

Exercise 3.4

Q.1 Write the possible unit's digits of the square root of the following numbers. Which of these numbers are odd square roots.

(i) 9801 (ii) 99856 (iii) 998001

(iv) 657666025

Solution: (i) 9801

Possible unit digit in square root of 9801 are 1 and 9.

It has odd square root.

(ii) 99856, Possible unit digits in its square root are 4 and 6.

It has even square roots.

(iii) 998001, Possible unit digits in its square root are 1 and 9.

It has odd square root.

(iv) 657666025 $\rightarrow$ Possible unit digit is 5

It has odd square root.

Q.2 Find the square root of the following by Prime factorisation method

(i) 441

(ii) 196

(iii) 529

(iv) 1764

(v) 1156

(vi) 4096

(vii) 7056

(viii) 8281

(ix) 11664

(x) 47089

(xi) 24336

(xii) 190969

(xiii) 586756

(xiv) 27225

(xv) 3013696.

Solution:

(i) $\therefore 441 = 3 \times 3 \times 7 \times 7$

$\sqrt{441} = 3 \times 7 = 21$

3	441
3	147
7	49
7	7
	1

(ii) $196 = 2 \times 2 \times 7 \times 7$

$\therefore \sqrt{196} = 2 \times 7 = 14$

2	196
2	98
7	49
7	7
	1

(iii) $529 = 23 \times 23$

$\therefore \sqrt{529} = 23$

$$(iv) \quad 1764 = 2 \times 2 \times 3 \times 3 \times 7 \times 7$$

$$\therefore \sqrt{1764} = 2 \times 3 \times 7 \\ = 42$$

$$\begin{array}{r|l} 2 & 1764 \\ \hline 2 & 882 \\ \hline 3 & 441 \\ \hline 3 & 147 \\ \hline 7 & 49 \\ \hline 7 & 7 \\ \hline & 1 \end{array}$$

$$(v) \quad 1156 = 2 \times 2 \times 17 \times 17$$

$$\therefore \sqrt{1156} = 2 \times 17 \\ = 34$$

$$\begin{array}{r|l} 2 & 1156 \\ \hline 2 & 578 \\ \hline 17 & 289 \\ \hline 17 & 17 \\ \hline & 1 \end{array}$$

$$(vi) \quad 4096 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \\ \times 2 \times 2 \times 2 \times 2 \times 2$$

$$\therefore \sqrt{4096} = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \\ = 64$$

$$\begin{array}{r|l} 2 & 4096 \\ \hline 2 & 2048 \\ \hline 2 & 1024 \\ \hline 2 & 512 \\ \hline 2 & 256 \\ \hline 2 & 128 \\ \hline 2 & 64 \\ \hline 2 & 32 \\ \hline 2 & 16 \\ \hline 2 & 8 \\ \hline 2 & 4 \\ \hline 2 & 2 \\ \hline & 1 \end{array}$$

(vii) 7056

$$\therefore 7056 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 7 \times 7$$

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

$$= 84$$

2	7056
2	3528
2	1764
2	882
3	441
3	147
7	49
7	7
	1

(viii) 8281 = $7 \times 7 \times 13 \times 13$

$$\therefore \sqrt{8281} = 7 \times 13$$

$$= 91$$

7	8281
7	1183
13	169
13	13
	1

(ix) 11664

$$11664 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$$

$$\therefore \sqrt{11664} = 2 \times 2 \times 3 \times 3 \times 3$$

$$= 108$$

2	11664
2	5832
2	2916
2	1458
3	729
3	243
3	81
3	27
3	9
3	3
	1

$$(x) \quad 47089 = 7 \times 7 \times 31 \times 31$$

$$\therefore \sqrt{47089} = 7 \times 31 \\ = 91$$

7	47089
7	67281
31	961
31	31
	1

$$(xi) \quad 24336$$

$$\therefore 24336 = 2 \times 2 \times 2 \times 2 \\ \times 3 \times 3 \times 13 \times 13$$

