Name : ______________________

Grade : VIII

Subject : Mathematics

Chapter : 7. Cubes and Cube Roots

Objective Type Questions **1 Marks.**

I. Multiple choice questions

1. Which of the following numbers must be subtracted from 345 to get a perfect cube?

   a. 121 b. 131 c. 2 d. 24

2. Which of the following numbers is a perfect cube?

   a. 343 b. 443 c. 543 d. 643

3. Which of the following numbers must be multiplied to 392 to get a perfect cube?

   a. 2 b. 3 c. 4 d. 7

4. By which of the following numbers 21296 must be divided to get a perfect cube?

   a. 2 b. 4 c. 5 d. 7

5. What is the volume of a cube whose each side is 4 cm?

   a. 24 cm^2 b. 48 cm^2 c. 64 cm^2 d. 125 cm^2

6. Which of the following numbers is a perfect cube?

   a. 141 b. 294 c. 216 d. 496

7. Which of the following numbers is a perfect cube?

   a. 1152 b. 1331 c. 2016 d. 739

8. $\sqrt[3]{512}$ = ?

   a. 6 b. 7 c. 8 d. 9

9. $\sqrt[3]{125 \times 64}$= ?

   a. 100 b. 40 c. 20 d. 30

10. $\sqrt[3]{\frac{64}{343}}$ = ?

a. $\frac{4}{9}$ b. $\frac{4}{7}$ c. $\frac{8}{7}$ d. $\frac{8}{21}$

11. $\sqrt[3]{\frac{-512}{729}}$ = ?

a. $-\frac{7}{9}$ b. $\frac{-8}{9}$ c. $\frac{7}{9}$ d. $\frac{8}{9}$

12. By what least number should 648 be multiplied to get a perfect cube?

a. 3 b. 6 c. 9 d. 8

13. The one's digit of the cube of 23 is:

a. 6 b. 7 c. 3 d. 9

14. $\sqrt[3]{1000}$is equal to:

a. 10 b. 100 c. 1 d. None of these

15. Which of the following numbers is a perfect cube?

a. 243 b. 216 c. 392 d. 8640

16. If m is the cube root of n, then n is:

a. m^2 b. $\sqrt{m}$ c. $\frac{m}{3}$ d. $\sqrt[3]{m}$

1. (c)	2. (a)	3. (d)	4. (a)	5. (c)	6. (c)	7. (b)	8. (c)
9. (c)	10. (b)	11. (b)	12. (c)	13. (b)	14. (a)	15. (b)	16. (a)

II. Multiple choice questions

1. The one"s digit of the cube of 23 is **[NCERT Exemplar]**

a. 6 b. 7 c. 3 d. 9

2. Which of the following numbers is a perfect cube?

a. 243 b. 216 c. 392 d. 8640

3. Which of the following numbers is not a perfect cube?

a. 216 b. 567 c. 125 d. 343

4. $\sqrt[3]{1000}$ is equal to

a. 10 b. 100 c. 1 d. None of these

5. If m is the cube root of n, then n is

a. m^3 b. $\sqrt{m}$ c. $\frac{n}{3}$ d. $\sqrt[3]{m}$

6. The cube of a number

a. is always positive b. is always negative

c. can be positive or negative d. can never be zero

7. If a number ends in 7, then its ends in

a. 7 only b. 9 only c. 3 only d. 7 or 3

8. If square of a number ends with 5, then its cube ends with

a. 25 b. 55 c. 50 d. 5

9. The side of a cube whose volume is 17576 m^3 is

a. 24 m b. 26 m c. 28 m d. 36 m

10. The cube root of a numbe which has 2 in its units place has the units digit as

a. 2 b. 8 c. 2 or 8 d. 2 or 4

1. b	2. b	3. b	4. a	5. a	6. c	7. c	8. d	9. b	10. b

I. Fill in the blanks

1. $\sqrt[3]{8} \times$ ________ = 8
2. $\sqrt[3]{1728}$= 4 × ________
3. $\sqrt[3]{480}$ = $\sqrt[3]{3} \times 2 \times \sqrt[3]{\_\_\_\_\_\_}$
4. $\sqrt[3]{\_\_\_\_\_\_}$ = $\sqrt[3]{7} \times \sqrt[3]{8}$
5. There are _________ perfect cubes between 1 and 1000.
6. The cube of an odd number is always an __________ number.
7. The cube root of a number x is denoted by _________.

