BAL BHARATI PUBLIC SCHOOL, PITAMPURA, DELHI – 110034

SUBJECT:- MATHEMATICS

CLASS:VIII CHAPTER:-6

TOPIC:- SQUARE AND SQUARE ROOTS(Part 3)

GUIDELINES

Dear students kindly refer to the following notes/video links for the Chapter- "SQUARE AND SQUARE ROOTS"(part3) and thereafter attempt the questions in your Mathematics notebook.

NOTE- Students can download NCERT book using the following link:-

http://ncert.nic.in/textbook/textbook.htm?hemh1=0-16

INTRODUCTION

Finding square root through prime factorisation

Consider the prime factorisation of the following numbers and their squares.

Prime Factorisation of a number and Prime Factorisation of its Square

Prime factorisation of a Number	Prime factorisation of its Square
$6 = 2 \times 3$	$36 = 2 \times 2 \times 3 \times 3$
$8 = 2 \times 2 \times 2$	$64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2$
$12 = 2 \times 2 \times 3$	$144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3$
$15 = 3 \times 5$	$225 = 3 \times 3 \times 5 \times 5$

How many times does 2 occur in the prime factorisation of 6? Once.
How many times does 2 occur in the prime factorisation of 36? Twice.

2	324
2	162
3	81
3	27
3	9
	3

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, $\sqrt{324} = 2 \times 3 \times 3 = 18$

Similarly can you find the square root of 256 ?

Prime factorization of 256 is $256 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$

By pairing the prime factors we get,

$$256 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} = (2 \times 2 \times 2 \times 2)^2$$

Therefore $\sqrt{256} = 2 \times 2 \times 2 \times 2 = 16$

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

,

SUBTOPICS

1) Calculating square root of given numbers by prime factorization
2) Number of digits in square and square root of a given number

Key points and important links for reference

1) Prime factorisation method to find square root

Example : Find the square root of 6400.

Solution: Write $6400 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{5 \times 5}$

Therefore $\sqrt{6400} = 2 \times 2 \times 2 \times 2 \times 5 = 80$

2	6400
2	3200
2	1600
2	800
2	400
2	200
2	100
2	50
5	25
	5

Example : Is 90 a perfect square?

Solution: We have $90 = 2 \times 3 \times 3 \times 5$

2	90
3	45
3	15
	5

The prime factors 2 and 5 do not occur in pairs. Therefore, 90 is not a perfect square. That 90 is not a perfect square can also be seen from the fact that it has only one zero.

Example : Is 2352 a perfect square? If not, find the smallest multiple of 2352 which is a perfect square. Find the square root of the new number.

Solution: We have $2352 = \underline{2 \times 2} \times \underline{2 \times 2} \times 3 \times \underline{7 \times 7}$

2	588
2	294
3	147
7	49
	7

As the prime factor 3 has no pair, 2352 is not a perfect square.
If 3 gets a pair then the number will become perfect square. So, we multiply 2352 by 3 to get,

$$2352 \times 3 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{7 \times 7}$$

Now each prime factor is in a pair. Therefore, $2352 \times 3 = 7056$ is a perfect square. Thus the required smallest multiple of 2352 is 7056 which is a perfect square.

And, $\sqrt{7056} = 2 \times 2 \times 3 \times 7 = 84$

Example : Find the smallest number by which 9408 must be divided so that the quotient is a perfect square. Find the square root of the quotient.

Solution: We have, $9408 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times 3 \times \underline{7 \times 7}$ If we divide 9408 by the factor 3, then
$9408 \div 3 = 3136 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{7 \times 7}$ which is a perfect square.
Therefore, the required smallest number is 3.

And, $\sqrt{3136} = 2 \times 2 \times 2 \times 7 = 56.$

Example : Find the smallest square number which is divisible by each of the numbers 6, 9 and 15.

2	6, 9, 15
3	3, 9, 15
3	1, 3, 5
5	1, 1, 5
	1, 1, 1

Solution: This has to be done in two steps. First find the smallest common multiple and then find the square number needed. The least number divisible by each one of 6, 9 and 15 is their LCM. The LCM of 6, 9 and 15 is $2 \times 3 \times 3 \times 5 = 90$.
Prime factorisation of 90 is $90 = 2 \times \underline{3 \times 3} \times 5$.

We see that prime factors 2 and 5 are not in pairs. Therefore 90 is not a perfect square.

In order to get a perfect square, each factor of 90 must be paired. So we need to make pairs of 2 and 5. Therefore, 90 should be multiplied by 2×5, i.e., 10.
Hence, the required square number is $90 \times 10 = 900$.

Please click on the links given below for a better understanding of the above concepts.

https://www.youtube.com/watch?v=Yl2WpSK_5v8

https://www.youtube.com/watch?v=aP9pxJBQ4Ak

2) Number of digits in square and square root of a given number

https://www.youtube.com/watch?v=yFyMgGUVgig

Please click on the above link to understand the concept.

POINTS TO REMEMBER

1. If a natural number *m* can be expressed as n^2, where *n* is also a natural number, then *m* is a **square number**.
2. All square numbers end with 0, 1, 4, 5, 6 or 9 at unit's place.
3. Square numbers can only have even number of zeros at the end.
4. Square root is the inverse operation of square.
5. There are two integral square roots of a perfect square number.
Positive square root of a number is denoted by the symbol $\sqrt{\ }$.

For example, $3^2 = 9$ gives $\sqrt{9} = 3$

ASSIGNMENT

1) **From NCERT textbook, the following questions are to be done in Mathematics notebook:**

{ EX 6.3 Q4i),iii),vii),viii),x)

Q5 i), iii), vi)

Q6 i),ii),iv)

Q8 and Q10 }

2) **Online Practice assignment on introduction to square roots (not to be done in notebook).**

(i) https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:rational-exponents-radicals/x2f8bb11595b61c86:radicals/e/roots-of-decimals-and-fractions

(ii)https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:rational-exponents-radicals/x2f8bb11595b61c86:simplifying-square-roots/e/multiplying_radicals

3) **Objective type questions** (to be done in a separate Mathematics practice notebook.)

1 196 is the square of

(a) 11 (b) 12 (c) 14 (d) 16

2 Which of the following is a square of an even number?

(a) 144 (b) 169 (c) 441 (d) 625

3 Which of the following will have 4 at the units place?

(a) 14^2 (b) 62^2 (c) 27^2 (d) 35^2

4 How many natural numbers lie between 5^2 and 6^2?

(a) 9 (b) 10 (c) 11 (d) 12

7 There are ________ natural numbers between n^2 and $(n + 1)^2$

8 The square root of 24025 will have ________ digits.

9 The square root of 0.9 is 0.3. **T/F**

10 The square of every natural number is always greater than the number itself. **T/F**

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