MATHEMATICS

Chapter 7: Cubes and Cube Roots

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Important Questions

Multiple Choice Questions-

Question 1. How many digits will be there in the cube root of 46656?

(a) 2

(b) 1

(c) 3

(d) 4

Question 2. Ones digit of cube of a number depends on the ________ of the number.

(a) tens digit

(b) ones digit

(c) hundred digit

(d) none of these

Question 3. What will be the unit digit of the cube root of a number ends with 8?

(a) 2

(b) 8

(c) 4

(d) 6

Question 4. The symbol for cube root is __________.

(a) √3

(b) ∛

(c) 2√3

(d) 3√3

Question 5. The smallest natural number by which 704 must be divided to obtain a perfect cube is

(a) 22

(b) 12

(c) 11

(d) 13

Question 6. The numbers 1, 8, 27... are ______.

(a) negative numbers

(b) cube numbers

(c) square numbers

(d) none of these

Question 7. If volume of cube is 4913cm^3 then length of side of cube is

(a) 16 cm

(b) 17 cm

(c) 18 cm

(d) 19 cm

Question 8. The square of a natural number subtracts from its cube comes 100. The number is __________.

(a) 2

(b) 3

(c) 5

(d) 1

Question 9. The value of 5^3 is __________.

(a) 125

(b) 15

(c) 10

(d) 75

Question 10. If $(2744)^{\frac{1}{3}} = 2p + 2$, then the value of P is

(a) 3

(b) 6

(c) 2

(d) 8

Very Short Questions:

1. Find the cubes of the following:

(a) 12

(b) -6

(c) $\frac{2}{3}$

(d) $\frac{-5}{6}$

2. Find the cubes of the following:

(a) 0.3

(b) 0.8

(c) .001

(d) 2 – 0.3

3. Is 135 a perfect cube?

4. Find the cube roots of the following:

(a) 1728

(b) 3375

5. Examine if (i) 200 (ii) 864 are perfect cubes.

6. Find the smallest number by which 1323 may be multiplied so that the product is a perfect cube.

Short Questions :

1. What is the smallest number by which 2916 should be divided so that the quotient is a perfect cube?

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

3. Using prime factorisation, find the cube root of 5832.

4. Show that $\sqrt[3]{27} \times \sqrt[3]{125} = \sqrt[3]{27 \times 125}$

Sir

5.

6. Find the cube roots of

(i) $4\frac{12}{125}$

(ii) -0.729

Long Questions :

1. Express the following numbers as the sum of odd numbers using the given pattern.

$$5^3 - 4^3 = 1 + \frac{5 \times 4}{2} \times 6 = 61$$

$$7^3 - 6^3 = 1 + \frac{7 \times 6}{2} \times 6 = 127$$

(i) $9^3 - 8^3$ = _________ = _________

(ii) $12^3 - 11^3$ = _________ = _________

(iii) $51^3 - 50^3$ = _________ = _________

2. Observe the following pattern and complete the blank spaces.

13 = 1

$$2^3 - 1^3 = 1 + \frac{2 \times 1}{2} \times 6 = 7$$

$$\therefore \quad 2^3 = 1 + 7 = 8$$

$$3^3 - 2^3 = 1 + \frac{3 \times 2}{2} \times 6 = 19$$

$$\therefore \quad 3^3 = 2^3 + 19$$

$$\Rightarrow \quad 3^3 = 1 + 7 + 19$$

(i) 4^4 = ________ (ii) 6^3 = ________

(iii) 7^3 = ________ (iv) 9^3 = ________

(v) 11^3 = ________

3. **Find the cubes of the following numbers: (i) 7, (ii) 12, (iii) 21, (iv) 100, (v) 302**

4. **By what number would you multiply 231525 to make it a perfect cube?**

Answer Key-

Multiple Choice questions-

1. (a) 2
2. (b) ones digit
3. (a) 2
4. (b) $\sqrt[3]{}$
5. (c) 11
6. (b) cube numbers
7. (b) 17 cm
8. (c) 5
9. (a) 125
10. (b) 6

Very Short Answer :

1.

(a) $12^3 = 12 \times 12 \times 12 = 1728$

(b) $(-6)^3 = (-6) \times (-6) \times (-6) = -216$

(c) $\left(\frac{2}{3}\right)^3 = \frac{2}{3} \times \frac{2}{3} \times \frac{2}{3} = \frac{8}{27}$

(d) $\left(\frac{-5}{6}\right)^3 = \left(\frac{-5}{6}\right) \times \left(\frac{-5}{6}\right) \times \left(\frac{-5}{6}\right) = \frac{-125}{216}$

2. (a) $(0.3)^3 = 0.3 \times 0.3 \times 0.3 = 0.027$

(b) $(0.8)^3 = 0.8 \times 0.8 \times 0.8 = 0.512$

(c) $(0.001)^3 = (0.001) \times (0.001) \times (0.001) = 0.000000001$

(d) $(2 - 0.3)^3 = (1.7)^3 = 1.7 \times 1.7 \times 1.7 = 4.913$

3. Prime factorisation of 135, is:

$135 = 3 \times 3 \times 3 \times 5$

We find that on making triplet, the number 5 does not make a group of the triplet.

Hence, 135 is not a perfect cube.

3	135
3	45
3	15
5	5
	1

4.