1. 64	2. 3	3. 20	4. 56	5. 8	6. odd	7. $\sqrt[3]{x}$

I. True or False

1. The cube of 0.4 is 0.064.
2. The cube root of 8000 is 200.
3. There are five perfect cubes between 1 and 100.

4. There is no perfect cube which ends in 4.

5. For an integer a, a^3 always greater than a^2.

6. If x and y are integers such that $x^2 > y^2$, then $x^3 > y^3$.

7. Let x and y be natural numbers. If x divides y, then x^3 divides y^3.

1. True	2. False	3. False	4. False	5. False	6. True	7. True

I. Match the following

Column A	Column B
1. The smallest Hardy-Ramanujan number is	a. 343
2. 7^3 is equal to	b. 5
3. The smallest number by which 675 must be multiplied to obtain a perfect cube is	c. 1729
	d. $\frac{3}{5}$
4. The smallest number by which 432 must be divided to obtain a perfect cube is	e. 2
5. The value of $\sqrt[3]{\frac{27}{125}}$ is	

1. (c)	2. (a)	3. (b)	4. (e)	5. (d)

I. Very Short Answer Type Questions.

1. Write cubes of first three multiples of 3.

Sol. Cubes of first 3 multiple of 3 are 27,216 and 729.

2. Find the cube of (-7).

Sol. $(-7)^3 = (-7) \times (-7) \times (-7)$

$= -343$

3. Find the cube of $\frac{2}{3}$.

Sol. We have,

$\left(\frac{2}{3}\right)^3 = \frac{2^3}{3^3} = \frac{2\times2\times2}{3\times3\times3} = \frac{8}{27}$

4. Find the cube of $5\frac{2}{7}$.

Sol. We have, $5\frac{2}{7} = \frac{37}{7}$

$\left(\frac{37}{7}\right)^3 = \frac{37^3}{7^3}$

$= \frac{37\times37\times37}{7\times7\times7} = \frac{50653}{343}$

5. Find the cube of rational number 3.1

Sol. $(3.1)^3 = 3.1\times 3.1 \times 3.1 = 29.791$

6. How many perfect cubes are there from 1 to 100?

There are only four perfect cubes from 1 to 100 these are: 1,8,27 and 64.

7. Is 500 a perfect cube?

Sol. $500 = 5 \times 5 \times 5 \times 2 \times 2$

In the above prime factorization 2×2 remain after grouping the prime factors in triples.

500 is not a perfect cube.

8. Consider the following pattern:

$0 + 1 = 1 = 1^3$

$3 + 5 = 8 = 2^3$

$7 + 9 + 11 = 27 = 3^3$

$13 + 15 + 17 + 19 = 64 = 4^3$

Express the following numbers as the sum of odd numbers using the above pattern?

(a) 6^3 (b) 8^3

Sol. (a) $n = 8$ and $(n - 1) = 5$

We start with $(6 \times 5) + 1 = 31$

We have

6^3 = 31 + 33 + 35 + 37 + 39 + 41 = 216

(b) n = 8 and $(n - 1)$ = 7

We start with (8× 7) + 1 = 57

We have,

8^3 = 57 + 59 + 61 + 63 + 65 +67 + 69 + 71

= 512

9. Evaluate: $\sqrt[3]{216}$

Sol. By prime factorization, we have

$216 = 2 \times 2 \times 2 \times 3 \times 3 \times 3$

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

$\sqrt[3]{216}$ = (2 × 6) = 6

II. Very Short Answer Type Questions.

1. Write cubes of first three multiples of 3.

Sol. First three multiples of 3 = 3, 6, 9

Cubes of these numbers are as follows.

$3^3 = 3 \times 3 \times 3 = 27$

$6^3 = 6 \times 6 \times 6 = 216$

$9^3 = 9 \times 9 \times 9 = 729$

2. Is 2401 a perfect cube?

Sol. 2401 = $7 \times 7 \times 7 \times 7$

Here, 7 remains after grouping the 7's in triplets. Therefore, 2401 is not a perfect cube.

