CHAPTER

5

SQUARE ROOT OF POSITIVE NUMBER

Student Learning Outcomes

After studying this unit, students will be able to:

- Define a perfect square.
- Test whether a number is a perfect square or not.
- Identify and apply the following properties of perfect square of a number.
  - The square of an even number is even.
  - The square of an odd number is odd.
  - The square of a proper fraction is less than itself.
  - The square of a decimal less than 1 is smaller than the decimal.
- Define the square root of a natural number and recognize its notation.
- Find square root, by division method and factorization method of a
  - Natural number,
  - Fraction,
  - Decimal,

  Which are perfect squares.
- Solve real life problems involving square roots.

5.1 Introduction

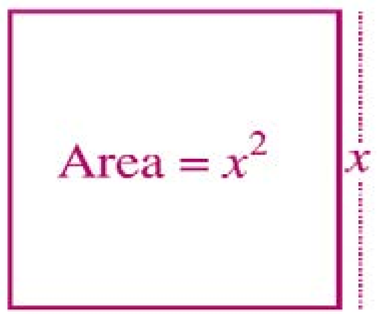
In previous classes, we have learnt that the area of a square can be calculated by multiplying its length by itself as shown below.

Area of the square = length × length

$= x \times x$

$= x^2$

It means x^2 is an area of a square whose side length is x or simply we can say that "x^2 is the square of x". i.e. The square of $x = x^2$



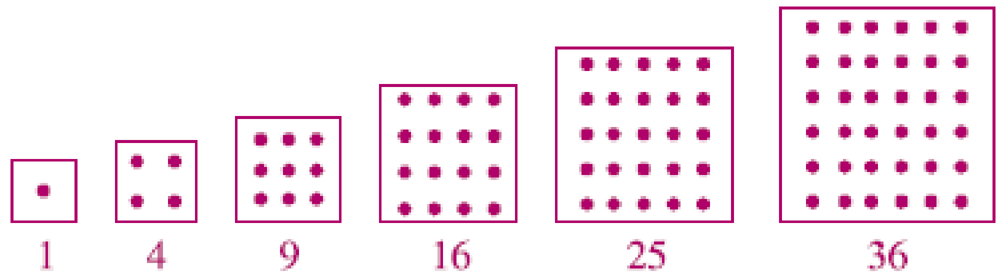
Thus, the square of a number can be defined as:
"The product of a number with itself is called its square."

5.1.1 Perfect Squares

A natural number is called a perfect square, if it is the square of any natural number. To make it clear, let us find the squares of some natural numbers.

$1^2 = 1 \times 1 = 1$	$6^2 = 6 \times 6 = 36$
$2^2 = 2 \times 2 = 4$	$7^2 = 7 \times 7 = 49$
$3^2 = 3 \times 3 = 9$	$8^2 = 8 \times 8 = 64$
$4^2 = 4 \times 4 = 16$	$9^2 = 9 \times 9 = 81$
$5^2 = 5 \times 5 = 25$	$10^2 = 10 \times 10 = 100$ and so on

Here, "1 is the square of 1", "4 is the square of 2", "9 is the square of 3" and so on. It can be noticed that all these are natural numbers. So, these are perfect squares which can be represented by drawing dots in squares.



When we have a number of rows equal to number of dots in a row, then it shows a perfect square.

5.1.2 To Test whether a number is a Perfect Square or not

To check whether a given number is a perfect square or not, write the number as a product of its prime factors, if all the factors can be grouped in pairs, then the given number is a perfect square.

Example 1: Check whether the following numbers are perfect squares or not.

(i) 3969 (ii) 6084 (iii) 3872

Solution:

(i) 3969

3	3969
3	1323
3	441
3	147
7	49
	7

The prime factors of 3969 = $\lfloor 3 \times 3 \rfloor \times \lfloor 3 \times 3 \rfloor \times \lfloor 7 \times 7 \rfloor$

We can see that each factor forms a pair. Hence, 3969 is a perfect square.

(ii) 6084

2	6084
2	3042
3	1521
3	507
13	169
	13

The prime factors of 6084 = $\lfloor 2 \times 2 \rfloor \times \lfloor 3 \times 3 \rfloor \times \lfloor 13 \times 13 \rfloor$

Here, each factor of 6084 forms a pair. So, it is a perfect square.

