

Question 1.

Find the cube of:

(i) 7

(ii) 11

(iii) 16

(iv) 23

(v) 31

(vi) 42

(vii) 54

Solution: (i) 7

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

Solution: (ii) 11

$$(11)^3 = 11 \times 11 \times 11 = 1331$$

Solution: (iii) 16

$$(16)^3 = 16 \times 16 \times 16 = 4096$$

Solution: (iv) 23

$$(23)^3 = 23 \times 23 \times 23 = 12167$$

Solution: (v) 31

$$(31)^3 = 31 \times 31 \times 31 = 29791$$

Solution: (vi) 42

$$(42)^3 = 42 \times 42 \times 42 = 74088$$

Solution: (vii) 54

$$(54)^3 = 54 \times 54 \times 54 = 157464$$

Question 2.

Find which of the following perfect cubes are:

(i) 243

(ii) 588

(iii) 1331

(iv) 24000

(v) 1728

(vi) 1938

Solution: (i) 243

Taking L.C.M.

3	243
3	81
3	27
3	9
3	3
	1

$$\therefore 243 = 3 \times 3 \times 3 \times 3$$

$$= (3 \times 3 \times 3) \times 3$$

$$= 3^3 \times 3$$

$\therefore 297$ is not a perfect cube.

Solution: (ii) 588

Taking L.C.M.

2	588
2	294
7	147
7	21
3	3
	1

$$588 = 2 \times 2 \times 7 \times 7 \times 3$$

∴ 588 is not perfect cube.

Solution: (iii) 1331

Taking L.C.M.

11	1331
11	121
11	11
	1

$$\therefore 1331 = 11 \times 11 \times 11 = (11)^3$$

∴ 1331 is a perfect cube.

Solution: (iv) 24000

$$\therefore 24000 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 5 \times 5 \times 5$$

$$= (2)^3 \times (2)^3 \times (5)^3 \times 3$$

∴ 24000 is not a perfect cube.

Solution: (v) 1728

Taking L.C.M.

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

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

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

∴ 1728 is a perfect cube.

Solution: (vi) 1938

Taking L.C.M.

2	1938
2	936
17	323
19	19
	1

$$1938 = 2 \times 3 \times 17 \times 19$$

1938 is not a perfect cube.

Question 3.

Find the cubes of:

(i) 2.1

(ii) 0.4

(iii) 1.6

(iv) 2.5

(v) 0.12

(vi) 0.02

Solution: (i) 2.1

$$\begin{aligned} 2.1 &= (2.1)^3 = \left(\frac{21}{10}\right)^3 = \frac{21 \times 21 \times 21}{10 \times 10 \times 10} \text{ (Splitting the terms)} \\ &= \frac{9261}{1000} = 9.261 \end{aligned}$$

Solution: (ii) 0.4

$$\begin{aligned} 0.4 &= (0.4)^3 = \left(\frac{4}{10}\right)^3 = \frac{4 \times 4 \times 4}{10 \times 10 \times 10} \text{ (Splitting the terms)} \\ &= \frac{64}{1000} = 0.064 \end{aligned}$$

Solution: (iii) 1.6

$$1.6 = (1.6)^3 = \left(\frac{16}{10}\right)^3 = \frac{16 \times 16 \times 16}{10 \times 10 \times 10} \text{ (Splitting the terms)}$$

$$= \frac{4096}{1000} = 4.096$$

Solution: (iv) 2.5

$$2.5 = (2.5)^3 = \left(\frac{25}{10}\right)^3 = \frac{25 \times 25 \times 25}{10 \times 10 \times 10}$$

$$= \frac{15625}{1000} = 15.625$$

Solution: (v) 0.12

$$0.12 = (0.12)^3 = \left(\frac{12}{100}\right)^3 = \frac{12 \times 12 \times 12}{100 \times 100 \times 100}$$

$$= \frac{1728}{1000000} = 0.001728$$

Solution: (vi) 0.02

$$0.02 = (0.02)^3 = \left(\frac{2}{100}\right)^3 = \frac{2 \times 2 \times 2}{100 \times 100 \times 100}$$

$$= \frac{8}{1000000} = 0.000008$$

Solution: (vii) 0.8

$$0.8 = (0.8)^3 = \left(\frac{8}{10}\right)^3 = \frac{8 \times 8 \times 8}{10 \times 10 \times 10} = \frac{512}{1000} = 0.512$$