3. Fill in the blanks.

i. There are ________________ perfect cubes between 1 and 1,000.

ii. The cube of 100 will have ________________ zeros.

iii. 1 m^3 = ________________ cm^3.

iv. Ones digit in the cube of 38 is ________________.

i. 8	ii. 6	iii. 10,00,000	iv. 2

4. Cube root of a number when divided by 5 results in 25, what is the number?

Sol. Let the number be x, then

$$\frac{\sqrt[3]{\sqrt{x}}}{5} = 25 \qquad \Rightarrow \qquad \sqrt[3]{x} = 25 \times 5$$

$$\sqrt[3]{x} = 25 \times 5 \qquad \Rightarrow \qquad x = (125)^3$$

5. What will be unit's digit in cube root of 493039?

Sol. Since digit at units place for the given number 493039 is 9, and

$$9 \times 9 \times 9 = 729$$

So, digit at units place in cube root of 493039 is 9.

I. Short Answer Type Questions.

1. Using prime factorization, find the cube root of 5832.

Sol. The prime factorization of 5832 is

2	5832
2	2916
2	1458
3	729
3	243
3	81
3	27
3	9
3	3
	1

$5832 = 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$

Therefore, $\sqrt[3]{5832} = \sqrt[3]{2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3}$

$= 2 \times 3 \times 3$

$= 18$

2. Check whether 1728 is a perfect cube by using prime factorization.

Sol. Prime factorization of 1728 is

$1728 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3$

Since, all prime factors can be grouped in triplets.

Therefore, 1728 is perfect cube.

3. **Is 9720 a perfect cube? If not, find the smallest number by which it should be divided to get a perfect cube.**

Sol.

2	9720
2	4860
2	2430
3	1215
3	405
3	135
3	45
3	15
5	5
	1

9720 = $2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 5$

The prime number 3 and 5 do not appear in the group of triples. So, 9720 is not a perfect cube.

We divide, 9720 by$3 \times 3 \times 5 = 45$, to make it perfect cube.

4. **Which of the following are perfect cubes?**

(i) 6859 **(ii) 2025**

Sol. (a)

19	6859
19	361
19	19
	1

We have, 6859 = $\underline{19 \times 19 \times 19}$

The prime factors of 6859 can be grouped into triplets and to factor is left over.

6869 is a perfect cube.

(b).

3	2025
3	675
3	225
3	75
5	25
5	5
	1

We have, 2025 = $\underline{3 \times 3 \times 3} \times 3 \times 5 \times 5$

∴ We do not get triplets of prime factors of 2025 and $3 \times 5 \times 5$ are left over.

∴ 2025 is not a perfect cube.

5. By what smallest number should 3600 be multiplied so that the quotient is a perfect cube. Also, find the cube root of the quotient.

Sol. We have,

3600 = $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5$

In this factorization, we find that there is no triplet of 2, 3 and 5.

So, 3600 is not a perfect cube. To make it perfect cube we multiply it by $2 \times 2 \times 3 \times 5 = 60.$

6. If one side of a cube is 15 m in length, find its volume.

Sol. Volume = a^3

= $(15)^3$

= $15 \times 15 \times 15$

= 3375 m^3

7. Find the length of each side of a cube if its volume is 512 cm^3.

Sol. Volume = $(side)^3$

512 = $(side)^3$

Side = $\sqrt[3]{512}$

Side = $\sqrt[3]{8 \times 8 \times 8}$ = 8

8. Find the cube root of (-1000).

Sol. Since $\sqrt[3]{-1000} = -\sqrt[3]{1000}$

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

Therefore, $-\sqrt[3]{1000} = -\sqrt[3]{2 \times 2 \times 2 \times 5 \times 5 \times 5}$

$= -2 \times 5$ = -10

9. Evaluate: $\sqrt[3]{1372} \times \sqrt[3]{1458}$

Sol.

2	1372
2	686
7	343
7	49
7	7
	1

2	1458
3	729
3	243
3	81
3	27
3	9
3	3
	1

Since, $\sqrt[3]{1372} \times \sqrt[3]{1458}$

$= \sqrt[3]{2 \times 2 \times 7 \times 7 \times 7 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3}$

$= \sqrt{2^3 \times 7^3 \times 3^3 \times 3^3}$

$= 2 \times 7 \times 3 \times 3$

= 126

10. Find the volume of a cube whose surface area is 150 m^2.

Sol. Since, surface area of cube = 150 m^2

Let the length of each edge = a

The, surface area of cube = $6a^2$

According to problem,

$6a^2 = 150$

or $a^2 = \frac{150}{6} = 25$

or $a^2 = 25$

$\Rightarrow$ $a = \sqrt{25} = \sqrt{5 \times 5}$

$\Rightarrow$ $a = 5$ m

We know that,

Volume of cube = a^3 cubic metre

Therefore,

Volume of cube = 5^3

$= 5 \times 5 \times 5$

= 125 m^3

11. $\left\{(5^2 + (12^2)^{\frac{1}{2}}\right\}^3$

Sol. $\left\{(5^2 + (12^2)^{\frac{1}{2}}\right\}^3$

$= \{(25 + 12)\}^3$

$= (37)^3$

$= 50653$

12. Evaluate: $\sqrt[3]{27} + \sqrt[3]{0.008} + \sqrt[3]{0.064}$

Sol. $\sqrt[3]{27} + \sqrt[3]{0.008} + \sqrt[3]{0.064}$

$= \sqrt[3]{3 \times 3 \times 3} + \sqrt[3]{0.2 \times 0.2 \times 0.2} + \sqrt[3]{0.4 \times 0.4 \times 0.4}$

$= 3 + 0.2 + 0.4$

$= 3.6$

II. Short Answer Type Questions.

1. Using prime factorisation, find the cube root of 2,744.

Sol. $\sqrt[3]{2744} = \sqrt[3]{2 \times 2 \times 2 \times 7 \times 7 \times 7}$

$= 2 \times 7 = 14$

2	2744
2	1372
2	686
7	343
7	49
7	7
	1

2. Is 9,720 a perfect cube? If not, find the smallest number by which it should be divided to get a perfect cube.

Sol. 9,720 = 2 x 2 x 2 x 3 x 3 x 3 x 3 x 3 = 5

The primes 3 and 5 do not appear in groups of there.

So, 9,720 is not a perfect cube.

We divide 9,720 by 3 x 3 x 5 = 45 , to make it perfect cube.

2	9720
2	4860
2	2430
3	1215
3	405
3	135
3	45
3	15
5	5
	1

3. Is 68,600 a perfect cube? If not, find the smallest number by which 68,600 must be multiplied to ge a perfect cube.

Sol. We have, 68,600

2	68600
2	34300
2	17150
5	8575
5	1715
7	343
7	49
7	7
	1

68600 = 2 x 2x 2 x 5 x 5 x 7 x 7 x 7

is not a perfect cube. To make it a perfect cube we multiply it by 5.

Thus, 68,600 x 5 = 2 x 2 x 2 x 5 x 5 x 5 x 7 x 7 x 7

= 3,43,000, which is a perfect cube.

Observe that 343 is a perfect cube.

So, 3,43,000 is also perfect cube.

4. Find the cube root of 4,38,976 using prime factorisation.

Sol. 4,38,976 = $\underline{2 \times 2 \times 2} \times \underline{2 x 2 x 2} \times \underline{19 \times 19 \times 19}$

∴ $\sqrt[3]{438976}$ = 2 x 2 x 19 = 76.

2	68600
2	34300
2	17150
5	8575
5	1715
7	343
7	49
7	7
	1

5. Find the cube root of the number 1,728 by successive subtraction of numbers 1, 7, 19, 37, 61, 91, 127, 169, 217, 271, 331, 397, …, etc.

Sol. i. 1728 – 1 = 1727

ii. 1727 – 7 = 1720

iii. 1720 – 19 = 1701

iv. 1701 – 37 = 1664

v. 1664 – 61 = 1603

vi. 1603 – 91 = 1512

vii. 1512 – 127 = 1385

viii. 1385 – 169 = 1216

ix. 1216 – 217 = 999

x. 999 – 271 = 728

xi. 728 – 331 = 397

xii. 397 – 397 = 0

Since 0 is coming at 12^{th} step of subtraction.

∴ 12 is the cube root of 1,728.

6. Show that : $\sqrt[3]{64 \times 729} = \sqrt[3]{64} \times \sqrt[3]{729}$

Sol. $\sqrt[3]{64 \times 729} = \sqrt[3]{4 \times 4 \times 4 \times 9 \times 9 \times 9} = 4 \times 9$

So, $\sqrt[3]{64 \times 729} = 4 \times 9 = 36$

And $\sqrt[3]{64} \times \sqrt[3]{729} = \sqrt[3]{4 \times 4 \times 4} \times \sqrt[3]{9 \times 9 \times 9} = 4 \times 9 = 36$

∴ $\sqrt[3]{64 \times 729} = \sqrt[3]{64} \times \sqrt[3]{729}$

7. Find the cube root of 1.331.

Sol. We can write 1.331 = $\frac{1331}{1000}$

$\therefore \qquad \sqrt[3]{1.331} = \sqrt[3]{\frac{1331}{1000}} = \frac{\sqrt[3]{1331}}{\sqrt[3]{1000}}$

$= \frac{\sqrt[3]{11 \times 11 \times 11}}{\sqrt[3]{10 \times 10 \times 10}} = \frac{11}{10} = 1.1$

8. Find the cube not root of - 5832.

2	68600
2	34300
2	17150
5	8575
5	1715
7	343
7	49
7	7
	1

Sol. $\sqrt[3]{-5832} = \sqrt[3]{5832}$

$= \sqrt[3]{2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3}$

$= -2 \times 3 \times 3 = -18$

I. Long Answer Type Questions.

1. Show that -1728 is a perfect cube. Also, find the number whose cube is -1728.

Sol.

2	1728
2	864
2	432
2	216
2	108
2	54
3	27
3	9
3	3
	1

We have,

i.e., $1728 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3$

$\Rightarrow \quad 1728 = 2^3 \times 2^3 \times 2^3$

$\Rightarrow \quad 1728 = (2 \times 2 \times 3)^3$

$\Rightarrow \sqrt[3]{1728} = 2 \times 2 \times 3 = 12$

Since, 1728 is a perfect cube.

-1728 is also a perfect cube.

Also, $\sqrt[3]{-1728} = -12$

2. **Three numbers are in the ratio 1:2:3 and the sum of their cubes is 4500. Find the numbers.**

Sol. Let the number be $x, 2x$ and $3x$

$(x)^3 + (2x)^3 + (3x)^3 = 4500$

$x^3 + 8x^3 + 27x^3 = 4500$

$36x^3 = 4500$

$x^3 = \frac{4500}{36}$

$x^3 = 125$

$x = 5$

So, the number are 5, 10 and 15.

3. **What is the smallest number by which 288 must be multiplied, so that the product is a perfect cube?**

Sol. Resolving 288 into prime factors, we have

2	288
2	144
2	72
2	36
2	18
3	9
3	3
	1

i.e., $288 = 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3$

Grouping the factors in triples, we get

$288 = [2 \times 2 \times 2] \times 2 \times 2 \times 3 \times 3$

We observe that, if 288 is multiplied by (2×3), then its prime factors will exist in triplet. Thus, the required smallest number by which 288 be multiplied to make it a perfect cube is (2×3), *i.e.*, 6.

4. **Show that 0.001728 is the cube of a rational number. Find tat rational number whose cube is 0.001728.**

Sol. We have, $0.001728 = \frac{1728}{1000000}$

Now,

2	1728
2	864
2	432
2	216
2	108
2	54
3	27
3	9
3	3
	1

2	1000000
2	500000
2	250000
2	125000
2	62500
2	31250
5	15625
5	3125
5	625
5	125
5	25
5	5
	1

Or $\sqrt[3]{\left(\frac{2\times2\times3}{2\times2\times5\times5}\right)^3} = \sqrt[3]{\left(\frac{12}{100}\right)^3} = \frac{12}{100} = 0.12$

The cube root of 0.001728 is 0.12

5. The volume of a cubical box is 64 cm^3. What is its side?

Sol. Let 'x' be the side of the cube.

$x^3 = 64$

or $\sqrt[3]{x^3} = \sqrt[3]{64}$

$x = \sqrt[3]{2\times2\times2\times2\times2\times2}$

$= \sqrt[3]{2^3\times2^3} = 2\times2 = 4$

Thus, the required side of the cube is 4 cm.

6. Difference of two perfect cubes is 189. If the cube root of the smaller of the numbers is 3, find the cube root of the larger number.

Sol. Since, the cube root of smaller number is 3

Hence, the number = $(3)^3 = 27$

Let the other number be x, then

$$x - 27 = 189$$

$$x = 189 + 27$$

$$x = 216$$

So, the cube root of x.

$$\sqrt[3]{216}$$

6	216
6	36
6	6
	1

$\sqrt[3]{216} = \sqrt[3]{6 \times 6 \times 6}$

Hence, the cube root of larger number = 6

7. Three numbers in the ratio 2:3:4. The sum of their cubes is 0.334125. Find the numbers.

Sol. Let the number be $2x$, $3x$ and $4x$, then

$(2x)^3 + (3x)^3 + (4x)^3 = 0.334125$

$8x^3 + 27x^3 + 64x^3 = 0.334125$

$99x^3 = 0.334125$

$x^3 = \frac{0.334125}{99}$

$x^3 = 0.003375$

$x^3 = \frac{3375}{1000000}$

$= \frac{15}{100}$

$= 0.15$

Hence, the number are 0.3, 0.45 and 0.6.

II. Long Answer Type Questions.

1. Find the cube root of 17,576 through estimation.

Sol. The given number is 17,576.

Step 1 : Form groups of three starting from the rightmost digit of 17,576. 17576. In this case one group, i.e., 576 has three digits whereas 17 has only two digits.

Step 2: Take 576.

The digit 6 is at its one's place.

So one's place of the required cube root is 6.

Step 3: Take the other group, i.e., 17.

Cube of 2 is 8 and cube of 3 is 27. 17 lies between 8 and 27.

The smaller number among 2 and 3 is 2.

Take 2 as ten's place of the cube root of 17,576.

Thus, $\sqrt[3]{17576} = 26.$

2. Find the cube root of: 24,60,375, using the fact that 24,60,375 = 3,375 x 729

Sol. $\sqrt[3]{2460375} = \sqrt[3]{3375 \times 729}$

$= \sqrt[3]{3375} \times \sqrt[3]{729} \quad (\therefore \sqrt[3]{ab} = \sqrt[3]{a} = \sqrt[3]{b})$

Prime Factorisation of 3375 is and of 729

3	3375
3	1125
3	375
5	125
5	25
5	5
	1

3	729
3	243
3	81
3	27
3	9
3	3
	1

Hence, $\sqrt[3]{2460375} = \sqrt[3]{3375} \times \sqrt[3]{729}$

$= \sqrt[3]{3 \times 3 \times 3 \times 5 \times 5 \times 5} \times \sqrt[3]{3 \times 3 \times 3 \times 3 \times 3 \times 3}$

= 3 x 5 x 3 x 3 = 135

3. Find the cube roots of:

i. $\frac{9261}{42875}$ ii. $\frac{343}{166375}$

Sol. i. We have $\sqrt[3]{\frac{9261}{42875}} = \frac{\sqrt[3]{9261}}{\sqrt[3]{42875}}$

$= \frac{\sqrt[3]{\underline{3 \times 3 \times 3} \times \underline{7 \times 7 \times 7}}}{\sqrt[3]{\underline{5 \times 5 \times 5} \times \underline{7 \times 7 \times 7}}} \frac{3 \times 7}{5 \times 7} = \frac{21}{35} = \frac{3}{5}$

ii. We have, $\sqrt[3]{\frac{343}{166375}} = \frac{\sqrt[3]{343}}{\sqrt[3]{166375}}$

$= \frac{\sqrt[3]{7 \times 7 \times 7}}{\sqrt[3]{5 \times 5 \times 5 \times 11 \times 11 \times 11}} = \frac{7}{5 \times 11} = \frac{7}{55}$

4. Find the value of smallest positive integers n for which 864 n is a perfect cube.

Sol. We have,

2	864
2	432
2	216
2	108
2	54
3	27
3	9
3	3
	1

864 = 2 x 2 x 2 x 2 x 2 x 3 x 3 x 3

Since 2 x 2 is the only incomplete triplet, so 864 has to be multiplied by 2 to make it a perfect cube.

