

### EXERCISE 3.4

**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

$$441 = 3 \times 3 \times 7 \times 7$$
$$= 3^2 \times 7^2$$

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

**(ii)** 196

Firstly let's find the prime factors for

$$196 = 2 \times 2 \times 7 \times 7$$
$$= 2^2 \times 7^2$$

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

**(iii)** 529

Firstly let's find the prime factors for

$$529 = 23 \times 23$$
$$= 23^2$$

$$\sqrt{529} = 23$$

**(iv)** 1764

Firstly let's find the prime factors for

$$1764 = 2 \times 2 \times 3 \times 3 \times 7 \times 7$$
$$= 2^2 \times 3^2 \times 7^2$$

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

**(v)** 1156

Firstly let's find the prime factors for

$$1156 = 2 \times 2 \times 17 \times 17$$
$$= 2^2 \times 17^2$$

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

**(vi)** 4096

Firstly let's find the prime factors for

$$4096 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$$
$$= 2^{12}$$

$$\sqrt{4096} = 2^6$$



$$= 64$$

**(vii)** 7056

Firstly let's find the prime factors for

$$\begin{aligned} 7056 &= 2 \times 2 \times 2 \times 2 \times 21 \times 21 \\ &= 2^2 \times 2^2 \times 21^2 \end{aligned}$$

$$\begin{aligned} \sqrt{7056} &= 2 \times 2 \times 21 \\ &= 84 \end{aligned}$$

**(viii)** 8281

Firstly let's find the prime factors for

$$\begin{aligned} 8281 &= 91 \times 91 \\ &= 91^2 \end{aligned}$$

$$\sqrt{8281} = 91$$

**(ix)** 11664

Firstly let's find the prime factors for

$$\begin{aligned} 11664 &= 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \\ &= 2^2 \times 2^2 \times 3^2 \times 3^2 \times 3^2 \end{aligned}$$

$$\begin{aligned} \sqrt{11664} &= 2 \times 2 \times 3 \times 3 \times 3 \\ &= 108 \end{aligned}$$

**(x)** 47089

Firstly let's find the prime factors for

$$\begin{aligned} 47089 &= 217 \times 217 \\ &= 217^2 \end{aligned}$$

$$\sqrt{47089} = 217$$

**(xi)** 24336

Firstly let's find the prime factors for

$$\begin{aligned} 24336 &= 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 13 \times 13 \\ &= 2^2 \times 2^2 \times 3^2 \times 13^2 \end{aligned}$$

$$\begin{aligned} \sqrt{24336} &= 2 \times 2 \times 3 \times 13 \\ &= 156 \end{aligned}$$

**(xii)** 190969

Firstly let's find the prime factors for

$$\begin{aligned} 190969 &= 23 \times 23 \times 19 \times 19 \\ &= 23^2 \times 19^2 \end{aligned}$$

$$\begin{aligned}\sqrt{190969} &= 23 \times 19 \\ &= 437\end{aligned}$$

(xiii) 586756

Firstly let's find the prime factors for

$$\begin{aligned}586756 &= 2 \times 2 \times 383 \times 383 \\ &= 2^2 \times 383^2\end{aligned}$$

$$\begin{aligned}\sqrt{586756} &= 2 \times 383 \\ &= 766\end{aligned}$$

(xiv) 27225

Firstly let's find the prime factors for

$$\begin{aligned}27225 &= 5 \times 5 \times 3 \times 3 \times 11 \times 11 \\ &= 5^2 \times 3^2 \times 11^2\end{aligned}$$

$$\begin{aligned}\sqrt{27225} &= 5 \times 3 \times 11 \\ &= 165\end{aligned}$$

(xv) 3013696

Firstly let's find the prime factors for

$$\begin{aligned}3013696 &= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 217 \times 217 \\ &= 2^6 \times 217^2\end{aligned}$$

$$\begin{aligned}\sqrt{3013696} &= 2^3 \times 217 \\ &= 1736\end{aligned}$$

**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

$$\begin{aligned}180 &= (2 \times 2) \times (3 \times 3) \times 5 \\ &= 2^2 \times 3^2 \times 5\end{aligned}$$

To make the unpaired 5 into paired, multiply the number with 5

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

$$\begin{aligned}\therefore \text{Square root of } \sqrt{(180 \times 5)} &= 2 \times 3 \times 5 \\ &= 30\end{aligned}$$