(iii) 3872

2	3872
2	1936
2	968
2	484
2	242
11	121
	11

The prime factors of 3872 = $\lfloor 2 \times 2 \rfloor \times \lfloor 2 \times 2 \rfloor \times 2 \times \lfloor 11 \times 11 \rfloor$

We can see that 2 is a factor which cannot be paired with any equal factor. So, 3872 is not a perfect square.

5.1.3 Properties of Perfect Squares of Numbers

There are some interesting properties about perfect squares. Let us discuss some of them.

- The square of an even number is even

We know that natural numbers can be divided into two groups: even numbers and odd numbers. Look at the squares of the even numbers given below.

$2^2 = 2 \times 2 = 4$ $\quad 4^2 = 4 \times 4 = 16$

$6^2 = 6 \times 6 = 36$ $\quad 8^2 = 8 \times 8 = 64$

$10^2 = 10 \times 10 = 100$ $\quad 12^2 = 12 \times 12 = 144$

Notice that the squares of all even numbers are even numbers.

- **The square of an odd number is odd**

Now we find the square of some odd numbers.

$1^2 = 1 \times 1 = 1$ $\quad 3^2 = 3 \times 3 = 9$

$5^2 = 5 \times 5 = 25$ $\quad 7^2 = 7 \times 7 = 49$

$9^2 = 9 \times 9 = 81$ $\quad 11^2 = 11 \times 11 = 121$

Hence, the squares of all odd numbers are also odd numbers.

Example 2: Without solving, separate the perfect squares of even numbers and odd numbers

(i) 3481 (ii) 2704 (iii) 49284 (iv) 12321

Solution:

(i) 3481

The square of an odd number is also odd.

$\because$ 3481 is the square of an odd number.

(ii) 2704

The square of an even number is also even.

$\because$ 2704 is the square of an even number.

(iii) 49284

The square of an even number is also even.

$\because$ 49284 is the square of an even number.

(iv) 12321

The square of an odd number is also odd.

$\because$ 12321 is the square of an odd number.

- **The square of a proper fraction is less than itself**

To square a fraction, we multiply the numerator by itself and do the same for the denominator.

$$\left(\frac{2}{5}\right)^2 = \frac{2}{5} \times \frac{2}{5} = \frac{2 \times 2}{5 \times 5} = \frac{4}{25}$$

Now let us compare the fraction $\frac{2}{5}$ with its square $\frac{4}{25}$ by using the method of cross multiplication.

$\frac{2}{5} \times \frac{4}{25}$ $\boxed{50 > 20}$

From the above it can be observed that the square of a proper fraction is less than itself ,i.e. $\frac{2}{5} > \frac{4}{25}$. Similarly,

$$\left(\frac{1}{3}\right)^2 = \frac{1}{3}\times\frac{1}{3} = \frac{1\times1}{3\times3} = \frac{1}{9} \qquad \boxed{\frac{1}{3} > \frac{1}{9}}$$

$$\left(\frac{4}{7}\right)^2 = \frac{4}{7}\times\frac{4}{7} = \frac{4\times4}{7\times7} = \frac{16}{49} \qquad \boxed{\frac{4}{7} > \frac{16}{49}}$$

- **The square of a decimal less than 1 is smaller than the decimal**

To find the square of a decimal, we can use the following method.

$$(0.3)^2 = (0.3)\times(0.3) = \frac{3}{10}\times\frac{3}{10} = \frac{9}{100} = 0.09$$

Is 0.09 smaller than 0.3 or greater? Certainly, 0.09 is smaller than 0.3.i.e.0.09 < 0.3,

$$(0.02)^2 = (0.02)\times(0.02) = \frac{2}{100}\times\frac{2}{100} = \frac{4}{10000} = 0.0004$$

Again 0.0004 is smaller than 0.02 i.e. 0.0004 < 0.02.
It means the square of a decimal less than '1' is always smaller than the given decimal.

