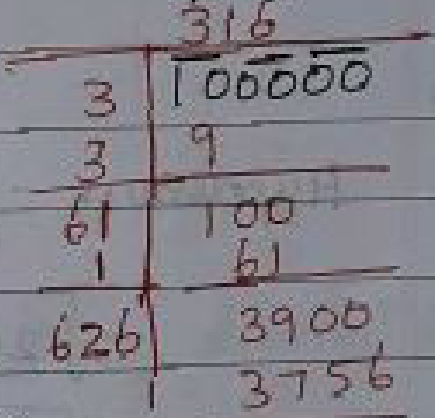
Square root = 27

4 Find the smallest 6-digit number which is a perfect square.

Smallest 6-digit number = 100000

First we have check whether is it perfect square or not.

Not in perfect square means we want to change this number as a perfect square in 6-digit



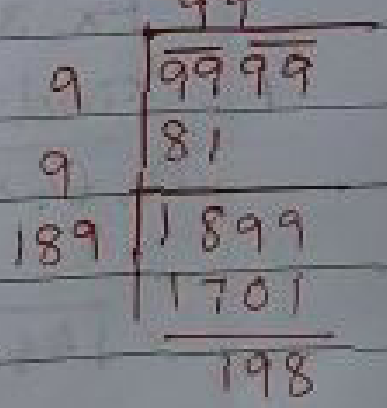
So, 317 is a perfect square root

$317^2 = 100,489$

This is the perfect square in the 6-digits

5 In the largest 4-digit number which is a perfect square

Largest 4 digit number = 9999



9999 - 198

= 9801 is the largest 4 digit square number

9 Find the perimeter of a square land having an area of $9,409\ m^2$.

Area = 9,409

Side of square = $\sqrt{9409}$

$= 97$

perimeter = 4a

$= 4 \times 97 = 388\ m$

	97
9	$\overline{94}\,\overline{09}$
9	81
187	1309
	1309
	0

10

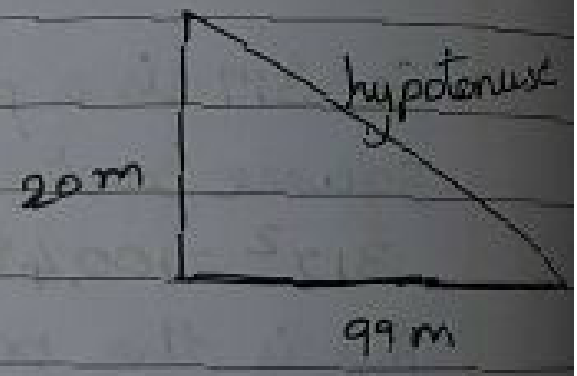
Hypotenuse = $\sqrt{Side^2 + Side^2}$

$= \sqrt{20^2 + 99^2}$

$= \sqrt{400 + 9801}$

$= \sqrt{10201}$

$= 101\ m$



Ex 3.4 P.NO:33

1 Find the value

a) $\sqrt{64 \times 289}$

$\sqrt{a \times b} = \sqrt{a} \times \sqrt{b}$

$\sqrt{64 \times 289} = \sqrt{64} \times \sqrt{289}$

$= 8 \times 17$

$= 136$

	17
1	289
27	189
	189
	0

2 b) $\sqrt{\frac{12.96}{0.0144}}$

$$\sqrt{\frac{9}{b}} = \frac{\sqrt{9}}{\sqrt{b}}$$

$$\sqrt{\frac{1296}{0.0144}} = \frac{\sqrt{12.96}}{\sqrt{0.0144}}$$

$$= \frac{3.6}{0.12}$$

$$= \frac{36 \times 10^{-1}}{12 \times 10^{-2}}$$

$$= 30$$

0.12

1	$0.\overline{01}\,\overline{44}$
1	1
22	44
	44
	0

3.6

3	$\overline{12}.\overline{96}$
3	9
66	396
	396
	0

3 Find the square root (three decimal places)

a) 11

We insert as many zeros to make 3 pairs of digits in the decimal part of 11 like → 11.000000

