Section A

1. The cube of a negative number is

(a) negative (b) positive (c) negative or positive (d) None of these.

Answer: (a) negative

Example: -4 x -4 x -4 = $(-4)^3$ = -64

2. The cube root of $1\frac{27}{216}$ is

(a) $\frac{6}{7}$ (b) $\frac{-7}{6}$ (c) $1\frac{1}{6}$ (d) $\frac{-6}{7}$

Answer: $1\frac{27}{216} = \sqrt[3]{\frac{343}{216}} = \sqrt[3]{\frac{343}{216}} = \sqrt{\frac{7 \, x \, 7 \, x \, 7}{2 \, x \, 2 \, x \, 2 \, x \, 3 \, x \, 3 \, x \, 3}} = \frac{7}{2 \, x \, 3} = \frac{7}{6} = 1\frac{1}{6}$

7	343
7	49
7	7
	1

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

3. The smallest number by which 686 should be divided to make it a perfect cube is

(a) 1 (b) 2 (c) 3 (d) 4

Answer: Prime factorization of 686

2	686
7	343
7	49
7	7
	1

∴ 686 = 2 x 7 x 7 x 7

➔ 686 = 2 x 7^3

➔ $\frac{686}{2} = 7^3$

Therefore when 686 is divided by two, it will make it a perfect cube.

4. The volume of the cube is 729 m^3. The length of its side is

(a) 3 m (b) 6 m (c) 9 m (d) 27 m

Answer: Given that the volume of the cube = 729 m^3

➔ side x side x side = 729 m^3

➔ $(\text{side})^3$ = 729 m^3

➔ side = $\sqrt[3]{729}$ m = $\sqrt[3]{9\ x\ 9\ x\ 9}$ m

➔ side = 9 m

Section B

5. 363 × 81 is a perfect cube. State whether the statement is true or false.

Answer: Using prime factorization

3	363
11	121
11	11
	1

3	81
3	27
3	9
3	3
	1

So, 363 = 11 × 11 × 3

81 = 3 × 3 × 3 × 3

Now, 363 × 81 = 11 × 11 × 3 × 3 × 3 × 3 × 3

We observe that 11 × 11 × 3 occur without pairs.

Therefore, 363 × 81 is not a perfect cube.

6. The least number to be multiplied by 9 to make it a perfect cube is ______________.

Answer: $9 = 3^2$

To get a perfect cube, multiply 9 by 3

Now, $9 \times 3 = 27$

$27 = 3^3$

Therefore, the required value is 3.

7. Write a Pythagorean triplet whose smallest number is 66**.**

Answer: Given, that the smallest number is 6.

We have to write a Pythagorean triplet.

For every natural number $m > 1$, $2m$, $m^2 - 1$, and $m^2 + 1$ form a Pythagorean triplet.

Given, $2m = 6$

$m = 6/2$

$m = 3$

So, $m^2 - 1 = (3)^2 - 1$

$= 9 - 1 = 8$

So, $m^2 + 1 = (3)^2 + 1$

$= 9 + 1 = 10$

Therefore, the Pythagorean triplet is 6, 8, 10.

8. Evaluate the following: $\sqrt[3]{27} + \sqrt[3]{0.008} + \sqrt[3]{0.064}$

Answer: Let us simplify

➔ $\sqrt[3]{3 \ x \ 3 \ x \ 3} + \sqrt[3]{0.2 \ x \ 0.2 \ x \ 0.2} + \sqrt[3]{0.4 \ x \ 0.4 \ x \ 0.4}$

➔ $\sqrt[3]{(3)^3} + \sqrt[3]{(0.2)^3} + \sqrt[3]{(0.4)^3}$

➔ $3 + 0.2 + 0.4 = 3.6$

Section C

9. Multiply 6561 by the smallest number so that the product is a perfect cube. Also, find the cube root of the product.

Answer: By factorizing 6561 we get

3	6561
3	2187
3	729
3	243
3	81
3	27
3	9
3	3
	1

6561 = (3 x 3 x 3) x (3 x 3 x 3) x 3 x 3

To complete the triplet we should multiply by 3

The required number smallest number = 3

Cube root of product = 3 x 3 x 3 = 27

10. Three numbers are in the ratio 3: 4: 5. If their product is 480, find the numbers.

Answer: Three numbers are in the ratio 3: 4: 5

Product = 480

Let the numbers be 3x, 4x and 5x

3x x 4x x 5x = 480

$60x^3 = 480$

$x^3 = \frac{480}{60} = 8$

$x^3 = 8$

$x = \sqrt[3]{8} = \sqrt[3]{2 \times 2 \times 2}$

x = 2

First number = 3x = 3 x 2 = 6

Second number = 4x = 4 x 2 = 8

Third Number = 5x = 5 x 2 = 10

3. The 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 larger number.

Answer: Given, the cube root of a smaller number = 3

On cubing both sides,

Cube of smaller number = $(3)^3 = 27$

Let the cube root of the larger number be y.

According to the question,

Cube of larger number – a cube of smaller number = 189

$y^3 - 27 = 189$

$y^3 = 189 + 27$

$y^3 = 216$

Taking cube root,

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

$y = \sqrt[3]{6 \, x \, 6 \, x \, 6}$

$y = 6$

Therefore, the cube root of the larger number is 6.

Section D

1. Evaluate the following:
(i) $\{(5^2 + 12^2)^{1/2}\}^3$
(ii) $\{(6^2 + 8^2)^{1/2}\}^3$

Answer:

(i) $\{(5^2 + 12^2)^{1/2}\}^3$

Given, the expression is $\{5^2 + (12^2)^{½}\}^3$

We have to evaluate the expression.

$5^2 = 5 \times 5 = 25$

$(12^2)^{1/2} = 12$

$5^2 + (12^2)^{½} = 25+12 = 37$

$\{5^2 + (12^2)^{½}\}^3 = (37)^3$

$= 37 \times 37 \times 37 = 50653$

Therefore, the required value is 50653.

(ii) $\{(6^2 + 8^2)^{1/2}\}^3$

Given, the expression is $\{6^2 + (8^2)^{1/2}\}^3$

We have to evaluate the expression.

$6^2 = 6 \times 6 = 36$

$(8^2)^{1/2} = 8$

$6^2 + (8^2)^{1/2} = 36 + 8 = 44$

$\{6^2 + (8^2)^{1/2}\}^3 = (44)^3$

$= 44 \times 44 \times 44 = 85184$

Therefore, the required value is 85184.

2. In a Maths lab there are some cubes and cuboids of the following measurements:

(i) One cube of side 4 cm

(ii) one cube of side 6 cm

(iii) 3 cuboids each of dimensions 4 cm × 4 cm × 6 cm and 3 cuboids each of the dimensions 4 cm × 6 cm × 6 cm.

A student wants to arrange these cubes and cuboids in the form of a big cube. Is it possible for him/her to arrange them in the form of a big cube? If yes, then find the length of a side of the new cube so formed.

Answer:

(i) One cube of side = 4 cm

∴ Volume = $(4)^3 = 64$ cm^3

(ii) One cube of side = 6 cm

∴ Volume = $(6)^3 = 216$ cm^3

(iii) 3 cuboids of the size 4 cm x 4 cm x 6 cm x 3 = 288 cm^3

and 3 cuboids of the size 4 x 6 x 6 x 3 = 432 cm^3

Total volume = 64 + 216 + 288 + 432 = 1000 cm^3

∴ side $= \sqrt[3]{1000} = \sqrt[3]{10 \, x \, 10 \, x \, 10}$ = 10 cm

Yes, it is possible, and the length of the side of a new cube is 10 cm.