EXERCISE 5.1

1. Find the squares of the following numbers.
(i) 6 (ii) 5 (iii) 10 (iv) 7
(v) 13 (vi) 8 (vi) 41 (vii) 19
(ix) 100 (x) 9 (xi) 11 (xii) 25

2. Test whether the following numbers are perfect squares or not.
(i) 59 (ii) 625 (iii) 225 (iv) 196
(v) 425 (vi) 81 (vi) 121 (vii) 2500

3. Without solving, separate the perfect squares of even and odd numbers.
(i) 441 (ii) 144 (iii) 2401 (iv) 6561
(v) 2025 (vi) 11236 (vi) 7569 (vii) 12544

4. Find the squares of proper fractions. Also compare them with itself.
(i) $\frac{3}{4}$ (ii) $\frac{5}{6}$ (iii) $\frac{4}{11}$ (iv) $\frac{1}{7}$

5. Find the squares of decimals and compare them with itself.
(i) 0.4 (ii) 0.6 (iii) 0.12 (iv) 0.05

5.2 Square Roots

5.2.1 Defining square root of a natural number and recognizing its notation

The process of finding the square root is an opposite operation of "squaring a number". To understand it, again we find some perfect squares.

$2^2 = 4$(2 squared is 4)
$5^2 = 25$(5 squared is 25)
$7^2 = 49$(7 squared is 49)

These equations can also be read as, "2 is the square root of 4", "5 is the square root of 25" and "7 is the square root of 49".

Similarly, we can find the square root of any square number. For this purpose, we use the symbol " $\sqrt{\ }$ " to represent a square root, i.e. $\sqrt{x^2} = x$ where " $\sqrt{\ }$ " is called redical sign. Here, x^2 is called redicand.

If x is any number that can be written in the form of $x = y^2$, then x is called the square of y and y itself is called the square root of x.

5.2.2 Finding square roots by prime factorization

We have learnt that:

If a, b be any two numbers, then
(i) $\sqrt{a \times b} = \sqrt{a} \times \sqrt{b}$
(ii) $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

The square root of 4 is, $\sqrt{4} = \sqrt{2^2} = 2$
The square root of 9 is, $\sqrt{9} = \sqrt{3^2} = 2$
The square root of 25 is, $\sqrt{25} = \sqrt{5^2} = 2$

and so on. But in case of large perfect squares, it becomes more difficult for us to guess their square roots. To solve this problem, we use a method which is called the prime factorization method.The steps for finding the method are given below,

Step 1: Find the prime factors of the given number. Suppose the given number is 36, then.
36 = 2 x 2 x 3 x3

2	36
2	18
3	9
	3

Step 2: Take the square root on both sides.
$$\sqrt{36} = \sqrt{2 \times 2 \times 3 \times 3}$$

Step 3: Write them as a pair of prime factors of a perfect square.
$$\sqrt{36} = \sqrt{2 \times 2} \times \sqrt{3 \times 3}$$
$$= \sqrt{2^2} \times \sqrt{3^2}$$

Step 4: Write the square root of each perfect square, i.e. $\sqrt{x^2} = x$ and find their product.
$$\sqrt{36} = 2 \times 3 = 6$$

Hence, 6 is the square root of the given number 36.

The prime factors of a perfect square are always in the pairs.

Example 1: Write the square root of 900.

2	900
2	450
3	225
3	75
5	25
	5

Solution:

- Find the prime factors of 900.
  Factorization of 900 = 2 × 2 × 3 × 3 × 5 × 5

- Take square root on both sides.
$$\sqrt{900} = \sqrt{2 \times 2 \times 3 \times 3 \times 5 \times 5}$$
  Write them as a pair of prime factors of a perfect square.
$$\sqrt{900} = \sqrt{2 \times 2} \times \sqrt{3 \times 3} \times \sqrt{5 \times 5}$$
$$= \sqrt{2^2} \times \sqrt{3^2} \times \sqrt{5^2}$$

Write the square root of each perfect square, i.e. $\sqrt{x^2} = x$ and find their product.
$$\sqrt{900} = 2 \times 3 \times 5 = 30$$
Hence, 30 is the square root of 900.

- **Finding Square Roots of Fractions**

We know that there are three types of common fractions.

- Proper fraction
- Improper fraction
- Compound fraction

Example 2: Find the square root of a common fraction $\frac{144}{256}$

Solution:

- We have to find the square root of $\frac{144}{256}$. So,

  we can write it as: $\frac{\sqrt{144}}{\sqrt{256}} = \frac{\sqrt{144}}{\sqrt{256}}$

- Find separately the prime factors of 144 and 256 as given.

