Ch-4

11/6/21

Cubes and Cube Roots

4 (A)

1. Find the cube of :-

i. $7 = 7^3$
$= 7 \times 7 \times 7 = 343$

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

iii. $16 = 16^3$
$= 16 \times 16 \times 16 = 4096$

iv. $23 = 23^3$
$= 23 \times 23 \times 23$
$= 12167$

v. $31 = 31^3$
$= 31 \times 31 \times 31 = 29791$

vi. $42 = 42^3$
$= 42 \times 42 \times 42$
$= 74088$

vii. $54 = 54^3$
$= 54 \times 54 \times 54 = 157464$

2. Find which of the following are perfect cubes?

Solution,

(iii ; 1331 and v ; 1728) are perfect cubes.

3. Find the cubes of :-

i. $2.1 = (2.1)^3$
$= 2.1 \times 2.1 \times 2.1 = 9.261$ (Ans)

(ii) $0.4 = (0.4)^3$
$= 0.4 \times 0.4 \times 0.4$
$= 0.064$ (Ans)

iii. $1.6 = (1.6)^3$
$= 1.6 \times 1.6 \times 1.6$
$= 4.096$ (Ans)

iv. $2.5 = (2.5)^3$
$= 2.5 \times 2.5 \times 2.5 = 15.625$

v. $0.12 = (0.12)^3$
$= 0.12 \times 0.12 \times 0.12$
$= 0.001728$ Ans

vi. $0.02 = (0.02)^3$
$= 0.02 \times 0.02 \times 0.02$
$= 0.000008$ Ans

vii. $0.8 = (0.8)^3$
$= 0.8 \times 0.8 \times 0.8 =$ [illegible] 0.512 Ans

4. Find the cubes of :-

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

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

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

iv. $1\frac{2}{7} = \left(\frac{9}{7}\right)^3 = \frac{9}{7} \times \frac{9}{7} \times \frac{9}{7} = \frac{729}{343} = 2\frac{43}{343}$ Ans

v. $2\frac{1}{2} = \left(\frac{5}{2}\right)^3 = \frac{5}{2} \times \frac{5}{2} \times \frac{5}{2} = \frac{125}{8} = 15\frac{5}{8}$ Ans

5. Find the cubes of :-

i. $(-3) = (-3)^3 = (-3) \times (-3) \times (-3) = (-27)$ Ans

ii. $(-7) = (-7)^3 = (-7) \times (-7) \times (-7) = (-343)$ Ans

iii. $(-12) = (-12)^3 = (-12) \times (-12) \times (-12) = (-1728)$ Ans

iv. $(-18) = (-18)^3 = (-18) \times (-18) \times (-18) = (-5832)$ (Ans).

v. $(-25) = (-25)^3 = (-25) \times (-25) \times (-25) = (-15625)$ (Ans)

6. Which of the following are cubes of :-

i. an even number = 216, 8000, 4096

ii. an odd number = 729, 3375, 125, 343, 9261

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

Solution :

Prime factorization of $1323 = \sqrt{(3 \times 3 \times 3) \times 7 \times 7}$

3 | 1323
3 | 441
7 | 147
7 | 21
3 | 3
1

∴ 7 must be multiplied so that the product is a perfect cube.

8. Find the smallest number by which 8768 be multiplied so that the quotient is a perfect cube?

Solution,

Prime factors of $8768 = \sqrt[3]{(2\times2\times2)\times(2\times2\times2)\times137}$

$\therefore$ 137 must be divided so that the resulting quotient is a perfect cube

Thus, 137 (Ans).

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

9. Find the smallest number by which 27783 be multiplied to get a perfect cube number?

Solution,

Prime factors of $27783 = \sqrt[3]{(3\times3\times3)\times3\times(7\times7\times7)}$

$\therefore$ 27783 must be multiplied by $3\times3 = 9$ (Ans).

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

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

Solution,

Prime factors of $8640 = \sqrt[3]{(2\times2\times2)\times(2\times2\times2)\times(3\times3\times3)\times5}$

$\therefore$ 8640 must be divided by 5. (Ans).

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

Solution,

Prime factors of $77175 = \sqrt{(7\times7\times7)\times3\times3\times5\times5}$

$\therefore$ 77175 must be multiplied by 3×5

$= 15$ (Ans).