$$\sqrt{24336} = 2 \times 2 \times 3 \times 13 \\ = 104$$

2	24336
2	12168
2	6084
2	3042
3	1521
3	507
13	169
13	13
	1

$$(xii) \quad 190969 = 23 \times 23 \times 19 \times 19$$

$$\Rightarrow \sqrt{190969} = 23 \times 19 \\ = 437$$

23	190969
23	8303
19	361
19	19
	1

$$(xiii) \quad 586756$$

$$= 2 \times 2 \times 383 \times 383$$

$$\therefore \sqrt{586756} = 2 \times 383 \\ = 766$$

2	586756
2	293378
383	146689
383	383
	1

(XIV) 27225

$$\therefore 27225 = 5 \times 5 \times 3 \times 3 \times 11 \times 11$$

$$\therefore \sqrt{27225} = 5 \times 3 \times 11$$

$$= 165$$

5	27225
5	5445
3	1089
3	363
11	121
11	11
	1

(XV) 3013696

$$= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 7 \times 7$$

$$\times 31 \times 31$$

$$\therefore \sqrt{3013696} = 2 \times 2 \times 2 \times 7 \times 31$$

$$= 1736$$

2	3013696
2	1506848
2	753424
2	376712
2	188356
2	94178
7	47089
7	6727
31	961
31	31
	1

Q.3 Find the smallest number by which 180 must be multiplied so that it becomes a perfect square.
Also, find the square root of the perfect square so obtained.

Solution

$$\therefore 180 = 2 \times 2 \times 3 \times 3 \times 5$$

Number should be multiplied
by 5.

$$\begin{array}{r|l} 2 & 180 \\ \hline 2 & 90 \\ \hline 3 & 45 \\ \hline 3 & 15 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

$$\therefore 180 \times 5 = 2 \times 2 \times 3 \times 3 \times 5 \times 5$$

$$\Rightarrow \sqrt{900} = 2 \times 3 \times 5$$

$$= 30$$

Q4 Find the smallest number by which 147 must be multiplied so that it becomes a perfect square. Also find the square root of the number so obtained.

Solution

$$\therefore 147 = 7 \times 7 \times 3$$

$\therefore$ Number should be multiplied by 3.

$$\therefore 147 \times 3 = 7 \times 7 \times 3 \times 3$$

$$\Rightarrow \sqrt{441} = 7 \times 3$$

$$= 21$$

$$\begin{array}{r|l} 7 & 147 \\ \hline 7 & 21 \\ \hline 3 & 3 \\ \hline & 1 \end{array}$$

Q.5 Find the smallest number by which 3645 must be divided so that it becomes a perfect square. Also, find the square root of the number so obtained.

Solution

$$3645 = 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 5$$

Here prime factor 5 is not in pairs.

$\therefore$ It should be divided by 5

$$\frac{3645}{5} = \frac{3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 5}{5}$$

$$\Rightarrow 729 = 3 \times 3 \times 3 \times 3 \times 3 \times 3$$

$$\therefore \sqrt{729} = 3 \times 3 \times 3 = 27.$$

$$\begin{array}{r|l} 3 & 3645 \\ \hline 3 & 1215 \\ \hline 3 & 405 \\ \hline 3 & 135 \\ \hline 3 & 45 \\ \hline 3 & 15 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

Q.6 Find the smallest number by which 1152 must be divided so that it becomes a perfect square. Also find the square root of the number so obtained.

Sol:

$$\therefore 1152 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3$$

No. should be divided by 2

$$\frac{1152}{2} = \frac{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3}{2}$$

$$= \sqrt{576} = 2 \times 2 \times 2 \times 3 = 24$$

$$\begin{array}{r|l} 2 & 1152 \\ \hline 2 & 576 \\ \hline 2 & 288 \\ \hline 2 & 144 \\ \hline 2 & 72 \\ \hline 2 & 36 \\ \hline 2 & 18 \\ \hline 3 & 9 \end{array}$$

$$\begin{array}{r|l} 3 & 3 \\ \hline & 1 \end{array}$$

Q.7 The Product of two numbers is 1296, If one number is 16 times the other, find the numbers

Solution: let one number be x
other no. = $16x$

$$\therefore x \times 16x = 1296$$

$$\Rightarrow 16x^2 = 1296$$

$$\Rightarrow x^2 = \frac{1296}{16} = 81$$

$$\Rightarrow x = \sqrt{81} = 9$$

Therefore no.s are $x = 9$

$$16x = 16 \times 9 = 144$$

Q.8 A welfare association collected Rs. 202500 as donation from the residents. If each paid as many rupee as there were residents. Find the number of residents.