2	144
2	72
2	36
2	18
3	9
	3

2	256
2	128
2	64
2	32
2	16
2	8
2	4
	2

$$\frac{\sqrt{144}}{\sqrt{256}}=\frac{\sqrt{2\times2\times2\times2\times3\times3}}{\sqrt{2\times2\times2\times2\times2\times2\times2\times2}}=\frac{\sqrt{2\times2}\times\sqrt{2\times2}\times\sqrt{3\times3}}{\sqrt{2\times2}\times\sqrt{2\times2}\times\sqrt{2\times2}\times\sqrt{2\times2}}$$

$$=\frac{\sqrt{2^2}\times\sqrt{2^2}\times\sqrt{3^2}}{\sqrt{2^2}\times\sqrt{2^2}\times\sqrt{2^2}\times\sqrt{2^2}}=\frac{2\times2\times3}{2\times2\times2\times2}=\frac{12}{16}$$

Therefore, $\frac{12}{16}$ is the required answer.

Example 3: Find the square root of the compound fraction $1\frac{63}{81}$

Solution:

(i) Change the mixed fraction into an improper fraction as:

$$1\frac{63}{81}=\frac{144}{81}$$

Now find the square root. Thus,

3	81
3	27
3	9
	3

2	144
2	72
2	36
2	18
3	9
	3

$$\frac{\sqrt{144}}{\sqrt{81}}=\frac{\sqrt{2\times2\times2\times2\times3\times3}}{\sqrt{3\times3\times3\times3}}=\frac{\sqrt{2\times2}\times\sqrt{2\times2}\times\sqrt{3\times3}}{\sqrt{3\times3}\times\sqrt{3\times3}}$$

$$=\frac{\sqrt{2^2}\times\sqrt{2^2}\times\sqrt{3^2}}{\sqrt{3^2}\times\sqrt{3^2}}=\frac{2\times2\times3}{3\times3}=\frac{12}{9}=1\frac{3}{9}$$

Thus, $1\frac{3}{9}$ is the square root of $1\frac{63}{81}$

- **Finding Square Roots of Decimals**

In the case of decimals first we change them into common fractions and then we find the square root. After finding the square root, we again write the answer in decimal form. We make it clear with an example.

Example 4: Find the square root of the decimal 0.64

Solution:

- Change the decimal into a fraction as, $0.64=\frac{64}{100}$
- Now find the square root as a proper fraction.

2	64
2	32
2	26
2	8
2	4
	2

2	100
2	50
5	25
	5

$$\frac{\sqrt{64}}{\sqrt{100}}=\frac{\sqrt{2\times2\times2\times2\times2\times2}}{\sqrt{2\times2\times5\times5}}=\frac{\sqrt{2\times2}\times\sqrt{2\times2}\times\sqrt{2\times2}}{\sqrt{2\times2}\times\sqrt{5\times5}}$$

$$=\frac{\sqrt{2^2}\times\sqrt{2^2}\times\sqrt{2^2}}{\sqrt{2^2}\times\sqrt{5^2}}=\frac{2\times2\times2}{2\times5}=\frac{8}{10}=0.8$$

Thus, 0.8 is the required square root of 0.64

EXERCISE 5.2

1. Find the square roots of the following numbers.

(i) 4 (ii) $(9)^2$ (iii) 36 (iv) $(25)^2$
(v) 16 (vi) c^2 (vii) 49 (viii) a^2
(ix) 25 (x) 81 (xi) y^2 (xii) 100

2. Find the square roots of the following numbers by prime factorization.

(i) 144 (ii) 256 (iii) 576 (iv) 324
(v) 441 (vi) 729 (vii) 196 (viii) 1225
(ix) 10000 (x) 1764 (xi) 4356

3. Find the square roots of the following fractions.

(i) $\frac{49}{81}$ (ii) 2.25 (iii) $\frac{144}{196}$ (iv) 0.0196
(v) $\frac{784}{441}$ (vi) $1\frac{13}{36}$ (vii) 3.24 (viii) 12.25

(ix) $3\frac{325}{900}$ (x) 59.29 (xi) $1\frac{252}{324}$ (xii) 1.5626

4. Prove each of the following by prime factorization.

(i) $\sqrt{9\times 36}=\sqrt{9}\times\sqrt{36}$ (ii) $\sqrt{144\times 4}=\sqrt{144}\times\sqrt{4}$

(iii) $\sqrt{64\times 25}=\sqrt{64}\times\sqrt{25}$ (iv) $\sqrt{81\times 100}=\sqrt{81}\times\sqrt{100}$

(v) $\sqrt{\frac{144}{9}}=\frac{\sqrt{144}}{\sqrt{9}}$ (vi) $\sqrt{\frac{256}{4}}=\frac{\sqrt{256}}{\sqrt{4}}$

(vii) $\sqrt{\frac{484}{121}}=\frac{\sqrt{484}}{\sqrt{121}}$ (viii) $\sqrt{\frac{576}{144}}=\frac{\sqrt{576}}{\sqrt{144}}$

• Finding Square Root by Division Method

We have already learnt the process of finding the square root of natural numbers by prime factorization method. Now we learn another method for finding the square roots of natural numbers which is known as 'division method'.

