Homework-19

VIII **Squares and Square Roots & Cubes and Cube roots**

1) Find the square root of 144 by the method of repeated subtraction.

Soln:- $144-1=143$ $128-9=119$ $80-17=63$
$143-3=140$ $119-11=108$ $63-19=44$
$140-5=135$ $108-13=95$ $44-21=23$
$135-7=128$ $95-15=80$ $23-23=0$
$\therefore \sqrt{144}=12$

2) How many numbers lie between the square of 16 and 17?

Soln:- we know that there are $2n$ numbers lie between n^2 and $(n+1)^2$.
$n=16 \Rightarrow 2n=32$
$\therefore$ There are 32 numbers lie between 16^2 and 17^2.

3) Find the square root of 39204 and 31.36 by long division method.

Soln:- $\therefore \sqrt{39204}=198$

	198
1	39204
	1
29	292
	261
388	3104
	3104
	0

$\therefore \sqrt{31.36}=5.6$

	5.6
5	31.36
	25
106	636
	636
	0

4) Find a Pythagorean triplet in which one member is 17.

Soln:- we know than $(2m, m^2-1, m^2+1)$ forms a Pythagorean triplet.
Let $m^2+1=17 \Rightarrow m^2=16$
$\Rightarrow m=4$

$\therefore 2m = 8$

$m^2 - 1 = 16 - 1 = 15$

$\therefore (8, 15, 17)$ forms a Pythagorean triplet.

5) Find a Pythagorean triplet in which one member is 12.

Soln:- We know than $(2m, m^2-1, m^2+1)$ forms a Pythagorean triplet.

Let $2m = 12 \Rightarrow m = 6$

$\therefore m^2 - 1 = 36 - 1 = 35$

$m^2 + 1 = 36 + 1 = 37$

Thus, $(6, 35, 37)$ forms a Pythagorean triplet.

6) Find the smallest number by which 1800 must be multiplied so that it becomes a perfect square. Also, find the square root of the perfect square so obtained.

Soln:- $1800 = 3 \times 3 \times 5 \times 5 \times 2 \times 2 \times (2)$

$\therefore$ The smallest number to be multiplied $= 2$

Then, $1800 \times 2 = 3 \times 3 \times 5 \times 5 \times 2 \times 2 \times 2 \times 2$

$\sqrt{3600} = 3 \times 5 \times 2 \times 2$

$= 60$

3	1800
3	600
2	200
2	100
2	50
5	25
	5

Hence, the perfect square obtained is 3600 and $\sqrt{3600} = 60$.

7) Is 2352 a perfect square? If not, find the smallest number by which 2352 must be multiplied so that the product is a perfect square. Find the square root of new number.

Soln:- $2352 = 2 \times 2 \times 2 \times 2 \times 7 \times 7 \times (3)$

Thus 2352 is not a perfect square since all the factors are not appearing as pairs.

Also, the smallest number to be multiplied is 3

$\therefore 2352 \times 3 = 2 \times 2 \times 2 \times 2 \times 7 \times 7 \times 3 \times 3$

$\sqrt{7056} = 2 \times 2 \times 7 \times 3 = 84$

2	2352
2	1176
2	588
2	294
7	147
7	21
	3

8) Using prime factorisation, find the square roots of
(a) 11025 (b) 4761

Soln:- $11025 = 5\times5\times3\times3\times7\times7$

$\therefore \sqrt{11025} = 5\times3\times7 = \underline{\underline{105}}$

5	11025
5	2205
3	441
7	147
7	21
	3

$4761 = 3\times3\times23\times23$

$\therefore \sqrt{4761} = 3\times23 = \underline{\underline{69}}$

3	4761
3	1587
23	529
	23

9) The area of a square field is 8281 m^2. find the length of its side.

Soln:- Area of a square $= a^2 = 8281\ m^2$

$a = \sqrt{8281}$

$= 91\ m$ //

Hence, length of the side $= \underline{\underline{91m}}$

	91
9	8281
	81
181	181
	181
	0

10) Find the square root of $4\frac{53}{169}$

Soln:- $4\frac{53}{169} = \frac{729}{169}$

$\therefore \sqrt{\frac{729}{169}} = \underline{\underline{\frac{27}{13}}}$

11) Find the smallest number by which 3645 should be divided so as to get a perfect square. Also, find the square root of the number so obtained.

Soln:- $3645 = 3\times3\times3\times3\times3\times3\times5$

$\therefore$ The required number to be divided is 5

$3645 \div 5 = 3\times3\times3\times3\times3\times3$

$\sqrt{729} = 3\times3\times3 = \underline{\underline{27}}$.

5	3645
3	729
3	243
3	81
3	27
3	9
	3

12) There are 500 children in a school. For a P.T drill they have to stand in such a manner that the number of rows is equal to number of columns. How many children would be left out in this arrangement?

Soln:- Let the no. of rows = no. of columns = x.