Solution!

Total Amount collected = Rs 202500

let no. of residents = x

Amount paid by each = Rs x

$$\therefore x \times x = 202500$$

$$x^2 = 202500$$

$$\therefore x = \sqrt{202500}$$

$$\therefore \sqrt{202500} = 2 \times 2 \times 5 \times 5 \times 5 \times 5 \\ \times 3 \times 3 \times 3 \times 3$$

$$\Rightarrow \sqrt{202500} = 2 \times 5 \times 5 \times 3 \times 3 \\ = 450$$

2	202500
2	101250
5	50625
5	10125
5	2025
5	405
3	81
3	27
3	9
3	3
	1

Q9 A society collected Rs 92.16. Each member collected as many paise as there were members. How many members were there and how much did each contribute?

Solution: Total Amount collected = Rs 92.16
 $= 92.16 \times 100 = 9216$ Paise

Let no. of members = x
Amount collected by each member = x Paise

$$\therefore x \times x = 9216 \\ \Rightarrow x^2 = 9216 \\ \Rightarrow x = \sqrt{9216}$$

$$x = 2 \times 2 \times 2 \times 2 \times 2 \times 3 \\ = 96$$

2	9216
2	4608
2	2304
2	1152
2	576
2	288
2	144
2	72
2	36
2	18

3	9
3	3
	1

Q.10 A school collected Rs 2304 as fees from its students. If each student paid as many paise as there were students in the school. how many students were there.

Solution : Total Contribution = Rs 2304
 let no. of students = x
 Amount paid by each student = Rs. x

$$\therefore x \times x = 2304$$

$$\Rightarrow x = \sqrt{2304}$$

$$\Rightarrow 2304 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3$$

$$\Rightarrow \sqrt{2304} = 2 \times 2 \times 2 \times 2 \times 3 = 48$$

2	2304
2	1152
2	576
2	288
2	144
2	72
2	36
2	18
3	9
3	3
	1

Q.11 The area of square field is 5184 m^2 . A rectangular field, whose length is twice its breadth has its perimeter equal to the Perimeter of square field. Find the area of rectangular field.

Solution:

$$\text{Area of square field} = 5184 \text{ m}^2$$

$$(\text{Side})^2 = 5184$$

$$\Rightarrow \text{side} = \sqrt{5184}$$

$$\sqrt{5184} = 2 \times 2 \times 2 \times 3 \times 3$$

$$= 72$$

$$\therefore \text{side} = 72 \text{ m}$$

Let length and breadth of rectangular field are $2x$ and x

$\therefore$ Perimeter of rectangle = Perimeter of square

$$2(l+b) = 4 \times \text{side}$$

$$\Rightarrow 2(2x+x) = 4 \times 72$$

$$\Rightarrow 2 \times 3x = 288$$

$$\Rightarrow x = \frac{288}{6} = 48 \text{ m.}$$

$$\therefore \text{breadth} = 48 \text{ m, length} = 2 \times 48 = 96 \text{ m}$$

$$\text{Hence, Area of rectangular field} = l \times b$$

$$= 96 \times 48 \text{ m}^2$$

$$= 4608 \text{ m}^2.$$

2	5184
2	2592
2	1296
2	648
2	324
2	162
3	81
3	27
3	9
3	3
	1

Q.12 Find the least square number, exactly divisible by each one of the number.

(i) 6, 9, 15 and 20

(ii) 8, 12, 15 and 20

Solution : (i) 6, 9, 15 and 20

least number divisible by 6, 9, 15, 20

$$= \text{LCM} (6, 9, 15, 20) = 180.$$

By Prime factorisation of 180, we get

$$180 = 2 \times 2 \times 3 \times 3 \times 5$$

2	180
2	90
3	45
3	15
5	5
	1

To make it perfect square we multiply 180 by 5

$$\therefore \text{required number} = 180 \times 5 = 900$$

$$(ii) \text{ LCM} (8, 12, 15, 20) = 360.$$

$$\therefore 360 = 2 \times 2 \times 3 \times 3 \times 2 \times 5$$

To make it perfect square it should be multiplied by 2×5 i.e. 10

$$\therefore \text{required no.} = 360 \times 10 = 3600$$

Q.13 Find the square roots of 121 and 169 by the method of repeated subtraction.