Example 1: Find the square root of 324 by division method.

Solution: 324

Step 1: $\overline{3}\,\overline{24}$ From right to the left make pairs of the digits and show them by putting a bar over each of them.

Step 2: $1\,|\,\overline{3}\,\overline{24}$ Try to guess the greatest number whose square must be equal to or less than the first pair or digit (from left to right). Here we can see the required greatest number is 1.

Step 3:

```
     1
1 | 3 24
   -1
    2 24
```

Subtract the square of the number from the pair or digit. i.e. $1^2 = 1$ and $3 - 1 = 2$. Now bring down the 2nd pair as shown.

Step 4:

```
       1
 1  | 3 24
+1  |-1
 2  | 2 24
```

Double the quotient and use it as 2nd divisor.

Step 5:

```
        18
 1   | 3 24
+1   |-1
 2(8)| 2 24
     |-2 24
         0
```

Again try to guess the greatest number whose product with divisor must be equal to or less than the 2nd dividend as given in the opposite.

25 × 5 = 125
26 × 6 = 156
27 × 7 = 189
28 × 8 = 224

The quotient is the required square root. It can be checked by finding its square. Thus the required square root is 18.

Example 2: Find the square root of 585225 by division method.

Solution: 585225

```
          7  6  5
 7      | 58 52 25
+7      |-49
 14(6)  |  9 52
 +6     | -8 76
 152(5) |    76 25
        |   -76 25
               0
```

∵ 6 × 6 = 36
7 × 7 = 49
8 × 8 = 64

∵ 145 × 5 = 752
146 × 6 = 876
147 × 7 = 1029

∵ 1524 × 4 = 6096
1525 × 5 = 7625
1526 × 6 = 9156

Thus, the required square root is 765.

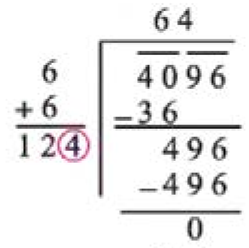
• Finding Square Roots of Fractions

We have learnt the method of finding the square root of fractions by prime factorization. Now we find the square root of a fraction by division method.

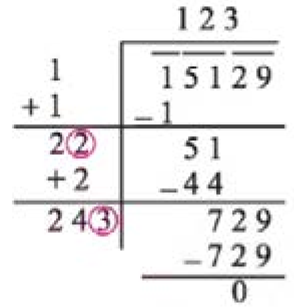
Example 1: Find the square roots of $\frac{4096}{15129}$ by division method.

Solution: $\frac{4096}{15129}$

We know that: $\sqrt{\frac{4096}{15129}}=\frac{\sqrt{4096}}{\sqrt{15129}}$



∵ $5 \times 5 = 25$
$6 \times 6 = 36$
$7 \times 7 = 49$
∵ $123 \times 3 = 369$
$124 \times 4 = 496$



∵ $21 \times 1 = 21$
$22 \times 2 = 44$
$23 \times 3 = 69$
∵ $242 \times 2 = 484$
$243 \times 3 = 729$

Thus, $\sqrt{\frac{4096}{15129}} = \frac{\sqrt{4096}}{\sqrt{15129}} = \frac{64}{123}$

- **Finding Square Roots of Decimals**

To learn the process of finding the square roots of decimals, we examine the following example and its steps.

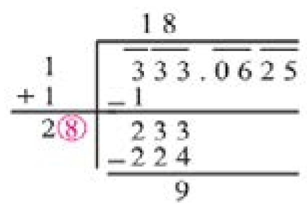
Example 2: Find the square root of 333.0625 by division method.