4(B)

1. Find the cube-roots of :-

i. $64 = \sqrt[3]{64} = \sqrt{(2\times2\times2)\times(2\times2\times2)}$

$= 2\times2$

$= 4$ (Ans)

2	64
2	32
2	16
2	8
2	4
	2

ii. $343 = \sqrt[3]{343} = \sqrt{(7\times7\times7)}$

$= 7$ (Ans)

7	343
7	49
	7

iii. $729 = \sqrt[3]{729} = \sqrt{(3\times3\times3)\times(3\times3\times3)}$

$= 3\times3$

$= 9$ (Ans)

3	729
3	243
3	81
3	27
3	9
	3

iv. $1728 = \sqrt[3]{1728} = \sqrt{(2\times2\times2)\times2\times2\times3\times3}$

$= 2\times2\times3$

$= 12$ (Ans)

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

v. $9261 = \sqrt[3]{9261} = \sqrt[3]{(3\times3\times3)\times(7\times7\times7)}$

$= 3\times7$

$= 21$ Ans

3 | 9261
3 | 3087
3 | 1029
7 | 343
7 | 49
7

vi. $4096 = \sqrt[3]{4096} = \sqrt[3]{(2\times2\times2)\times(2\times2\times2)\times(2\times2\times2)\times(2\times2\times2)}$

$= 2\times2\times2\times2$

$= 16$ Ans

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

vii. $8000 = \sqrt[3]{8000} = \sqrt[3]{(2\times2\times2)\times(2\times2\times2)\times(5\times5\times5)}$

$= 2\times2\times5$

$= 20$ Ans

2 | 8000
2 | 4000
2 | 2000
2 | 1000
2 | 500
2 | 250
5 | 125
5 | 25
5

viii. $3375 = \sqrt[3]{3375} = \sqrt[3]{(5\times5\times5)\times(3\times3\times3)}$

$= 5\times3$

$= 15$ Ans

3 | 3375
3 | 1125
3 | 375
5 | 125
5 | 25
5

Q 3. Find the cube-roots of :-

i. $\frac{27}{64} = \frac{\sqrt[3]{(3\times3\times3)}}{\sqrt[3]{(2\times2\times2)\times(2\times2\times2)}} = \frac{3}{2\times2} = \frac{3}{4}$ Ans

3 | 27
3 | 9
3

2 | 64
2 | 32
2 | 16
2 | 8
2 | 4
2

ii. $\frac{125}{216} = \frac{\sqrt[3]{(5\times5\times5)}}{\sqrt[3]{2\times2\times3\times3\times3}} = \frac{5}{2\times3} = \frac{5}{6}$ Ans

5 | 125
5 | 25
5

2 | 216
2 | 108
2 | 54
3 | 27
3 | 9
3

iii. $\frac{343}{512} = \frac{\sqrt[3]{(7\times7\times7)}}{\sqrt[3]{(2\times2\times2)\times(2\times2\times2)\times(2\times2\times2)}} = \frac{7}{2\times2\times2} = \frac{7}{8}$ Ans

7 | 343
7 | 49
7

2 | 512
2 | 256
2 | 128
2 | 64
2 | 32
2 | 16
2 | 8
2 | 4
2

iv. $64\times729 = \sqrt[3]{(2\times2\times2)\times(2\times2\times2)\times(3\times3\times3)\times(3\times3\times3)}$

$= 2\times2\times3\times3$

$= 36$ Ans

2 | 64
2 | 32
2 | 16
2 | 8
2 | 4
2

3 | 729
3 | 243
3 | 81
3 | 27
3 | 9
3

vi. $729 \times 8000 = \sqrt[3]{5,832000} = \sqrt{(2\times2\times2)\times(2\times2\times2)\times(3\times3\times3)\times(3\times3\times3)\times(5\times5\times5)}$

$= 2\times2\times3\times3\times5$

$= 180$ Ans)

vii. $9375 \times 512 = \sqrt[3]{1728000} = \sqrt{(2\times2\times2)\times(2\times2\times2)\times(2\times2\times2)\times(3\times3\times3)\times(5\times5\times5)}$

$= 2\times2\times2\times3\times5$

$= 120$ Ans)

2. Find the cube-root of :-

i. $(-216) = \sqrt[3]{-216} = \sqrt{-(2\times2\times2)\times(3\times3\times3)} = -2\times3 = (-6)$ Ans).

ii. $-512 = \sqrt[3]{-512} = \sqrt{-(2\times2\times2)\times(2\times2\times2)\times(2\times2\times2)} = -(2\times2\times2) = (-8)$ Ans

iii. $-1331 = \sqrt[3]{-1331} = \sqrt{-(11\times11\times11)} = -11$ Ans)

iv. $-\frac{27}{125} = \sqrt{\frac{-(3\times3\times3)}{(5\times5\times5)}} = -\frac{3}{5}$ Ans).

