Cubes and Cube Roots: Exercise 7.1

Q.1 Which of the following numbers are not perfect cubes?
(i) 216 (ii) 128 (iii) 1000 (iv) 100 (v) 46656

Sol. **(i)** Firstly, we need to find out prime factors of 216:

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

So, prime factors of 216 = 2 x 2 x 2 x 3 x 3 x 3
Since in prime factors, each prime factor is appearing in triplet form.
Thus, 216 is a perfect cube.

(ii) Firstly, we need to find out prime factors of 128:

2|128
2|64
2|32
2|16
2|8
2|4
2|2
|1

So, prime factors of 128 = 2 x 2 x 2 x 2 x 2 x 2 x 2
Since in prime factors, each prime factor is not appearing in triplet form.
Thus, 128 is not a perfect cube.

(iii) