EXERCISE 3.4 PAGE NO: 3.38

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
We know that unit digit of 9801 is 1
Unit digit of square root = 1 or 9
Since the number is odd, square root is also odd

(ii) 99856
We know that unit digit of 99856 = 6
Unit digit of square root = 4 or 6
Since the number is even, square root is also even

(iii) 998001
We know that unit digit of 998001 = 1
Unit digit of square root = 1 or 9
Since the number is odd, square root is also odd

(iv) 657666025
We know that unit digit of 657666025 = 5
Unit digit of square root = 5
Since the number is odd, square root is also odd

2. Find the square root of each of the following by prime factorization.
(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) 441
Firstly let's find the prime factors for
$441 = 3\times3\times7\times7$
$= 3^2\times7^2$
$\sqrt{441} = 3\times7$
$= 21$

(ii) 196
Firstly let's find the prime factors for
$196 = 2\times2\times7\times7$
$= 2^2\times7^2$
$\sqrt{196} = 2\times7$
$= 14$

(iii) 529
Firstly let's find the prime factors for
$529 = 23\times23$
$= 23^2$
$\sqrt{529} = 23$

(iv) 1764
Firstly let's find the prime factors for
$1764 = 2\times2\times3\times3\times7\times7$
$= 2^2\times3^2\times7^2$
$\sqrt{1764} = 2\times3\times7$
$= 42$

(v) 1156
Firstly let's find the prime factors for
$1156 = 2\times2\times17\times17$
$= 2^2\times17^2$
$\sqrt{1156} = 2\times17$
$= 34$

(vi) 4096
Firstly let's find the prime factors for
$4096 = 2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2$
$= 2^{12}$
$\sqrt{4096} = 2^6$

= 64

(vii) 7056
Firstly let's find the prime factors for
$7056 = 2\times2\times2\times2\times21\times21$
$= 2^2\times2^2\times21^2$
$\sqrt{7056} = 2\times2\times21$
$= 84$

(viii) 8281
Firstly let's find the prime factors for
$8281 = 91\times91$
$= 91^2$
$\sqrt{8281} = 91$

(ix) 11664
Firstly let's find the prime factors for
$11664 = 2\times2\times2\times2\times3\times3\times3\times3\times3\times3$
$= 2^2\times2^2\times3^2\times3^2\times3^2$
$\sqrt{11664} = 2\times2\times3\times3\times3$
$= 108$

(x) 47089
Firstly let's find the prime factors for
$47089 = 217\times217$
$= 217^2$
$\sqrt{47089} = 217$

(xi) 24336
Firstly let's find the prime factors for
$24336 = 2\times2\times2\times2\times3\times3\times13\times13$
$= 2^2\times2^2\times3^2\times13^2$
$\sqrt{24336} = 2\times2\times3\times13$
$= 156$

(xii) 190969
Firstly let's find the prime factors for
$190969 = 23\times23\times19\times19$
$= 23^2\times19^2$

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

(xiii) 586756
Firstly let's find the prime factors for
$586756 = 2 \times 2 \times 383 \times 383$
$= 2^2 \times 383^2$
$\sqrt{586756} = 2 \times 383$
$= 766$

(xiv) 27225
Firstly let's find the prime factors for
$27225 = 5 \times 5 \times 3 \times 3 \times 11 \times 11$
$= 5^2 \times 3^2 \times 11^2$
$\sqrt{27225} = 5 \times 3 \times 11$
$= 165$

(xv) 3013696
Firstly let's find the prime factors for
$3013696 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 217 \times 217$
$= 2^6 \times 217^2$
$\sqrt{3013696} = 2^3 \times 217$
$= 1736$

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:
Firstly let's find the prime factors for
$180 = (2 \times 2) \times (3 \times 3) \times 5$
$= 2^2 \times 3^2 \times 5$
To make the unpaired 5 into paired, multiply the number with 5
$180 \times 5 = 2^2 \times 3^2 \times 5^2$
$\therefore$ Square root of $\sqrt{(180 \times 5)} = 2 \times 3 \times 5$
$= 30$

4. 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:
Firstly let's find the prime factors for

$147 = (7 \times 7) \times 3$
$= 7^2 \times 3$
To make the unpaired 3 into paired, multiply the number with 3
$147 \times 3 = 7^2 \times 3^2$
$\therefore$ Square root of $\sqrt{}(147 \times 3) = 7 \times 3$
$= 21$

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 resulting number.
Solution:
Firstly let's find the prime factors for
$3645 = (3 \times 3) \times (3 \times 3) \times (3 \times 3) \times 5$
$= 3^2 \times 3^2 \times 3^2 \times 5$
To make the unpaired 5 into paired, the number 3645 has to be divided by 5
$3645 \div 5 = 3^2 \times 3^2 \times 3^2$
$\therefore$ Square root of $\sqrt{}(3645 \div 5) = 3 \times 3 \times 3$
$= 27$

6. Find the smallest number by which 1152 must be divided so that it becomes a square. Also, find the square root of the number so obtained.
Solution:
Firstly let's find the prime factors for
$1152 = (2 \times 2) \times (2 \times 2) \times (2 \times 2) \times 2 \times (3 \times 3)$
$= 2^2 \times 2^2 \times 2^2 \times 3^2 \times 2$
To make the unpaired 2 into paired, the number 1152 has to be divided by 2
$1152 \div 2 = 2^2 \times 2^2 \times 2^2 \times 3^2$
$\therefore$ Square root of $\sqrt{}(1152 \div 2) = 2 \times 2 \times 2 \times 3$
$= 24$