Question 4

Find the cubes of:

(i) $\frac{3}{7}$

(ii) $\frac{8}{9}$

(iii) $\frac{10}{13}$

(iv) $1\frac{2}{7}$

(v) $2\frac{1}{2}$

Solution: (i) $\frac{3}{7}$

$$\left(\frac{3}{7}\right)^3 = \left(\frac{3}{7}\right)^3 = \frac{3 \times 3 \times 3}{7 \times 7 \times 7} = \frac{27}{343}$$

Solution: (ii) $\frac{8}{9}$

$$\frac{8}{9} = \left(\frac{8}{9}\right)^3 = \frac{8 \times 8 \times 8}{9 \times 9 \times 9} = \frac{512}{729}$$

Solution: (iii) $\frac{10}{13}$

$$\frac{10}{13} = \left(\frac{10}{13}\right)^3 = \frac{10 \times 10 \times 10}{13 \times 13 \times 13} = \frac{1000}{2197}$$

Solution: (iv) $1\frac{2}{7}$

$$\begin{aligned} \text{(iv)} 1\frac{2}{7} &= \left(1\frac{2}{7}\right)^3 = \left(\frac{1 \times 7 + 2}{7}\right)^3 = \left(\frac{9}{7}\right)^3 \\ &= \frac{9 \times 9 \times 9}{7 \times 7 \times 7} = \frac{729}{343} = 2\frac{48}{343} \end{aligned}$$

Solution: (v) $2\frac{1}{2}$

$$\begin{aligned} 2\frac{1}{2} &= \left(2\frac{1}{2}\right)^3 = \left(\frac{5}{2}\right)^3 \\ &= \frac{5 \times 5 \times 5}{2 \times 2 \times 2} = \frac{125}{8} = 15\frac{5}{8} \end{aligned}$$

Question 5.

Find the cubes of:

(i) -3

(ii) -7

(iii) -12

(iv) -18

(v) -25

(vi) -30

(vii) -50

Solution: (i) -3

$$\begin{aligned}(i) -3 &= (-3)^3 = -3 \times -3 \times -3 \\ &= -(3 \times 3 \times 3) = -27\end{aligned}$$

Solution: (ii) -7

$$\begin{aligned}-7 &= (-7)^3 = -7 \times -7 \times -7 \\ &= -(7 \times 7 \times 7) = -343\end{aligned}$$

Solution: (iii) -12

$$\begin{aligned}-12 &= (-12)^3 = -12 \times -12 \times -12 \\ &= -(12 \times 12 \times 12) = -1728\end{aligned}$$

Solution: (iv) -18

$$\begin{aligned}-18 &= (-18)^3 = -18 \times -18 \times -18 \\ &= -(18 \times 18 \times 18) = -5832\end{aligned}$$

Solution: (v) -25

$$\begin{aligned}-25 &= (-25)^3 = -25 \times -25 \times -25 \\ &= -(25 \times 25 \times 25) = -15625\end{aligned}$$

Solution: (vi) -30

$$\begin{aligned}-30 &= (-30)^3 = -30 \times -30 \times -30 \\ &= -(30 \times 30 \times 30) = -27000\end{aligned}$$

Solution: (vii) -50

$$\begin{aligned}-50 &= (-50)^3 = -50 \times -50 \times -50 \\ &= -(50 \times 50 \times 50) = -125000\end{aligned}$$

Question 6.

Chapter 4 – Cubes and Cube-Roots (Including use of tables for natural numbers)

Which of the following are cubes of?

