Exercise 4.3

Q.1 Find the cube root of the following numbers by successive subtraction of numbers:

1, 7, 19, 37, 61, 91, 127, 169, 217, 271, 331, 397 - - - -

(i) 64 (ii) 512 (iii) 1728

Solution: (i) 64

$64 - 1 = 63$
$63 - 7 = 56$
$56 - 19 = 37$
$37 - 37 = 0$

$\therefore \sqrt[3]{64} = 4$

(ii) 512

$512 - 1 = 511$
$511 - 7 = 504$
$504 - 19 = 485$
$485 - 37 = 448$
$448 - 61 = 387$
$387 - 91 = 296$
$296 - 127 = 169$
$169 - 169 = 0$

$\therefore \sqrt[3]{512} = 8$

1728

$1728 - 1 = 1727$
$1727 - 7 = 1720$
$1720 - 19 = 1701$
$1701 - 37 = 1664$
$1664 - 61 = 1603$
$1603 - 91 = 1512$
$1512 - 127 = 1385$
$1385 - 169 = 1216$
$1216 - 217 = 999$
$999 - 271 = 728$
$728 - 331 = 397$
$397 - 397 = 0$

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

Q.2 Using the method of successive subtraction examine whether or not the following numbers are perfect cubes

(i) 130 (ii) 345 (iii) 792 (iv) 1331

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Sol: (i) 130, By successive subtraction

$130 - 1 = 129$

$129 - 7 = 122$

$122 - 19 = 103$

$103 - 37 = 66$

$66 - 61 = 5$

$\therefore$ next number to be subtracted is 91. which is greater than 5.

$\therefore$ 130 is not a perfect cube.

(ii) 345

By successive subtraction

$345 - 1 = 344$

$344 - 7 = 337$

$337 - 19 = 318$

$318 - 37 = 281$

$281 - 61 = 220$

$220 - 91 = 129$

$129 - 127 = 2$

$\because$ next number to be subtracted is 169, which is greater than 2.

$\therefore$ 345 is not a perfect cube.

(iii) 792

Let's by subtraction.

$792 - 1 = 791$

$791 - 7 = 784$

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784 − 19 = 765

765 − 37 = 728

728 − 61 = 667

667 − 91 = 576

576 − 127 = 449

449 − 169 = 280

280 − 217 = 63

Next number to be subtracted is 271, which is greater than 63.

∴ 792 is not a perfect cube.

(iv) 1331

By subtraction.

1331 − 1 = 1330

1330 − 7 = 1323

1323 − 19 = 1304

1304 − 37 = 1267

1267 − 61 = 1206

1206 − 91 = 1115

1115 − 127 = 988

988 − 169 = 819

819 − 217 = 602

602 − 271 = 331

331 − 331 = 0

∴ 1331 is a perfect cube.

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Q.3 Find the smallest number that must be subtract from these of the numbers in Q.2 which are not perfect cubes, to make them perfect cubes. what are the corresponding cube roots?

Solution: (i) 130

By Performing subtraction

$130 - 1 = 129$

$129 - 7 = 122$

$122 - 19 = 103$

$103 - 37 = 66$

$66 - 61 = 5$

$\because$ next no. to be subtracted is 91, which is greater than 5

Therefore 5 must be subtracted.

$\therefore$ required perfect cube no. $= 130 - 5 = 125$

also $\sqrt[3]{125} = 5$.

(ii) 345

By Performing subtraction.

$345 - 1 = 344$

$344 - 7 = 337$

$337 - 19 = 318$

$318 - 37 = 281$

$281 - 61 = 220$

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$220 - 91 = 129$

$129 - 127 = 2$

Next no. to be subtracted is 169, which is greater than 2.

$\therefore$ 2 must be subtracted.

Hence required no. $= 345 - 2 = 343$

also $\sqrt[3]{343} = 7$.

(iii) <u>792</u>

By performing subtraction.

$792 - 1 = 791$

$791 - 7 = 784$

$784 - 19 = 765$

$765 - 37 = 728$

$728 - 61 = 667$

$667 - 91 = 576$

$576 - 127 = 449$

$449 - 169 = 280$

$280 - 217 = 63$

next no. to be subtracted is 271. which is greater than 63.

$\therefore$ 63 must be subtracted.

required no $= 792 - 63 = 729$

$\therefore \sqrt[3]{729} = 9$

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Q.4 Find the cube root of the following natural numbers.