7. The product of two numbers is 1296. If one number is 16 times the other, find the numbers.
Solution:
Let us consider two numbers a and b
So we know that one of the number, a =16b
$a \times b = 1296$
$16b \times b = 1296$
$16b^2 = 1296$
$b^2 = 1296/16 = 81$
$b = 9$

a = 16b
= 16(9)
= 144
∴ a =144 and b =9

8. A welfare association collected Rs 202500 as donation from the residents. If each paid as many rupees as there were residents, find the number of residents.
Solution:
Let us consider total residents as a
So, each paid Rs. a

Total collection = a (a) = a^2
We know that the total Collection = 202500
a = √ 202500
a = √a(2 × 2 × 3 × 3 × 3 × 3 × 5 × 5 × 5 × 5)
= 2 × 3 × 3 × 5 × 5a
= 450
∴ Total residents = 450

9. 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:
Let us consider there were few members, each attributed a paise
a (a), i.e. total cost collected = 9216 paise
a^2 = 9216
a = √9216
= 2 × 2 × 2 × 12
= 96
∴ There were 96 members in the society and each contributed 96 paise

10. A society 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 in the school?
Solution:
Let us consider number of school students as a
each student contributed a paise
Total money obtained = a^2paise
= 2304 paise
a = √2304

$a = \sqrt{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3}$
$a = 2 \times 2 \times 2 \times 2 \times 3$
$a = 48$
∴ There were 48 students in the school

11. The area of a square field is 5184 m^2. A rectangular field, whose length is twice its breadth has its perimeter equal to the perimeter of the square field. Find the area of the rectangular field.
Solution:
Let us consider the side of square field as a
$a^2 = 5184\ m^2$
$a = \sqrt{5184}m$
$a = 2 \times 2 \times 2 \times 9$
$= 72$ m
Perimeter of square = 4a
$= 4(72)$
$= 288$ m
Perimeter of rectangle = 2 (l + b) = perimeter of the square field
= 288 m
2 (2b + b) = 288
b = 48 and l = 96
Area of rectangle = $96 \times 48\ m^2$
$= 4608\ m^2$

12. Find the least square number, exactly divisible by each one of the numbers: (i) 6, 9, 15 and 20 (ii) 8, 12, 15 and 20
Solution:
(i) 6, 9, 15 and 20
Firstly take L.C.M for 6, 9, 15, 20 which is 180
So the prime factors of $180 = 2^2 \times 3^2 \times 5$
To make it a perfect square, we have to multiply the number with 5
$180 \times 5 = 2^2 \times 3^2 \times 5^2$
∴ 900 is the least square number divisible by 6, 9, 15 and 20

(ii) 8, 2, 15 and 20
Firstly take L.C.M for 8, 2, 15, 20 which is 360
So the prime factors of $360 = 2^2 \times 3^2 \times 2 \times 5$
To make it a perfect square, we have to multiply the number with $2 \times 5 = 10$
$360 \times 10 = 2^2 \times 3^2 \times 5^2 \times 2^2$

∴ 3600 is the least square number divisible by 8, 12, 15 and 20

13. Find the square roots of 121 and 169 by the method of repeated subtraction.
Solution:
Let us find the square roots of 121 and 169 by the method of repeated subtraction
121 – 1 = 120
120 – 3 = 117
117 – 5 = 112
112 – 7 = 105
105 – 9 = 96
96 – 11 = 85
85 – 13 = 72
72 – 15 = 57
57 – 17 = 40
40 – 19 = 21
21 – 21 = 0
Clearly, we have performed operation 11 times
∴ √121 = 11

169 – 1 = 168
168 – 3 = 165
165 – 5 = 160
160 – 7 = 153
153 – 9 = 144
144 – 11 = 133
133 – 13 = 120
120 – 15 = 105
105 – 17 = 88
88 – 19 = 69
69 – 21 = 48
48 – 23 = 25
25 – 25 = 0
Clearly, we have performed subtraction 13 times
∴ √169 = 13

14. Write the prime factorization of the following numbers and hence find their square roots.
(i) 7744
(ii) 9604

(iii) 5929
(iv) 7056
Solution:
(i) 7744
Prime factors of 7744 is
$7744 = 2^2 \times 2^2 \times 2^2 \times 11^2$
∴ The square root of 7744 is
$\sqrt{7744} = 2 \times 2 \times 2 \times 11$
$= 88$

(ii) 9604
Prime factors of 9604 is
$9604 = 2^2 \times 7^2 \times 7^2$
∴ The square root of 9604 is
$\sqrt{9604} = 2 \times 7 \times 7$
$= 98$

(iii) 5929
Prime factors of 5929 is
$5929 = 11^2 \times 7^2$
∴ The square root of 5929 is
$\sqrt{5929} = 11 \times 7$
$= 77$

(iv) 7056
Prime factors of 7056 is
$7056 = 2^2 \times 2^2 \times 7^2 \times 3^2$
∴ The square root of 7056 is
$\sqrt{7056} = 2 \times 2 \times 7 \times 3$
$= 84$

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 the class, Find the number of students in the class.
Solution:
Let us consider number of students as a
Each student denoted a rupee
So, total amount collected is a × a rupees = 2401
$a^2 = 2401$

a = √2401
a = 49
∴ There are 49 students in the class.

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 the number of columns. Find the number of rows if 71 were left out after arrangement.

Solution:

Let us consider number of rows as a
No. of columns = a
Total number of students who sat in the field = a^2
Total students $a^2 + 71 = 6000$
$a^2 = 5929$
a = √5929
a = 77
∴ total number of rows are 77.