- (i) an even number
- (ii) an odd number

216, 729, 3375, 8000, 125, 343, 4096 and 9261

Solution:

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

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

$$= (2)^3 \times (3)^3 = (6)^3$$

$$729 = 3 \times 3 \times 3 \times 3 \times 3 \times 3$$

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

$$= (3)^3 \times (3)^3 = (9)^3$$

$$3375 = 5 \times 5 \times 5 \times 3 \times 3 \times 3$$

5	3375
5	675
5	135
3	27
3	9
3	3
	1

$$= (5)^3 \times (3)^3 = (15)^3$$

$$8000 = 20 \times 20 \times 20 = (20)^3$$

Chapter 4 – Cubes and Cube-Roots (Including use of tables for natural numbers)

20		8000
20		400
20		20
		1

$$125 = 5 \times 5 \times 5 = (5)^3$$

5		125
5		25
5		5
		1

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

7		343
7		49
7		7
		1

$$4096 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$$

2		4096
2		2048
2		1024
2		512
2		256
2		128
2		64
2		32
2		16
2		8
2		4
2		2
		1

$$= (2)^3 \times (2)^3 \times (2)^3 \times (2)^3 = (16)^3$$

- (i) Cubes of an even number are 216, 8000, 4096.
- (ii) Cubes of an odd number are 729, 3375, 125, 343, 9261

Question 7.

Find the least number by which 1323 must be multiplied so that the product is a perfect cube.

Solution:

Chapter 4 – Cubes and Cube-Roots (Including use of tables for natural numbers)

The prime factor of 1323 are

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

$$= (3 \times 3 \times 3) \times 7 \times 7$$

Clearly, 1323 must be multiplied by 7.

Question 8.

Find the smallest number by which 8768 must be divided so that the quotient is a perfect cube.

Solution:

The prime factor of 8768 are

2	8768
2	4384
2	2192
2	1096
2	548
2	274
137	137
	1

$$= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 137$$

$$= (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times 137$$

Clearly, 8768 must be divided by 137

Question 9.

Find the smallest number by which 27783 be multiplied to get a perfect square number.

Solution:

3	27783
3	9261
3	3087
3	1029
7	343
7	49
7	7
	1

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

Chapter 4 – Cubes and Cube-Roots (Including use of tables for natural numbers)

$$= (3 \times 3 \times 3) \times (7 \times 7 \times 7) \times 3$$

Clearly, 27783 must be multiplied by

$$3 \times 3 = 9$$

Question 10.

With what least number must 8640 be divided so that the quotient is a perfect cube?

Solution:

The prime factors of 8640 are

2	8460
2	4320
2	2160
2	540
2	270
3	135
3	45
3	15
5	5
	1

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

$$= (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times (3 \times 3 \times 3) \times 5$$

Clearly, 8640 must be divided by 5.

Question 11.

Which is the smallest number that must be multiplied to 77175 to make it a perfect cube?

Solution:

The prime factors of 77175 are

3	77175
3	25725
5	8575
5	1715
7	343
7	49
7	7

$$\begin{aligned} & | 1 \\ & = 3 \times 3 \times 5 \times 5 \times 7 \times 7 \times 7 \\ & = (7 \times 7 \times 7) \times 3 \times 3 \times 5 \times 5 \end{aligned}$$

Clearly, 77175 must be multiplied by $3 \times 5 = 15$

EXERCISE 4(B)

Question 1.

Find the cube-roots of:

(i) 64

(ii) 343

(iii) 729

(iv) 1728

(v) 9261

(vi) 4096

(vii) 8000

(viii) 3375

Solution: (i) 64

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

$$64 = \sqrt[3]{64} = (2 \times 2 \times 2) \times (2 \times 2 \times 2)$$

$$= 2 \times 2 = 4$$

Solution: (ii) 343

Chapter 4 – Cubes and Cube-Roots (Including use of tables for natural numbers)