**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

$$147 \times 3 = 7^2 \times 3^2$$

$$\therefore \text{Square root of } \sqrt{(147 \times 3)} = 7 \times 3$$

$$= 21$$

**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

$$3645 \div 5 = 3^2 \times 3^2 \times 3^2$$

$$\therefore \text{Square root of } \sqrt{(3645 \div 5)} = 3 \times 3 \times 3$$

$$= 27$$

**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

$$1152 \div 2 = 2^2 \times 2^2 \times 2^2 \times 3^2$$

$$\therefore \text{Square root of } \sqrt{(1152 \div 2)} = 2 \times 2 \times 2 \times 3$$

$$= 24$$

**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,  $a = 16b$

$$a \times b = 1296$$

$$16b \times b = 1296$$

$$16b^2 = 1296$$

$$b^2 = 1296/16 = 81$$

$$b = 9$$

$$\begin{aligned}a &= 16b \\ &= 16(9) \\ &= 144\end{aligned}$$

$$\therefore a = 144 \text{ and } b = 9$$

**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.  $a$

$$\text{Total collection} = a(a) = a^2$$

We know that the total Collection = 202500

$$a = \sqrt{202500}$$

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

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

$$= 450$$

$$\therefore \text{Total residents} = 450$$

**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

$$a^2 = 9216$$

$$a = \sqrt{9216}$$

$$= 2 \times 2 \times 2 \times 12$$

$$= 96$$

$$\therefore \text{There were 96 members in the society and each contributed 96 paise}$$

**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 =  $a^2$  paise

$$= 2304 \text{ paise}$$

$$a = \sqrt{2304}$$

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

$$a = 2 \times 2 \times 2 \times 2 \times 3$$

$$a = 48$$

∴ There were 48 students in the school

**11. The area of a square field is 5184 m<sup>2</sup>. 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

$$a^2 = 5184 \text{ m}^2$$

$$a = \sqrt{5184} \text{ m}$$

$$a = 2 \times 2 \times 2 \times 9$$

$$= 72 \text{ m}$$

$$\text{Perimeter of square} = 4a$$

$$= 4(72)$$

$$= 288 \text{ m}$$

$$\text{Perimeter of rectangle} = 2(l + b) = \text{perimeter of the square field}$$

$$= 288 \text{ m}$$

$$2(2b + b) = 288$$

$$b = 48 \text{ and } l = 96$$

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

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

**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<sup>2</sup> × 3<sup>2</sup> × 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<sup>2</sup> × 3<sup>2</sup> × 2 × 5

To make it a perfect square, we have to multiply the number with 2 × 5 = 10

$$360 \times 10 = 2^2 \times 3^2 \times 5^2 \times 2^2$$

$\therefore$  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

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

$$169 - 1 = 168$$

$$168 - 3 = 165$$

$$165 - 5 = 160$$

$$160 - 7 = 153$$

$$153 - 9 = 144$$

$$144 - 11 = 133$$

$$133 - 13 = 120$$

$$120 - 15 = 105$$

$$105 - 17 = 88$$

$$88 - 19 = 69$$

$$69 - 21 = 48$$

$$48 - 23 = 25$$

$$25 - 25 = 0$$

Clearly, we have performed subtraction 13 times

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

**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

$$\begin{aligned}\sqrt{7744} &= 2 \times 2 \times 2 \times 11 \\ &= 88\end{aligned}$$

**(ii) 9604**

Prime factors of 9604 is

$$9604 = 2^2 \times 7^2 \times 7^2$$

∴ The square root of 9604 is

$$\begin{aligned}\sqrt{9604} &= 2 \times 7 \times 7 \\ &= 98\end{aligned}$$

**(iii) 5929**

Prime factors of 5929 is

$$5929 = 11^2 \times 7^2$$

∴ The square root of 5929 is

$$\begin{aligned}\sqrt{5929} &= 11 \times 7 \\ &= 77\end{aligned}$$

**(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

$$\begin{aligned}\sqrt{7056} &= 2 \times 2 \times 7 \times 3 \\ &= 84\end{aligned}$$

**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  $a \times a$  rupees = 2401

$$a^2 = 2401$$

$$a = \sqrt{2401}$$

$$a = 49$$

∴ 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  $a^2 + 71 = 6000$

$$a^2 = 5929$$

$$a = \sqrt{5929}$$

$$a = 77$$

∴ total number of rows are 77.



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