Ans: 3.316

↓ three decimal part

3.316

3	$11.\overline{00}\,\overline{00}\,\overline{00}$
3	9
63	200
3	189
661	1100
1	661
6626	43900
	39756
	4144

5 Area of square $= \sqrt{1\frac{56}{169}}\ m^2$

$$\text{Area} = 1\frac{56}{169} = \frac{169+56}{169} = \frac{225}{169}$$

length of square $= \sqrt{\frac{225}{169}} = \frac{15}{13}$

$$\text{perimeter} = \frac{15}{13} \times 4$$

$$= \frac{60}{13} = 4\frac{8}{13}$$

8. If $\sqrt{3969} = 63$, the value of

a) $\sqrt{0.003969}$

$$= \sqrt{3969 \times 10^{-6}} = 63 \times 10^{-3} = 0.063$$

b) $\sqrt{39.69} = \sqrt{3969 \times 10^{-2}} = \sqrt{3969} \times \sqrt{10^{-2}}$

$$= 63 \times 10^{-1} = 6.3$$

Ex 3.5 P.NO: 38

1. Find the cube

a) $2\frac{1}{5} = \frac{11}{5}$

cube of this number $= \left(\frac{11}{5}\right)^3 = \frac{11}{5} \times \frac{11}{5} \times \frac{11}{5}$

$$= \frac{1331}{125}$$

2. Which of the following numbers are cube of even numbers?

a) 729 b) 1,000 c) 2,744 d) 6,859

Cube of all even numbers are even b) 1000 & c) 2744 are cube of even number.

3. It is similar to 4th question

4. Find the cube root by successive subtraction of number, 1, 7, 9.

The odd numbers may be obtained by putting $n = 1, 2, 3 \ldots$ in $1 + n(n-1)\times 3$

a) $27 - 1 = 26$ — (1)

$26 - 7 = 9$ — (2) 3 time subtraction

$9 - 9 = 0$ — (3).

So cube root is 3

5. Find the cube root of numbers by finding their ones and tens digits

a) 3,375

Cube Root using Digits

We observe that the cube of a numbers ending in 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9

end in 0, 1, 8, 7, 4, 5, 6, 3, 2, and 9 respectively.

Step 1: Look at the ones place of 33
5 is ones digit, so the digit at ones place in cube root also 5

Step 2: Strike out the last three digits of the number from the right. If Nothing is left, we stop.

Step 3: The number left is 3
Now $1^2 = 1 < 3$ and $2^2 = 4 > 3$
So its tens digit is 1
Thus $\sqrt{3375} = \underline{15}$

6 prime factorization method in cube r

a) 2197

$\sqrt[3]{2197}$

13 | 2197
13 | 169
13

$(13 \times 13 \times 13)^{\frac{1}{3}} = \boxed{13 = \text{Ans}}$

7 $\sqrt[3]{125 \times 64}$

$\sqrt[3]{a \times b} = \sqrt[3]{a} \times \sqrt[3]{b}$

$\sqrt[3]{125 \times 64} = \sqrt[3]{125} \times \sqrt[3]{64}$

$= \sqrt[3]{5 \times 5 \times 5} \times \sqrt[3]{4 \times 4 \times 4}$

$= 5 \times 4 = \boxed{20 = \text{Ans}}$

12 The sum of the cubes of three numbers is in the ratio 1:3:4 is 17,576. Find the numbers.

ratio = 1:3:4

tootal = 1+3+4 = 8

I number $= \frac{1}{8} \times 17,576 = \frac{17,576}{8}$

$= 2197$

II number $= \frac{3}{8} \times 17,576 =$

$= 6591$

III number $= \frac{4}{8} \times 17,576$

$= 8788.$

So, the three numbers

$\sqrt[3]{2197}, \sqrt[3]{6591}, \sqrt[3]{8788}$

13, 39, 52

Rest of the sum (Problems) do it your self

Complete the chapter-3 in your class work copy.