7	343
7	49
7	7
	1

$$\sqrt[3]{343} = 7 \times 7 \times 7 = 7$$

Solution: (iii) 729

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

$$729 = \sqrt[3]{729} = (3 \times 3 \times 3) \times (3 \times 3 \times 3)$$

$$= 3 \times 3 = 9$$

Solution: (iv) 1728

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

$$1728 = \sqrt[3]{1728} = (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times (3 \times 3 \times 3)$$

$$= 2 \times 2 \times 3 = 12$$

Solution: (v) 9261

3	9261
3	3087
3	1029
7	343
7	49
7	7
	1

$$9261 = \sqrt[3]{9261} = (3 \times 3 \times 3) \times (7 \times 7 \times 7)$$

$$= 3 \times 7 = 21$$

Solution: (vi) 4096

2	4096
2	2048
2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

$$4096 = \sqrt[4]{4096} = (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times (2 \times 2 \times 2)$$

$$= 2 \times 2 \times 2 \times 2 = 16$$

Solution: (vii) 8000

4	8000
4	2000
4	500
5	125
5	25
5	5
	1

$$8000 = \sqrt[4]{8000} = (4 \times 4 \times 4) \times (5 \times 5 \times 5)$$

$$= 4 \times 5 = 20$$

Solution: (viii) 3375

5	3375
5	675
5	135
3	27
3	9
3	3
	1

$$3375 = \sqrt[3]{3375} = (5 \times 5 \times 5) \times (3 \times 3 \times 3)$$

$$= 5 \times 3 = 15$$

Question 2:

Find the cube-roots of:

(i) $\frac{27}{64}$

(ii) $\frac{125}{216}$

(iii) $\frac{343}{512}$

(iv) 64×729

(v) 64×27

(vi) 729×8000

(vii) 3375×512

Solution: (i) $\frac{27}{64}$

$$\frac{27}{64} = \sqrt[3]{\frac{27}{64}} = \frac{\sqrt{3 \times 3 \times 3}}{\sqrt{4 \times 4 \times 4}} = \frac{3}{4}$$

Solution: (ii) $\frac{125}{216}$

$$\frac{125}{216} = \sqrt[3]{\frac{125}{216}} = \frac{\sqrt{5 \times 5 \times 5}}{\sqrt{6 \times 6 \times 6}} = \frac{5}{6}$$

Solution: (iii) $\frac{343}{512}$

$$\frac{343}{512} = \sqrt[3]{\frac{343}{512}} = \frac{\sqrt{7 \times 7 \times 7}}{\sqrt{8 \times 8 \times 8}} = \frac{7}{8}$$

Solution: (iv) 64×729

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

$$= \sqrt{4 \times 4 \times 4 \times 9 \times 9 \times 9} = 4 \times 9 = 36$$

Solution: (v) 64×27

$$64 \times 27 = \sqrt[3]{64 \times 27}$$

$$= \sqrt{4 \times 4 \times 4 \times 3 \times 3 \times 3} = 4 \times 3 = 12$$

Solution: (vi) 729×8000

$$\begin{aligned} 729 \times 8000 &= \sqrt[3]{729 \times 8000} \\ &= \sqrt{9 \times 9 \times 9 \times 20 \times 20 \times 20} \\ &= 9 \times 20 = 180 \end{aligned}$$

Solution: (vii) 3375×512

$$\begin{aligned} 3375 \times 512 &= \sqrt[3]{3375 \times 512} \\ &= \sqrt{15 \times 15 \times 15 \times 8 \times 8 \times 8} \\ &= 15 \times 8 = 120 \end{aligned}$$

Question 3.

Find the cube-roots of:

(i) -216

(ii) -512

(iii) -1331

(iv) $\frac{-27}{125}$

(v) $\frac{-64}{343}$

(vi) $\frac{-512}{343}$

(vii) -2197

(viii) -5832

(ix) -2744000

Solution: (i) -216

$$-216 = \sqrt[3]{-216} = \sqrt{-6x - 6x - 6} = -6$$

Solution: (ii) -512

$$-512 = \sqrt[3]{-512} = \sqrt{-8x - 8x - 8} = -8$$

Solution: (iii) – 1331

$$-1331 = \sqrt[3]{-1331}$$

$$= \sqrt{-11x - 11x - 11} = -11$$

Solution: (iv) $\frac{-27}{125}$

$$\frac{-27}{125} = -\frac{\sqrt[3]{27}}{\sqrt[3]{125}} = -\frac{\sqrt{3 \times 3 \times 3}}{\sqrt{5 \times 5 \times 5}} = -\frac{3}{5}$$

Solution: (v) $\frac{-64}{343}$

$$\frac{-64}{343} = \frac{\sqrt[3]{-64}}{\sqrt[3]{343}} = \frac{\sqrt[3]{-4 \times -4 \times -4}}{\sqrt[3]{7 \times 7 \times 7}} = \frac{-4}{7}$$

Solution: (vi) $\frac{-512}{343}$

$$\frac{-512}{343} = -\frac{\sqrt[3]{512}}{\sqrt[3]{343}} = -\frac{\sqrt{8 \times 8 \times 8}}{\sqrt{7 \times 7 \times 7}} = -\frac{8}{7}$$

Solution: (vii) – 2197

$$-2197 = \sqrt[3]{-2197}$$

13	2197
13	167
13	13
	1

$$= \sqrt[3]{-13x - 13x - 13} = -13$$

Solution: (viii) – 5832

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

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

3	9
3	3
	1

$$= \sqrt{-2x - 2x - 2x - 3x - 3x - 3x - 3x - 3x - 3}$$

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

Solution: (ix) -2744000

2	2744000
2	1372000
2	68600007
7	343000
7	49000
7	7000
10	1000
10	100
	1

$$= \sqrt{-2 \times -2 \times -2 \times -7 \times -7 \times -7 \times -10 \times -10 \times -10}$$

$$= -2 \times -7 \times -10 = -140$$

Question 4.

Find the cube-roots of:

(i) 2.744

(ii) 9.261

(iii) 0.000027

(iv) -0.512

(v) -15.625

(vi) -125×1000

Solution: (i) 2.744

$$2.744 = \sqrt[3]{\frac{2744}{1000}}$$

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

$$= \sqrt[3]{\frac{2 \times 2 \times 2 \times 7 \times 7 \times 7}{10 \times 10 \times 10}}$$

$$= \frac{2 \times 7}{10} = \frac{14}{10} = 1.4$$

Solution: (ii) 9.261

$$9.261 = \sqrt[3]{\frac{9261}{1000}}$$

3	9261
3	3087
3	1029
7	343
7	49
7	7
	1

$$= \sqrt[3]{\frac{3 \times 3 \times 3 \times 7 \times 7 \times 7}{10 \times 10 \times 10}} = \frac{3 \times 7}{10} = \frac{21}{10} = 2.1$$

Solution: (iii) 0.000027

$$0.000027 = \sqrt[3]{\frac{27}{1000000}}$$

$$= \sqrt[3]{\frac{3 \times 3 \times 3}{100 \times 100 \times 100}} = \frac{3}{100} = 0.03$$

Solution: (iv) – 0.512

$$-0.512 = \sqrt[3]{\frac{-512}{1000}} = \sqrt[3]{\frac{-8 \times -8 \times -8}{10 \times 10 \times 10}}$$

$$= \frac{-8}{10} = -0.8$$

Solution: (v) – 15.625

$$-15.625 = \sqrt[3]{\frac{-15625}{1000}}$$

5	15625
3	3125
5	625
5	125
5	255
5	5
	1

$$\sqrt{\frac{-(5 \times 5 \times 5) \times (5 \times 5 \times 5)}{10 \times 10 \times 10}}$$

$$= \frac{-5 \times 5}{10} = \frac{-25}{10} = -2.5$$

Solution: (vi) – 125 × 1000

$$-125 \times 1000 = \sqrt{-125 \times 100}$$

$$= \sqrt{-(5 \times 5 \times 5) \times (10 \times 10 \times 10)}$$

$$= -5 \times 10 = -50$$

