Exercise 7.1

1. Which of the following numbers are not perfect cubes?

(i) 216

Solution:

By resolving 216 into prime factor,

2	216
2	108
2	54
3	27
3	9
3	3
	1

$216 = 2\times2\times2\times3\times3\times3$

By grouping the factors in triplets of equal factors,

$216 = (2\times2\times2)\times(3\times3\times3)$

Here, 216 can be grouped into triplets of equal factors,

$\therefore 216 = (2\times3) = 6$

Hence, 216 is cube of 6.

(ii) 128

Solution:

By resolving 128 into prime factor,

2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

128 = 2×2×2×2×2×2×2
By grouping the factors in triplets of equal factors,
128 = (2×2×2)×(2×2×2)×2
Here, 128 cannot be grouped into triplets of equal factors, we are left of with one factors 2 .
∴ 128 is not a perfect cube.

(iii) 1000

Solution:

By resolving 1000 into prime factor,

2	1000
2	500
2	250
5	125
5	25
5	5
	1

1000 = 2×2×2×5×5×5
By grouping the factors in triplets of equal factors,
1000 = (2×2×2)×(5×5×5)
Here, 1000 can be grouped into triplets of equal factors,
∴ 1000 = (2×5) = 10
Hence, 1000 is cube of 10.

(iv) 100

Solution:

By resolving 100 into prime factor,

2	100
2	50
5	25
5	5
	1

100 = 2×2×5×5
Here, 100 cannot be grouped into triplets of equal factors.

∴ 100 is not a perfect cube.

(v) 46656

Solution:

By resolving 46656 into prime factor,

2	46656
2	23328
2	11664
2	5832
2	2916
2	1458
3	729
3	243
3	81
3	27
3	9
3	3
	1

46656 = 2×2×2×2×2×2×3×3×3×3×3×3

By grouping the factors in triplets of equal factors,

46656 = (2×2×2)×(2×2×2)×(3×3×3)×(3×3×3)

Here, 46656 can be grouped into triplets of equal factors,

∴ 46656 = (2×2×3×3) = 36

Hence, 46656 is cube of 36.

2. Find the smallest number by which each of the following numbers must be multiplied to obtain a perfect cube.

(i) 243

Solution:

By resolving 243 into prime factor,

3	243
3	81
3	27
3	9
3	3
	1

243 = 3×3×3×3×3
By grouping the factors in triplets of equal factors,
243 = (3×3×3)×3×3
Here, 3 cannot be grouped into triplets of equal factors.
∴ We will multiply 243 by 3 to get perfect square.

(ii) 256

Solution:

By resolving 256 into prime factor,

2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

256 = 2×2×2×2×2×2×2×2
By grouping the factors in triplets of equal factors,
256 = (2×2×2)×(2×2×2)×2×2
Here, 2 cannot be grouped into triplets of equal factors.
∴ We will multiply 256 by 2 to get perfect square.

(iii) 72

Solution:

By resolving 72 into prime factor,

2	72
2	36
2	18
3	9
3	3
	1

72 = 2×2×2×3×3

By grouping the factors in triplets of equal factors,

72 = (2×2×2)×3×3

Here, 3 cannot be grouped into triplets of equal factors.

∴ We will multiply 72 by 3 to get perfect square.

(iv) 675

Solution:

By resolving 675 into prime factor,

3	675
3	225
3	75
5	25
5	5
	1

675 = 3×3×3×5×5

By grouping the factors in triplets of equal factors,

675 = (3×3×3)×5×5

Here, 5 cannot be grouped into triplets of equal factors.

∴ We will multiply 675 by 5 to get perfect square.

(v) 100

Solution:

By resolving 100 into prime factor,

2	100
2	50
5	25
5	5
	1

$100 = 2\times2\times5\times5$

Here, 2 and 5 cannot be grouped into triplets of equal factors.

∴ We will multiply 100 by (2×5) 10 to get perfect square.

3. Find the smallest number by which each of the following numbers must be divided to obtain a perfect cube.

(i) 81

Solution:

By resolving 81 into prime factor,

3	81
3	27
3	9
3	3
	1

$81 = 3\times3\times3\times3$

By grouping the factors in triplets of equal factors,

$81 = (3\times3\times3)\times3$

Here, 3 cannot be grouped into triplets of equal factors.

∴ We will divide 81 by 3 to get perfect square.

(ii) 128

Solution:

By resolving 128 into prime factor,

2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

128 = 2×2×2×2×2×2×2
By grouping the factors in triplets of equal factors,
128 = (2×2×2)×(2×2×2)×2
Here, 2 cannot be grouped into triplets of equal factors.
∴ We will divide 128 by 2 to get perfect square.

(iii) **135**

Solution:

By resolving 135 into prime factor,

3	135
3	45
3	15
5	5
	1

135 = 3×3×3×5
By grouping the factors in triplets of equal factors,
135 = (3×3×3)×5
Here, 5 cannot be grouped into triplets of equal factors.
∴ We will divide 135 by 5 to get perfect square.

(iv) **192**

Solution:

By resolving 192 into prime factor,

2	192
2	96
2	48
2	24
2	12
2	6
3	3
	1

192 = 2×2×2×2×2×2×3
By grouping the factors in triplets of equal factors,
192 = (2×2×2)×(2×2×2)×3
Here, 3 cannot be grouped into triplets of equal factors.
∴ We will divide 192 by 3 to get perfect square.

(v) 704

Solution:

By resolving 704 into prime factor,

2	704
2	352
2	176
2	88
2	44
2	22
11	11
	1

704 = 2×2×2×2×2×2×11
By grouping the factors in triplets of equal factors,
704 = (2×2×2)×(2×2×2)×11
Here, 11 cannot be grouped into triplets of equal factors.
∴ We will divide 704 by 11 to get perfect square.

4. Parikshit makes a cuboid of plasticine of sides 5 cm, 2 cm, 5 cm. How many such cuboids will he need to form a cube?

Solution:

Given, side of cube is 5 cm, 2 cm and 5 cm.
∴ Volume of cube = 5×2×5 = 50

2	50
5	25
5	5
	1

50 = 2×5×5
Here, 2 , 5 and 5 cannot be grouped into triplets of equal factors.
∴ We will multiply 50 by (2×2×5) 20 to get perfect square.
Hence, 20 cuboid is needed.

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1. Find the cube root of each of the following numbers by prime factorisation method.

(i) 64

Solution:

$64 = 2\times2\times2\times2\times2\times2$

By grouping the factors in triplets of equal factors,

$64 = (2\times2\times2)\times(2\times2\times2)$

Here, 64 can be grouped into triplets of equal factors,

$\therefore 64 = 2\times2 = 4$

Hence, 4 is cube root of 64.

(ii) 512

Solution:

$512 = 2\times2\times2\times2\times2\times2\times2\times2\times2$

By grouping the factors in triplets of equal factors,

$512 = (2\times2\times2)\times(2\times2\times2)\times(2\times2\times2)$

Here, 512 can be grouped into triplets of equal factors,

$\therefore 512 = 2\times2\times2 = 8$

Hence, 8 is cube root of 512.

(iii) 10648

Solution:

$10648 = 2\times2\times2\times11\times11\times11$

By grouping the factors in triplets of equal factors,

$10648 = (2\times2\times2)\times(11\times11\times11)$

Here, 10648 can be grouped into triplets of equal factors,

$\therefore 10648 = 2\times11 = 22$

Hence, 22 is cube root of 10648.

(iv) 27000

Solution:

$27000 = 2\times2\times2\times3\times3\times3\times3\times5\times5\times5$

By grouping the factors in triplets of equal factors,

$27000 = (2\times2\times2)\times(3\times3\times3)\times(5\times5\times5)$

Here, 27000 can be grouped into triplets of equal factors,

$\therefore 27000 = (2\times3\times5) = 30$

Hence, 30 is cube root of 27000.

(v) 15625

Solution:

$15625 = 5\times5\times5\times5\times5\times5$

By grouping the factors in triplets of equal factors,

$15625 = (5\times5\times5)\times(5\times5\times5)$

Here, 15625 can be grouped into triplets of equal factors,

$\therefore 15625 = (5\times5) = 25$

Hence, 25 is cube root of 15625.

(vi) 13824

Solution:

$13824 = 2\times2\times2\times2\times2\times2\times2\times2\times2\times3\times3\times3$

By grouping the factors in triplets of equal factors,

$13824 = (2\times2\times2)\times(2\times2\times2)\times(2\times2\times2)\times(3\times3\times3)$

Here, 13824 can be grouped into triplets of equal factors,

$\therefore 13824 = (2\times2\times 2\times3) = 24$

Hence, 24 is cube root of 13824.