(i) 343 (ii) 2744 (iii) 4913 (iv) 1728

(v) 35937 (vi) 17576 (vii) 13421772 8

(viii) 48228544 (ix) 74088000 (x) 157464

(xi) 1157625 (xii) 33698267

Sol: (i) $\sqrt[3]{343} = \sqrt[3]{7\times7\times7} = 7$

(ii) 2744

By Prime factorisation

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

$\sqrt[3]{2744} = \sqrt[3]{2\times2\times2\times7\times7\times7}$

$= 2\times7$

$= 14$

(iii) 4913

By Prime factorisation

17	4913
17	289
17	17
	1

$\sqrt[3]{4913} = \sqrt[3]{17\times17\times17} = 17$

(iv) 1728

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

$\sqrt[3]{1728} = \sqrt[3]{2\times2\times2\times2\times2\times2\times3\times3\times3}$

$= 2\times2\times3$

$= 12$

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(v) 35937

$\because \sqrt[3]{35937} = \sqrt[3]{3\times3\times3\times11\times11\times11}$

$= 3\times11$

$= 33$

3	35937
3	11979
3	3993
11	1331
11	121
11	11
	1

(vi) 17576

$\because \sqrt[3]{17576} = \sqrt[3]{2\times2\times2\times13\times13\times13}$

$= 2\times13$

$= 26$

2	17576
2	8788
2	4394
13	2197
13	169
13	13
	1

(vii) 134217728

By using Prime factorisation.

$\sqrt[3]{134217728} = \sqrt[3]{2^{27}} = 2^9 = 512$

(viii) $\sqrt[3]{18228544} = \sqrt[3]{2\times2\times2\times2\times2\times2\times7\times7\times7\times13\times13\times13}$

$= 2\times2\times7\times13 = 364$

(ix) $\sqrt[3]{74088000} = \sqrt[3]{2^3\times2^3\times3^3\times5^3\times7^3} = 2\times2\times3\times5\times7$

$= 420$

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(xi) $\sqrt[3]{1157625} = \sqrt[3]{3\times3\times3\times5\times5\times5\times7\times7\times7}$

$= 3\times5\times7 = 105$

(x) $\sqrt[3]{157464} = \sqrt[3]{2\times2\times2\times3\times3\times3\times3\times3\times3\times3\times3\times3}$

$= 2\times3\times3\times3 = 54$

(xii) $\sqrt[3]{33698267} = \sqrt[3]{17\times17\times17\times19\times19\times19}$

$= 17\times19 = 323$

Q.5 Find the smallest number which when multiplied with 3600 will make the product a perfect cube. Further, find the cube root of the product.

Sol: Prime factorisation of 3600

2	3600
2	1800
2	900
2	450
5	225
5	45
3	9
3	3
	1

$\because 3600 = 2\times2\times2\times2\times5\times5\times3\times3$

$= 2^3\times2^1\times5^2\times3^2$

$\therefore$ To make it perfect cube we need to multiply it by

$= 2\times2\times5\times3$

$= 60$

$\therefore 3600\times60 = 2^3\times2^3\times5^3\times3^3$

$= \sqrt[3]{216000} = 2\times2\times5\times3$

$= 60$

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Q.6 Multiply 210125 by the smallest number so that the product is a perfect cube. Also find out the cube root of the product.

Sol:

5	210125
5	42025
5	8405
41	1681
41	41
	1

$\therefore \quad 210125 = 5^3 \times 41^2$

hence the smallest number by which it should be multiply is 41.

$$\sqrt[3]{21025 \times 41} = 5 \times 41$$
$$= 205$$

Q.7 What is the smallest number by which 8192 must be divided so that the quotient is a perfect cube.? Also, find the cube root of the quotient so obtained.

Sol: $\because \quad 8192 = 2^3 \times 2^3 \times 2^3 \times 2^3 \times 2^1$

hence it should be divided by 2 to obtain a perfect cube.

$\therefore \quad \frac{8192}{2} = 2^3 \times 2^3 \times 2^3 \times 2^3$

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$\Rightarrow 4096 = 2^3 \times 2^3 \times 2^3 \times 2^3$

$\therefore \sqrt[3]{4096} = 2 \times 2 \times 2 \times 2$
$= 16.$

Q8 Three numbers are in the ratio 1:2:3. The sum of their cubes is 98784. Find the numbers.

Sol: Let numbers be $x, 2x, 3x$

$$x^3 + (2x)^3 + (3x)^3 = 98784$$

$$\Rightarrow x^3 + 8x^3 + 27x^3 = 98784$$

$$\Rightarrow 36x^3 = 98784$$

$$\Rightarrow x^3 = \frac{98784}{36} = 2744 = (14)^3$$

$$\Rightarrow x = 14$$

Therefore required numbers are

$x = 14$, $2x = 2 \times 14 = 28$, $3x = 3 \times 14$
$= 42$

Q9 The volume of a cube is 9261000 m^3. Find the side of the cube.

Solution: Volume of cube $= 9261000$

$$\Rightarrow (\text{side})^3 = 9261000$$

$$\Rightarrow \text{side} = \sqrt[3]{9261000} = 210\ m$$

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