$\therefore \quad n = 2.$

I. High Order Thinking Skills (HOTS) Questions

1. Find the value of $(71)^3$ by using the short-cut method.

Sol. Let a = 7 and b = 1

Since,

$a^2 \times a$	$a^2 \times 3b$	$b^2 \times 3a$	$b^2 \times b$
a^3	$3a^2 + b$	$3a + b^2$	b^3

Then,

49 $\times$ 7 353 +14 367	49 $\times$ 3 147 +2 149	1×21 21	1×1 1

Therefore, $(71)^3$ = 357911

2. **Prove that if x number is doubled then its cube is 8 times cube of the given number.**

Sol. Let y be the double of x

$$i.e., y = 2x$$

By using on both sides

$y^3 = (2x)^3$

$\Rightarrow y^3 = 2^3 \times x^3 = 2 \times 2 \times 2 \times x^3$

$\Rightarrow y^3 = 8x^3$

II. High Order Thinking Skills (HOTS) Questions

1. **Difference of two perfect cubes is 189. If the cube root of the smaller of the two numbers is 3, find the cube root of the large number.**

Sol. Since the cube root of smaller number = 3

Since difference = 189

Large number = 189 +27 = 216

$\therefore \quad \sqrt[3]{216} = \sqrt[3]{2 \times 2 \times 2 \times 3 \times 3 \times 3}$

$= 2 \times 3 = 6$

Hence, cube root of larger number is 6.

2. **Which number is known as Ramanujan number? What is the beauty of this number?**

Sol. 1,729 is known as Ramanujan number. The beauty of this number is that it can be expressed as the sum of two cubes in two different ways:

$1729 = 10^3 + 9^3$ and $12^3 + 1^3$

3. **If ^{a2} ^{e}nds in a even number of zeros, then a^3 ends in an odd number of zeros. State true or false and justify your answer.**

Sol. False. Let a = 200, then a^2 = 40000 and a^3 = 8000000

Here, both a^2 and a^3 have even number of zeros.

4. Find the value of $\sqrt[3]{\sqrt[3]{a^3}}$.

Sol. $\sqrt[3]{\sqrt[3]{a^3}} = \left[(a^3)^{\frac{1}{3}}\right]^{\frac{1}{3}}$

$= (a^3)^{\frac{1}{9}} = a^{\frac{1}{3}}$

I. Value Based Questions.

1. (a). Find the cube of 24 using method.

(b). How many perfect cubes are there from 1 to 30.

Sol. (a) Let $a = 2$ and $b = 4$ then

Column I	Column II	Column III	Column IV
a^3	$3 \times a^2 \times b$	$3 \times a \times b^2$	b^3
$2^3 = 8$ + 5	$3 \times 2^2 \times 4 = 48$ + 10	$3 \times 2 \times 4^2 = 96$ + 6	$43 = 6\underline{4}$
$\underline{13}$	$5\underline{8}$	$10\underline{2}$	
13	8	2	4

Hence, $24^3 = 13824$.

(b). There are only three perfect cubes from 1 to 30 $i.e.$, 1,8,27.

2. (a) Find the cube-root of 17576 through estimation.

(b). Show that $64\left(\frac{1}{2}\right)^3$ is a perfect cube.

Sol. (a) Since, given number

From groups of three starting from the right most of $\underline{17576}$ $i.e.$, 576 has three digits whereas 17 has only two digits.

Since, unit place = 6

The value of 1^{st} group = 17

$i.e.$, 17 lies between 8 and 27

Since, $2 < 3$

The one's place of 2 is 2 itself take 2 as ten's place of the cube root of 17576.

Therefore, $\sqrt[3]{17576 = 26}$

(b). Since, $64\left(\frac{1}{2}\right)^3 = 64 \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$

$= 64 \times \frac{1}{8} = 8$

$2^3 = 8$ (perfect cube)

3. (a) Three numbers are in the ratio 2:3:4. The sum of them in cube is 33957. Find the numbers.

(b). Is $\frac{27}{125}$ a cube of a rational number $\frac{3}{5}$?

Sol. Let the numbers are $2x, 3x$ and $4x$, then

$(2x)^3 + (3x)^3 + (4x)^3 = 33957$

or $8x^3 + 27x^3 + 64x^3 = 33957$

or $99x^3 = 33957$

or $x^3 = \frac{33957}{99} = 343$

or $x = (343)^{\frac{1}{3}}$

$= \sqrt[3]{7 \times 7 \times 7} = 7$

Hence, required numbers are

$2x = 2 \times 7 = 14$

$3x = 3 \times 7 = 21$

$4x = 4 \times 7 = 28$

(b). Since, $\frac{27}{125} = \frac{3\times3\times3}{5\times5\times5} = \frac{3^3}{5^3} = \left(\frac{3}{5}\right)^3$

Therefore, $\frac{27}{125}$ is cube of $\frac{3}{5}$.