



Class – 7

Chapter – 1

Rational and Irrational Number

Lecture sheet – 2

Square Root by Prime Factorization Method

Procedure

Step I: Obtain the given number.

Step II: Resolve the given number into prime factors by successive division.

Step III: Make pairs of prime factors such that both the factors in each pair are equal. Since the number is a perfect square, you will be able to make an exact number of pairs of prime factors.

Step IV: Take one factor from each pair.

Step V: Find the product of factors obtained in step IV.

Step VI: The product obtained in step V is the required square root.

Example 1: Find the square root of 3136 with the help of prime factor.

Solution:

$$\begin{array}{r} 2 \overline{) 3136} \\ \underline{2} \\ 2 \overline{) 1568} \\ \underline{2} \\ 2 \overline{) 784} \\ \underline{2} \\ 2 \overline{) 392} \\ \underline{2} \\ 2 \overline{) 196} \\ \underline{2} \\ 2 \overline{) 98} \\ \underline{2} \\ 7 \overline{) 49} \\ \underline{7} \\ 7 \end{array}$$

Here, $3136 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 7 \times 7$

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

\therefore Square root of 3136 = $\sqrt{3136} = 2 \times 2 \times 2 \times 7 = 56$

Ans: 56.

Example 2: What is the least number which is to be multiplied with 23805 to get a perfect square number?

Solution:

$$\begin{array}{r} 3 \overline{) 23805} \\ \underline{3} \\ 3 \overline{) 7935} \\ \underline{3} \\ 5 \overline{) 2645} \\ \underline{5} \\ 23 \overline{) 529} \\ \underline{23} \\ 23 \end{array}$$

$$23805 = (3 \times 3) \times 5 \times (23 \times 23)$$

There is no pair of 5. If 5 has a pair then the number will become perfect square number.

So if we multiply the number with 5 then the number will become perfect square number.

Ans: 5

Example 3: What is the least number which is to be divided by 4056 so that the quotient would be a perfect square number?

Solution:

$$\begin{array}{r} 2 \overline{) 4056} \\ \underline{2} \\ 2 \overline{) 2028} \\ \underline{2} \\ 2 \overline{) 1014} \\ \underline{2} \\ 3 \overline{) 507} \\ \underline{3} \\ 13 \overline{) 169} \\ \underline{13} \\ 13 \end{array}$$

$$4056 = (2 \times 2) \times 2 \times 3 \times (13 \times 13)$$

There is no pair of 2 and 3. So if we divide the number by (2×3) or 6 then the number will become perfect square number.

Required number is 6.

Ans: 6.

Some important points on square and square root

*If a point is put on after every alternate digits of number starting from right to the left, the number of points will be same as the number of digits in the square root.

For example,

$$\sqrt{81} = 9$$

(consists of one digit, here number of dot over
the number is one since 81 = 81)

$$\sqrt{100} = 10$$

(consists of two digits, here number of dot over
the number are two since 100 = 100)

$$\sqrt{47089} = 217$$

(consists of three digits, here number of dot over
the number are three since 47089 = 47089)

Exercise (Do yourself)

1. Find the square root of each by prime factorization:

- a) 169
- b) 529
- c) 1521
- d) 11025
- e) 1849
- f) 1024

2. What is the least number which is to be multiplied with the following numbers to get a perfect square number?

a) 147

b) 384

c) 1470

3. What is the least number which is to be divided by the following number so that the quotient would be a perfect square?

a) 972

b) 21952

4. Determine the number of digits of square roots of the numbers 3136, 1234321 and 52900.