Board –CBSE	Class – 8th	Topic – Square and Square Roots

You know that the area of a square = side × side (where 'side' means 'the length of a side'). Study the following table.

Side of a square (in cm)	Area of the square (in cm^2)
1	$1 \times 1 = 1 = 1^2$
2	$2 \times 2 = 4 = 2^2$
3	$3 \times 3 = 9 = 3^2$
5	$5 \times 5 = 25 = 5^2$
8	$8 \times 8 = 64 = 8^2$
a	$a \times a = a^2$

Since, 4 can be expressed as $2 \times 2 = 2^2$, 9 can be expressed as $3 \times 3 = 3^2$, all such numbers can be expressed as the product of the number with itself. Such numbers like 1,4,9,16,25, … are known as square numbers. The numbers 1,4,9,16 … are square numbers. These numbers are also called perfect squares.

Finding square roots

The inverse (opposite) operation of addition is subtraction and the inverse operation of multiplication is division. Similarly, finding the square root is the inverse operation of squaring.

We have, $1^2 = 1$, therefore square root of 1 is 1

$2^2 = 4$, therefore square root of 4 is 2

$3^2 = 9$, therefore square root of 9 is 3

Since	$9^2 = 81$,
and	$(-9)^2 = 81$
We say that square	
roots of 81 are 9 and -9.	

Finding square root through prime factorisation

You will find that each prime factor in the prime factorisation of the square of a number, occurs twice the number of times it occurs in the prime factorisation of the number itself. Let us use this to find the square root of a given square number, say 324 .

We know that the prime factorisation of 324 is

$$324 = 2 \times 2 \times 3 \times 3 \times 3 \times 3$$

By pairing the prime factors, we get

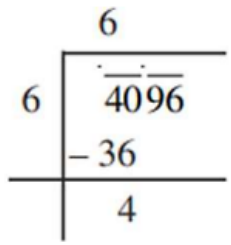
$324 = \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{3 \times 3} = 2^2 \times 3^2 \times 3^2 = (2 \times 3 \times 3)^2$

So,

$\sqrt{324} = 2 \times 3 \times 3 = 1$

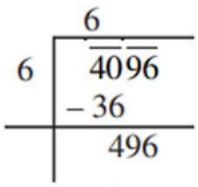
2	324
2	162
3	81
3	27
3	9
	3

Finding square root by division method

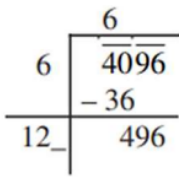


Step 1 Place a bar over every pair of digits starting from the one's digit. ($\overline{4096}$).

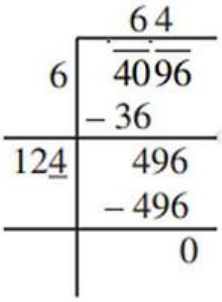
Step 2 Find the largest number whose square is less than or equal to the number under the left-most bar ($6^2 < 40 < 7^2$). Take this number as the divisor and the number under the left-most bar as the dividend. Divide and get the remainder i.e., 4 in this case.



Step 3 Bring down the number under the next bar (i.e., 96) to the right of the remainder.



Step 4 Double the quotient and enter it with a blank on its right.



Step 5 Guess a largest possible digit to fill the blank which also becomes the new digit in the quotient such that when the new digit is multiplied to the new quotient the product is less than or equal to the dividend. In this case we see that $124 \times 4 = 496$.

So the new digit in the quotient is 4. Get the remainder.

Step 6 Since the remainder is 0 and no bar left, therefore, $\sqrt{4096} = 64$.