

Board – ICSE

Class – 8th

Topic – Square and Square Roots

Square of a Number

The square of a number is the product of the number with itself.

If a is a number, then its square is $a^2 = a \times a$.

Example:

- $5^2 = 5 \times 5 = 25$
- $(-4)^2 = (-4) \times (-4) = 16$

Square Root of a Number

The square root of a number is a value that, when multiplied by itself, gives the original number.

Denoted by the symbol $\sqrt{\quad}$.

Example:

- $\sqrt{49} = 7$ because $7 \times 7 = 49$
- $\sqrt{100} = 10$

Perfect Squares

A perfect square is a number that is the square of a whole number.

Examples:

- 1, 4, 9, 16, 25, 36, 49, 64, 81, 100

Properties of Perfect Squares:

1. A perfect square always ends in 0, 1, 4, 5, 6, or 9.
2. A number ending in 2, 3, 7, or 8 is never a perfect square.
3. The number of zeros at the end of a perfect square is always even.
4. The sum of first n odd natural numbers is n^2 .

Example: $1 + 3 + 5 + 7 + 9 = 25 = 5^2$

Methods of Finding Squares

Multiplying the Number by Itself

$$12^2 = 12 \times 12 = 144$$

Using Algebraic Identities

$$(a + b)^2 = a^2 + 2ab + b^2$$

Example:

$$53^2 = (50 + 3)^2 = 50^2 + 2 \times 50 \times 3 + 3^2 = 2500 + 300 + 9 = 2809$$

Prime Factorization Method

Step 1: Find prime factors of the number.

Step 2: Pair the identical factors.

Step 3: Take one factor from each pair and multiply them.

Example:

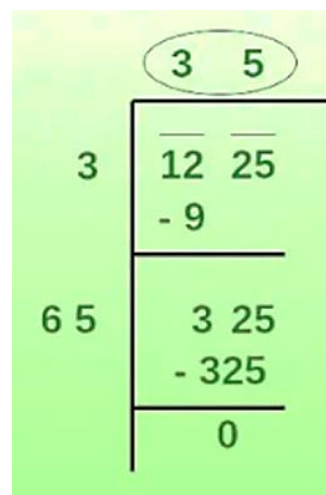
$$\sqrt{144} = \sqrt{2 \times 2 \times 2 \times 2 \times 3 \times 3} = 2 \times 2 \times 3 = 12$$

Square Root by Long Division

Long division method for finding square roots is a manual process for determining the square root of a number. It involves the following series of

steps:

- Pair the Digits
- Find the Largest Square
- Double the Quotient
- Find the New Digit
- Subtract and Repeat



$$\begin{array}{r}
 \overline{35} \\
 \underline{3 \ 12 \ 25} \\
 - 9 \\
 \hline
 6 \ 5 \\
 \underline{3 \ 25} \\
 - 3 \ 25 \\
 \hline
 0
 \end{array}$$