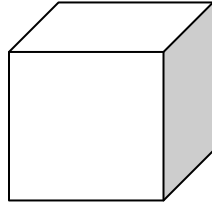*General instructions for Students: Whatever be the notes provided, everything must be copied in the Maths copy and then do the HOMEWORK in the same copy.*

Volume of a cube = $(side)^3$

If the side of a cube is $'a'$ units, then

Volume of a cube = $(a \times a \times a)$ cubic units

= $(a)^3$ cubic units

Cube of a number is the product of the number by itself by three times.   i.e. $n^3 = n \times n \times n$

For Example: $2^3 = 2 \times 2 \times 2$

$3^3 = 3 \times 3 \times 3$

Cube Numbers or Perfect Cubes

Natural number	Cube
1	$1 \times 1 \times 1 = 1$
2	$2 \times 2 \times 2 = 8$
3	$3 \times 3 \times 3 = 27$
4	$4 \times 4 \times 4 = 64$
5	$5 \times 5 \times 5 = 125$
6	$6 \times 6 \times 6 = 216$
7	$7 \times 7 \times 7 = 343$
8	$8 \times 8 \times 8 = 512$
9	$9 \times 9 \times 9 = 729$
10	$10 \times 10 \times 10 = 1000$

Cubes of a natural numbers are called Cube numbers or Perfect cubes. All natural numbers are not perfect cubes.

For Example: Let us consider a cube number 64

$$64 = (2 \times 2 \times 2) \times (2 \times 2 \times 2)$$

64 can be expressed as the product of triplets of equal prime factors.

Hence, 64 is a perfect cube.

2	64
2	32
2	16
2	8
2	4
2	2
	1

For Example: Let us consider a natural number 648

$$648 = (2 \times 2 \times 2) \times (3 \times 3 \times 3) \times 3$$

Since, 3 left after grouping in triplets

Therefore, 648 can not be expressed as the product of triplets of equal prime factors

Hence, 648 is not a perfect cube.

2	648
2	324
2	162
3	81
3	27
3	9
3	3
	1

NOTE: *A perfect cube can always be expressed as the product of triplets of equal prime factors.*

For Example: **By what smallest number should 3072 be multiplied so that the product becomes perfect cube?**

$$3072 = (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times 2 \times 3$$

   Since, 2 and 3 left after grouping

   So, 3072 is not a perfect cube.

To make a perfect cube: *If we multiply 3072 by $2 \times 2 \times 3 \times 3 (= 36)$, then prime factorization of the product*

2	3072
2	1536
2	768
2	384
2	192
2	96
2	48
2	24
2	12
2	6
3	3
	1

$$3072 \times 36 = (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times (3 \times 3 \times 3)$$

The smallest number by which 3072 should be multiplied to make a perfect cube is 36.

So, the resulting perfect cube is $3072 \times 36 = 110592 (= 48^3)$

*Hence, the required smallest number is **36**. Ans*

For Example: **By what smallest number should 1536 be divided so that the quotient is a perfect cube?**

$$1536 = (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times 3$$

Since, 3 left after grouping in triplets

Hence, 1536 is not a perfect cube.

To make a perfect cube: *If we divide 1536 by 3 , then prime factorization of the quotient*

$$1536 \div 3 = (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times (2 \times 2 \times 2)$$

The smallest number by which 1536 should be divided to make a perfect cube is 3.

So, the resulting perfect cube is $1536 \div 3 = 512 \, (= 8^3)$

Hence, the required smallest number is **3. Ans**

2	1536
2	768
2	384
2	192
2	96
2	48
2	24
2	12
2	6
3	3
	1

HOMEWORK

EXERCISE - 4.1

QUESTION NUMBERS: 1 (ii), (iii);   2 (ii), (iv);   3 (i), (iii)   and   4 (ii), (iv)

X*