Solution: 333.0625

Step 1: Make the pairs of the whole number part of the decimal as number.*(from right to left)* $3\overline{33}.0625$

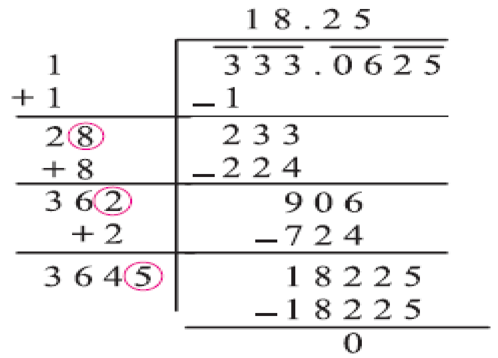
Step 2: Make the pairs of the decimal part. *(from left to right)* $\overline{3}\,\overline{33}\,.\,\overline{06}\,\overline{25}$

Step 3: Use the same division method as numbers.



∵ $27 \times 7 = 189$
$28 \times 8 = 224$
$29 \times 9 = 261$

Step 4: Put the decimal point in the quotient before bringing down the pair after decimal point.



∵ $361 \times 1 = 361$
$362 \times 2 = 724$
$363 \times 3 = 1089$
∵ $3644 \times 4 = 14576$
$3645 \times 5 = 18225$

Thus, $\sqrt{333.0625} = 18.25$

Example 3: Find the square root of the following by division method.

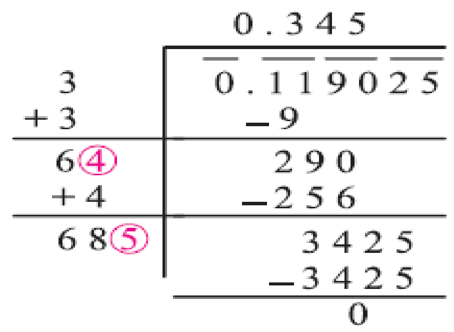
(i) 0.119025 (ii) 199.9396

Solution:

(i) 0.119025

Make pairs of the whole number part and decimal part respectively:

$0.\overline{11}\,\overline{90}\,\overline{25}$



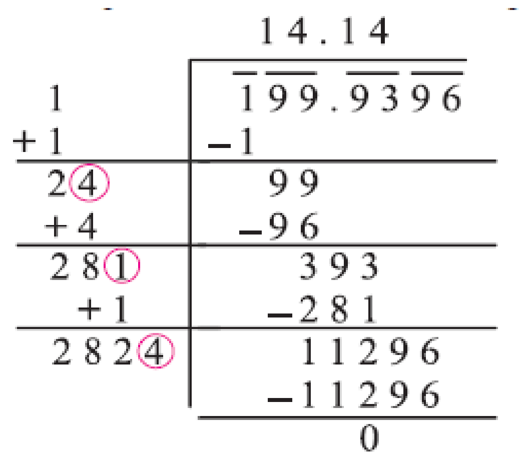
∵ $2 \times 2 = 4$
$3 \times 3 = 9$
$4 \times 4 = 16$
∵ $63 \times 3 = 189$
$64 \times 4 = 256$
$65 \times 5 = 325$
∵ $684 \times 4 = 2736$
$685 \times 5 = 3425$

Thus, $\sqrt{0.119025} = 0.345$

(ii) 199.9396

Make pairs of the whole number part and decimal part respectively:

$\overline{1}\,\overline{99}\,.\,\overline{93}\,\overline{96}$



∵ $23 \times 3 = 69$
$24 \times 4 = 96$
$25 \times 5 = 125$
∵ $281 \times 1 = 281$
$282 \times 2 = 546$
∵ $2823 \times 3 = 8469$
$2824 \times 4 = 11296$

Thus, $\sqrt{199.9396} = 14.14$

EXERCISE 5.3

1. Find the square roots of the following by division method.

(i)	729	(ii)	2304	(iii)	4489	(iv)	7056
(v)	9801	(vi)	14400	(vii)	15625	(viii)	18496
(ix)	207936	(x)	321489	(xi)	5499025	(xii)	4986289

2. Find the square roots of the following common fractions by division method.

(i) $\frac{36}{49}$ (ii) $\frac{225}{484}$ (iii) $\frac{81}{196}$ (iv) $\frac{729}{1024}$

(v) $2\frac{14}{25}$ (vi) $\frac{1296}{2025}$ (vii) $3\frac{526}{625}$ (viii) $\frac{3025}{4096}$

(ix) $2\frac{175}{225}$ (x) $\frac{324}{576}$ (xi) $\frac{5625}{40000}$ (xii) $1\frac{295}{729}$

3. Find the square roots of the following decimals by division method.

(i)	0.0529	(ii)	1.5625	(iii)	9.7344	(iv)	0.4761
(v)	0.001369	(vi)	32.1489	(vii)	0.002025	(viii)	131.1025
(ix)	508.5025	(x)	799.7584	(xi)	1082.41	(xii)	4596.84

5.2.3 Solving Real Life Problems involving Square Root

We solve real life problems involving square roots by using the method of finding the square root.