(vii) 110592

Solution:

$110592 = 2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times3\times3\times3$

By grouping the factors in triplets of equal factors,

$110592 = (2\times2\times2)\times(2\times2\times2)\times(2\times2\times2)\times(2\times2\times2)\times(3\times3\times3)$

Here, 110592 can be grouped into triplets of equal factors,

$\therefore 110592 = (2\times2\times2\times2 \times 3) = 48$

Hence, 48 is cube root of 110592.

(viii) 46656

Solution:

$46656 = 2\times2\times2\times2\times2\times2\times3\times3\times3\times3\times3\times3$

By grouping the factors in triplets of equal factors,

$46656 = (2\times2\times2)\times(2\times2\times2)\times(3\times3\times3)\times(3\times3\times3)$

Here, 46656 can be grouped into triplets of equal factors,

$\therefore 46656 = (2\times2\times3\times3) = 36$

Hence, 36 is cube root of 46656.

(ix) 175616

Solution:

$175616 = 2\times2\times2\times2\times2\times2\times2\times2\times2\times7\times7\times7$

By grouping the factors in triplets of equal factors,

$175616 = (2\times2\times2)\times(2\times2\times2)\times(2\times2\times2)\times(7\times7\times7)$

Here, 175616 can be grouped into triplets of equal factors,

$\therefore 175616 = (2\times2\times2\times7) = 56$

Hence, 56 is cube root of 175616.

(x) 91125

Solution:

$91125 = 3\times3\times3\times3\times3\times3\times5\times5\times5$

By grouping the factors in triplets of equal factors,

$91125 = (3\times3\times3)\times(3\times3\times3)\times(5\times5\times5)$

Here, 91125 can be grouped into triplets of equal factors,

$\therefore 91125 = (3\times3\times5) = 45$

Hence, 45 is cube root of 91125.

2. State true or false.

(i) Cube of any odd number is even.

Solution:

False

(ii) A perfect cube does not end with two zeros.

Solution:

True

(iii) If square of a number ends with 5, then its cube ends with 25.

Solution:

False

(iv) There is no perfect cube which ends with 8.

Solution:

False

(v) The cube of a two digit number may be a three digit number.

Solution:

False

(vi) The cube of a two digit number may have seven or more digits.

Solution:

False

(vii) The cube of a single digit number may be a single digit number.

Solution:

True

3. You are told that 1,331 is a perfect cube. Can you guess without factorisation what is its cube root? Similarly, guess the cube roots of 4913, 12167, 32768.

Solution:

- By grouping the digits, we get 1 and 331

We know that, since, the unit digit of cube is 1, the unit digit of cube root is 1.
∴ We get 1 as unit digit of the cube root of 1331.
The cube of 1 matches with the number of second group.
∴ The ten's digit of our cube root is taken as the unit place of smallest number.
We know that, the unit's digit of the cube of a number having digit as unit's place 1 is 1.

$\therefore \sqrt[3]{1331} = 11$

- By grouping the digits, we get 4 and 913

We know that, since, the unit digit of cube is 3, the unit digit of cube root is 7.
∴ we get 7 as unit digit of the cube root of 4913.
We know $1^3 = 1$ and $2^3 = 8$, $1 > 4 > 8$.
Thus, 1 is taken as ten digit of cube root.

$\therefore \sqrt[3]{4913} = 17$

- By grouping the digits, we get 12 and 167.

We know that, since, the unit digit of cube is 7, the unit digit of cube root is 3.
∴ 3 is the unit digit of the cube root of 12167
We know $2^3 = 8$ and $3^3 = 27$, $8 > 12 > 27$.

Thus, 2 is taken as ten digit of cube root.

$\therefore \sqrt[3]{12167} = 23$

- By grouping the digits, we get 32 and 768.

We know that, since, the unit digit of cube is 8, the unit digit of cube root is 2.
∴ 2 is the unit digit of the cube root of 32768.
We know $3^3 = 27$ and $4^3 = 64$, 27 > 32 > 64.
Thus, 3 is taken as ten digit of cube root.

$\therefore \sqrt[3]{32768} = 32$