(*a*) Prime factorisation of 1728 is:

$1728 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3}$

$= 2^3 \times 2^3 \times 3^3$

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

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

(*b*) We find the prime factorisation of 3375 as follows:

$3375 = \underline{3 \times 3 \times 3} \times \underline{5 \times 5 \times 5}$

$= 3^3 \times 5^3$

$\therefore \sqrt[3]{3375}$

$= 3 \times 5$

$= 15$

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

5. (i) $200 = 2 \times 2 \times 2 \times 5 \times 5$

If we form triplet of equal factors, the number 2 forms a group of three whereas 5 does not do it.

Therefore, 200 is not a perfect cube.

2	200
2	100
2	50
5	25
5	5
	1

(ii) We have 864 = 2 × 2 × 2 × 2 × 2

If we form triplet of equal factors, the number 2 and 3 form a group of three whereas another group of 2's does not do so.

Therefore, 864 is not a perfect cube.

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

6. 1323 = 3 × 3 × 3 × 7 × 7

Since we required one more 7 to make a triplet of 7.

Therefore 7 is the smallest number by which 1323 may be multiplied to make it a perfect cube.

3	1323
3	441
3	147
7	49
7	7
	1

Short Answer :

1. Prime factorisation of

2916 = 2 × 2 × 3 × 3 × 3 × 3 × 3 × 3

Since we required one more 2 to make a triplet

Therefore, the required smallest number by which 2916 should be divided to make it a perfect cube is 2 × 2 = 4, i.e., 2916 ÷ 4 = 729 which is a perfect cube.

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

2. Prime factorisation of 1728 is

1728 = 2 × 2 × 2 × 2 × 2 × 2 × 3 × 3 × 3

Since all prime factors can be grouped in triplets.

Therefore, 1728 is a perfect cube.

3.

The prime factorisation of 5832 is

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

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

Therefore,

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

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

4.

$$\text{LHS} = \sqrt[3]{27} \times \sqrt[3]{125}$$

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

$$= \sqrt[3]{3^3} \times \sqrt[3]{5^3} = 3 \times 5 = 15$$

$$\text{RHS} = \sqrt[3]{27 \times 125}$$

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

$$= \sqrt[3]{3^3 \times 5^3} = 3 \times 5 = 15$$

Hence, LHS = RHS

5.

$$\sqrt[3]{5-\frac{10}{27}} = \sqrt[3]{\frac{5\times 27-10}{27}}$$

$$= \sqrt[3]{\frac{135-10}{27}} = \sqrt[3]{\frac{125}{27}}$$

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

6.

$$(i)\ \sqrt[3]{4\frac{12}{125}} = \sqrt[3]{\frac{4\times 125+12}{125}} = \sqrt[3]{\frac{500+12}{125}}$$

$$= \sqrt[3]{\frac{512}{125}}$$

$$= \sqrt[3]{\frac{2\times 2\times 2\times 2\times 2\times 2\times 2\times 2\times 2}{5\times 5\times 5}}$$

$$= \sqrt[3]{\frac{2^3\times 2^3\times 2^3}{5^3}}$$

$$= \frac{2\times 2\times 2}{5} = \frac{8}{5}$$

$$(ii)\ \sqrt[3]{-0.729} = \sqrt[3]{\frac{-729}{1000}}$$

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

$$= \sqrt[3]{-\frac{3^3\times 3^3}{10^3}}$$

$$= -\frac{3\times 3}{10} = -\frac{9}{10} = -0.9$$

Long Answer :

1.

$$(i)\ 9^3-8^3 = 1+\frac{9\times 8}{2}\times 6 = 217$$

$$(ii)\ 12^3-11^3 = 1+\frac{12\times 11}{2}\times 6 = 397$$

$$(iii)\ 51^3-50^3 = 1+\frac{51\times 50}{2}\times 6 = 7651$$

2.

(ii) $6^3 - 5^3 = 1 + \frac{6 \times 5}{2} \times 6 = 91$

$\therefore \quad 6^3 = 5^3 + 91$

$= 1 + 7 + 19 + 37 + 61 + 91$

(iii) $9^3 = 9^3 - 8^3 = 1 + \frac{9 \times 8}{2} \times 6 = 217$

$\therefore \quad 9^3 = 8^3 + 217$

$= 1 + 7 + 19 + 37 + 61 + 91 + 127 + 169 + 217$

(iv) $11^3 - 10^3 = 1 + \frac{11 \times 10}{2} \times 6 = 331$

$\therefore 11^3 = 10^3 + 331$

$= 1 + 7 + 19 + 37 + 61 + 91 + 127 + 169 + 217 + 271 + 331$

3.

(i) $(7)^3 = 7 \times 7 \times 7 = 343$

(ii) $(12)^3 = 12 \times 12 \times 12 = 1728$

(iii) $(21)^3 = 21 \times 21 \times 21 = 9621$

(iv) $(100)^3 = 100 \times 100 \times 100 = 1000000$

(v) $(302)^3 = 302 \times 302 \times 302 = 27543608$

4. The prime factorisation of 231525 is $5 \times 5 \times 3 \times 3 \times 3 \times 7 \times 7 \times 7$.

The number that must be multiplied in order that the above product is a perfect cube is 5.

Therefore, Cube root of 231525×5 is $5 \times 3 \times 7 = 105$.