Example 1: The area of a rectangular park is equal to another square shaped park. Find the length of a square shaped park if the length and breadth of the rectangular park are 81m and 25m respectively.

Solution:

Area of the rectangular park = length x breadth

= 81m x 25m = 2025 m^2

As we know that,

Area of square shaped park = Area of rectangular park

Length of side = $\sqrt{2025m}$

= $\sqrt{2025}$

= $\sqrt{3\times3\times3\times3\times5\times5}$

= $\sqrt{3^2\times3^2\times5^2}$

3	2025
3	675
3	225
3	75
5	25
	5

= $(3 \times 3 \times 5)m$ = 45m

Thus, the required length is 45m.

Example 2: Find the length of a boundary of a square field whose area is 784m^2.

Solution:

Area of the square park = 784m^2

Length of side = $\sqrt{784}$

= $\sqrt{2\times2\times2\times2\times7\times7}$

= $\sqrt{2^2\times2^2\times7^2}$

= (2 x 2 x7)m = 28m

2	784
2	392
2	196
2	98
7	49
	7

The length of the boundary or perimeter of the square field:

= 4 (length)

= 4 (28m) = 112m

Example 3: Find the perimeter of a rectangular park whose length is three times of its width and the area is 720.75m^2. Also calculate the cost of fencing the park at the rate of Rs.195/m. *(use division method for finding square root)*

Solution:

We have

Length of the park = 3(width of the park)

Area of the rectangular park = 720.75m^2

(i) perimeter =? (ii) Cost of fencing =?

We know that: Area of the rectangular park = Length x width

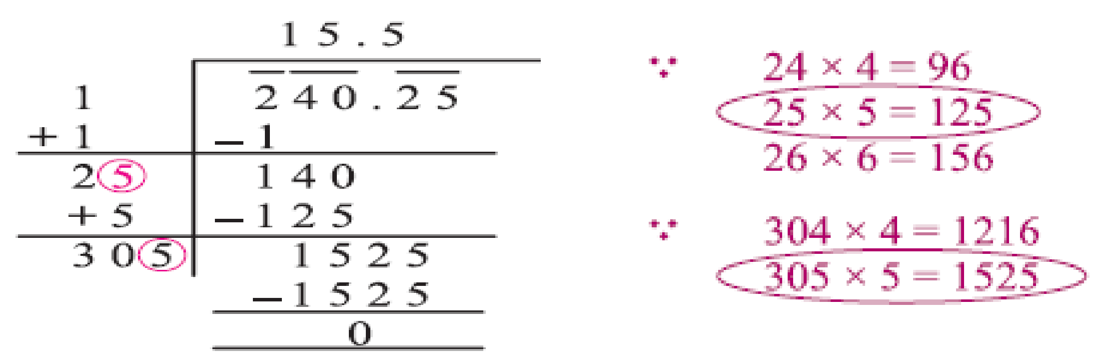
720.75m^2 = 3(width) x width

720.75m^2 = 3$(width)^2$

$\frac{720.75m^2}{3}$ = $(width)^2$

240.25m^2 = $(width)^2$

$\sqrt{240.25m^2}$ = width



Thus, width $= \sqrt{240.25m^2} = 15.5m$

Length $= 3\text{ (width)} = 3 \times 15.5m = 46.5m$

perimeter = 2(length + width)
= 2(46.5m + 15.5m)= 2 x 62m = 124m

Cost of fencing of 1m = Rs. 195

Cost of fencing of 124m = Rs.(195 x 124) =24,185

EXERCISE 5.4

1. The area of a square is $73.96m^2$. Calculate the length of its side.
2. 324 soldiers queued up such that the number of queues is equal to the number of soldiers in each queue. Find the number of queues.
3. By which smallest number can 275 be multiplied to get a perfect square?
4. By which smallest number can 648 be divided to get a perfect square?
5. The length and breadth of a rectangular swimming pool are 243m and 27m respectively. Find the length of a square shaped swimming pool which has the same area as rectangular swimming pool.
6. The base and height of a triangle are 8cm and 4.5cm respectively. Find the length of the side of a square whose area is the double of the given triangle.
7. The area of a square field is $617796m^2$. Find the length of its side.
8. A nursery owner tries to arrange 89500 plants into the shape of solid square. But he finds that he has 99 plants left over.