Solution: let us find $\sqrt{121}$ by Repeated Subtraction

$$(i) \quad 121 - 1 = 120$$

$$(ii) \quad 120 - 3 = 117$$

$$(iii) \quad 117 - 5 = 112$$

$$(iv) \quad 112 - 7 = 105$$

$$(v) \quad 105 - 9 = 96$$

$$(vi) \quad 96 - 11 = 85$$

$$(vii) \quad 85 - 13 = 72$$

$$(viii) \quad 72 - 15 = 57$$

$$(ix) \quad 57 - 17 = 40$$

$$(x) \quad 40 - 19 = 21$$

$$(xi) \quad 21 - 21 = 0$$

$$\therefore \text{clearly } \sqrt{121} = 11$$

Now $\sqrt{169}$

$$(i) \quad 169 - 1 = 168$$

$$(ii) \quad 168 - 3 = 165$$

$$(iii) \quad 165 - 5 = 160$$

$$(iv) \quad 160 - 7 = 153$$

$$(v) \quad 153 - 9 = 144$$

$$(vi) \quad 144 - 11 = 133$$

$$(vii) \quad 133 - 13 = 120$$

$$(viii) \quad 120 - 15 = 105$$

$$(ix) \quad 105 - 17 = 88$$

$$(x) \quad 88 - 19 = 69$$

$$(xi) \quad 69 - 21 = 48$$

$$(xii) \quad 48 - 23 = 25$$

$$(xiii) \quad 25 - 25 = 0$$

$$\therefore \sqrt{169} = 13$$

Q.14 Write the prime factorisation of the following numbers and hence find their square roots:

(i) 7744

(ii) 9604

(iii) 5929

(iv) 7056

Solution:

(i) 7744

$$\therefore 7744 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 11 \times 11$$

$$\therefore \sqrt{7744} = 2 \times 2 \times 2 \times 11 = 88$$

2	7744
2	3872
2	1936
2	968
2	484
2	242
11	22
11	2
	1

(ii) $9604 = 2 \times 2 \times 7 \times 7 \times 7 \times 7$

$$\therefore \sqrt{9604} = 2 \times 7 \times 7 = 98$$

2	9604
2	4802
7	2401
7	343
7	49
7	7
	1

$$(iii) \quad 5929 = 11 \times 11 \times 7 \times 7$$

$$\therefore \sqrt{5929} = 11 \times 7 = 77$$

11	5929
11	539
7	49
7	7
	1

$$(iv) \quad 7056$$

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

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

2	7056
2	3528
2	1764
2	882
3	441
3	147
7	49
7	7
	1

Q.15 The students of class VIII of a school donated Rs 2401 for PM's National Relief fund. Each student donated as many rupees as the number of students in class. Find number of students in class.

Solution: Let no. of students = x
 Contribution of each student = Rs. x

$$\therefore x^2 = 2401$$

$$\Rightarrow x = \sqrt{2401} = 49$$

$$\therefore \text{Total students} = 49$$

Q.16 A PT teacher wants to arrange maximum possible number of 6000 students in a field such that the number of rows is equal to number of columns. Find the number of rows if 71 were left out after arrangement.

Sol:

$$\begin{aligned}\text{No. of students arranged} &= 6000 - 71 \\ &= 5929\end{aligned}$$

$$\text{Let no. of rows} = x$$

$$\text{no. of columns} = x$$

$$\therefore x \times x = 5929$$

$$x^2 = 5929$$

$$x = \sqrt{5929}$$

$$\begin{aligned}\therefore x &= 7 \times 11 \\ &= 77\end{aligned}$$

$$\therefore \text{No. of rows} = 77.$$

7	5929
7	847
11	121
11	11
	1