v. $\frac{-64}{343} = \sqrt{\frac{-(2\times2\times2)\times(2\times2\times2)}{(7\times7\times7)}} = -\frac{2\times2}{7} = \frac{-4}{7}$ Ans).

vi. $-\frac{512}{343} = \sqrt{\frac{(2\times2\times2)\times(2\times2\times2)\times(2\times2\times2)}{(7\times7\times7)}} = -\frac{2\times2\times2}{7} = -\frac{8}{7}$ Ans).

vii. $-2197 = \sqrt{-(13\times13\times13)} = -13$ Ans)

viii. $-5832 = \sqrt{-(2\times2\times2)\times(3\times3\times3)\times(3\times3\times3)} = \sqrt{-2\times3\times3} = -18$ Ans

ix. $-2744000 = \sqrt{(2\times2\times2)\times(2\times2\times2)\times(7\times7\times7)\times(5\times5\times5)}$

$= -2\times2\times7\times5 = -140$ Ans)

4. Find the cube-roots of :-

i. $\sqrt[3]{2.744} = 1.4$ (Ans)

ii. $\sqrt[3]{9.261} = \sqrt[3]{(3\times3\times3)\times(7\times7\times7)}$
$= 3\times7 = 2.1$ (Ans).

iii. $\sqrt[3]{0.000027} = \sqrt[3]{0.03}$ (Ans)

iv. $\sqrt[3]{-0.512} = -0.8$ (Ans)

v. $\sqrt[3]{-15.625} = 2.5$ (Ans).

vi. $\sqrt[3]{-125\times1000} = \sqrt{-125000} = \sqrt[3]{(2\times2\times2)\times(5\times5\times5)}$
$= -2\times5\times5$
$= -50$

5. Find the smallest number by which 26244 should be divided so that the quotient is a perfect cube.

Solution)

Prime factor of $26244 = 2\times2\times(3\times3\times3)\times(3\times3\times3)\times3\times3$
$= 2\times2\times3\times3$
$= 36$ (Ans)

∴ 36 must be divided to get a perfect cube.

6. What is the least number by which 30375 should be multiplied to get a perfect cube?

Solution,

Prime factor of $90975 = (3\times5\times5)\times(3\times3\times3)\times3\times3$

$\therefore$ 3 should be multiplied to get a perfect cube. (Ans)

7. Find the cube-roots of :-

i. $700\times1\times49\times5$

$= \sqrt[3]{343000} = (2\times2\times2)\times(5\times5\times5)\times(7\times7\times7)$

$= 2\times5\times7$

$= 70$ (Ans)

2 | 343000
2 | 171500
2 | 85750
5 | 42875
5 | 8575
5 | 1715
7 | 343
7 | 49
7

ii. -216×1728

$= \sqrt[3]{-373,248} = \sqrt[3]{(2\times2\times2)\times(2\times2\times2)\times(2\times2\times2)\times(3\times3\times3)\times(3\times3\times3)}$

$= -2\times2\times2\times3\times3$

$= -72$ (Ans)

2 | 373248
2 | 186624
2 | 93312
2 | 46656
2 | 23328
2 | 11664
2 | 5832
2 | 2916
2 | 1458
3 | 729
3 | 243
3 | 81
3 | 27
3 | 9
3

iii. -64×-125

$= \sqrt[3]{8000} = (2\times2\times2)\times(2\times2\times2)\times(5\times5\times5)$

$= 2\times2\times5$

$= 20$ (Ans)

iv. $-\frac{27}{343} = -\frac{(3\times3\times3)}{(7\times7\times7)} = -\frac{3}{7}$ (Ans)

v. $\frac{729}{-1331} = -\frac{(3\times3\times3)\times(3\times3\times3)}{(11\times11\times11)} = -\frac{3\times3}{11} = -\frac{9}{11}$ (Ans)

vi. 250.047

$= \sqrt[3]{250047} = \sqrt[3]{(3\times3\times3)(3\times3\times3)(7\times7\times7)}$

$= 3 \times 3 \times 7$

$= 6.3$ (Ans).

3	250047
3	83349
3	27783
7	9261
7	1323
7	189
3	27
3	9
	3

vii. $-175616 = \sqrt[3]{-175616}$

$= \sqrt[3]{(2\times2\times2)(2\times2\times2)(2\times2\times2)(7\times7\times7)}$

$= -(2\times2\times2\times7)$

$= -56$ (Ans).

2	175616
2	87808
2	43904
2	21952
2	10976
2	5488
2	2744
2	1372
2	686
7	343
7	49
7	7
	1

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