Find how many plants did the owner arrange in a row. (Hint = 89500 – 99= ?)

9. Which smallest number can be subtracted from 15198 to get a perfect square?
10. Find the number that gives 992.8801 after multiplying itself.
11. Find the measurement of the sides of a rectangle whose length is four times of its width and area is $51.84cm^2$.
12. The area of a circular swimming pool is $154m^2$. Find out the radius of the swimming pool.

Review Exercise 5

1. Answer the following questions.
- (i) What is meant by the square of a number?
- (ii) Define a perfect square.
- (iii) Which smallest number can be subtracted from 50 to get a perfect square?
- (iv) Name the two methods for finding the square roots of large natural numbers.

2. Fill in the blanks.
- (i) 4, 9, 16, 25, ... are called __________.
- (ii) If $x = y^2$, then y is called the __________ of x.
- (iii) While finding the square root by division method, the digits are paired from __________.
- (iv) The number whose square root is non-terminiting and non-recurring decimal is called the __________ number.
- (v) $\sqrt{\frac{121}{144}} = \frac{\sqrt{121}}{\square}$ (vi) $\sqrt{\frac{\square}{\square}} = \frac{\sqrt{169}}{\sqrt{100}}$

3. Tick(✓) the correct answer.

4. Find the square root of the following.

(i) 1024 (ii) 484 (iii) $\frac{196}{49}$ (iv) 6.25

(v) 0.0225 (vi) $\frac{1225}{3025}$ (vii) $2\frac{14}{25}$ (viii) $1\frac{40}{81}$

(ix) 10.89 (x) $1\frac{23}{121}$ (xi) $\frac{225}{324}$ (xii) 3.0625

(xiii) 29.16 (xiv) $1\frac{539}{1225}$

5. Prove each of the following by prime factorization.

(i) $\sqrt{16\times81}=\sqrt{16}\times\sqrt{81}$

(ii) $\sqrt{0.25\times0.04}=\sqrt{0.25}\times\sqrt{0.04}$

(iii) $\sqrt{\frac{5625}{625}}=\frac{\sqrt{5625}}{\sqrt{625}}$

(iv) $\sqrt{\frac{5.76}{1.44}}=\frac{\sqrt{5.76}}{\sqrt{1.44}}$

6. 10201 soldiers have queued up for an attack such that the number of queues is equal to the number of the soldiers in each queue. Find the number of soldiers in each queue.

7. A businessman bought a square shaped park whose area is 50625m^2. He wants to fix light poles after the distance of each metre on its surroundings. For this he calculated the perimeter of the park. Do you know what perimeter he calculated?

8. The length and breadth of a rectangular swimming pool in a bungalow are 125m and 45m respectively. Find the length of another square shaped swimming pool which has the same area as rectangular swimming pool.

9. A teacher drew a triangle of 8cm height and 18cm base. Now he wants to draw a square whose area must be the twice that of the triangle. Calculate the length of the each side of the square that he has to draw.

10. Solve:

(i) By which smallest number can 605 be multiplied to get a perfect square?

(ii) By which smallest number can 3675 be divided to get a perfect square?

(iii) The area of a square is 94.09 m^2. What is the length of its side?

(iv) The length of a side of a square is 55.5 m. What is the area of the square?

Summary

- The product of a number with itself is called its square.
- A natural number is called a perfect square, if it is a square of any natural number.
- The square of an even number is even and of an odd number is odd.
- The square of a proper fraction is less than itself.
- The square of a decimal less than 1 is smaller than itself.
- The process of finding the square root is the reverse operation of 'squaring a number'.
- If x is a number such that $x = y^2$, then x is known as the square of y and y is known as square root os x.
- To represent the square root, we use the symbol " $\sqrt{\ }$ " which is called radical.
- To find the square root of a mixed fraction, we convert it into an improper fraction.
- We find the square root of a decimal by changing it into a fraction.
- We find the square root of a decimal by changing it into a fraction.