Then $x \times x = 500$

$\Rightarrow x^2 = 500$

$\therefore x = \sqrt{500}$

$$\begin{array}{r|l} & 22 \\ \hline 2 & \overline{500} \\ & 4 \\ \hline 42 & 100 \\ & 84 \\ \hline & 16 \end{array}$$

$\therefore$ 16 students will be left out in this arrangement.

13) Find the greatest four digit number which is a perfect square.

Soln:-

Greatest four digit number = 9999

$\therefore$ The required greatest four digit no. $= 9999 - 198$

$= \underline{9801}$

$$\begin{array}{r|l} & 99 \\ \hline 9 & \overline{9999} \\ & 81 \\ \hline 189 & 1899 \\ & 1701 \\ \hline & 198 \end{array}$$

14) Find the smallest square number that is divisible by each of the numbers 8, 15 and 20

Soln:- LCM (8, 15, 20) = 120

$120 = 2 \times 2 \times 2 \times 5 \times 3$

$\therefore$ The smallest square number

$= 120 \times 2 \times 5 \times 3 = \underline{3600}$

$$\begin{array}{r|l} 2 & 120 \\ 2 & 60 \\ 2 & 30 \\ 5 & 15 \\ & 3 \end{array}$$

$$\begin{array}{r|l} 5 & 8, 15, 20 \\ 2 & 8, 3, 4 \\ 2 & 4, 3, 2 \\ 2 & 2, 3, 1 \\ 3 & 1, 3, 1 \\ & 1, 1, 1 \end{array}$$

15) Find the least number that must be subtracted

from 5607 so as to get a perfect square. Also, find the square root of the perfect square.

Soln:-

$$\begin{array}{r|l} & 74 \\ \hline 7 & \overline{56}\,\overline{07} \\ & 49 \\ \hline 144 & 707 \\ & 576 \\ \hline & 131 \end{array}$$

∴ The least number to be Subtracted = 131

Thus, $5607 - 131 = 5476$.

Hence, $\sqrt{5476} = \underline{74}$

16) Find the least number which must be added to 1825 so as to get a perfect square. Also, find the square root of the perfect square so obtained.

Soln:-

$$\begin{array}{r|l} & 43 \\ \hline 4 & \overline{18}\,\overline{25} \\ & 16 \\ \hline 83 & 225 \\ & 249 \\ \hline & 24 \end{array}$$

∴ The required least number to the added = 24

Thus, the perfect square number $= 1825 + 24 = 1849$

$\therefore \sqrt{1849} = \underline{43}$

17) Show that 74088 is a perfect cube

$74088 = 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 7 \times 7 \times 7$

$$\begin{array}{r|l} 2 & 74088 \\ 2 & 37044 \\ 2 & 18522 \\ 3 & 9261 \\ 3 & 3087 \\ 3 & 1029 \\ 7 & 343 \\ 7 & 49 \\ & 7 \end{array}$$

Since the prime factors are appearing as triplets, 74088 is a perfect cube.

$\sqrt[3]{74088} = 2 \times 3 \times 7 = \underline{42}$

18) Find the Cube root of the following:-

(i) -9261

(ii) 0.216

(iii) $2\frac{43}{343}$

Soln:-(i) $\sqrt[3]{-9261} = \sqrt[3]{3\times3\times3\times7\times7\times7}$

$= -3\times7 = -21$

3	9261
3	3087
3	1029
7	343
7	49
	7

(ii) $0.216 = \frac{216}{1000}$

$\sqrt[3]{\frac{216}{1000}} = \frac{6}{10} = 0.6$

(iii) $2\frac{43}{343} = \frac{729}{343}$

$\sqrt[3]{\frac{729}{343}} = \frac{9}{7}$

19) Find the smallest number by which 5184 should be multiplied so that the product is a perfect cube. Also, find the cube root of the product.

Soln:- $5184 = 2\times2\times2\times2\times2\times2\times3\times3\times3\times3$

∴ The required smallest number to be multiplied $= 3\times3 = 9$

Thus, $\sqrt[3]{5184\times9} = 2\times2\times3\times3$

$\therefore \sqrt[3]{46656} = 36$

Hence cube root of 46656 is 36

3	5184
3	1728
3	576
3	192
2	64
2	32
2	16
2	8
2	4
	2

20) Find the smallest number by which 8788 should be divided so that the quotient is a perfect cube. Also, find the cube root of the quotient.

Soln:-

$8788 = 2\times2\times13\times13\times13$

∴ The required smallest number to be divided $= 2 \times 2 = 4$

2	8788
2	4394
13	2197
13	169
	13

Thus, $\sqrt[3]{\frac{8788}{4}} = 13$

$\Rightarrow \sqrt[3]{2197} = 13$ //

21) Find the side of a cube whose volume is $4096\ m^3$.

Soln:- Volume of a cube $= a^3 = 4096$

∴ Side of the cube, $a = \sqrt[3]{4096}$

$= 2 \times 2 \times 2 \times 2$

$= 16\ m$

2	4096
2	2048
2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
	2

22) Find the cube root of 103823 by estimation method.

$\overline{103}\,\overline{823} = 4\ 7$

$4^3 < 103 < 5^3$

∴ $\sqrt[3]{103823} = 47$ //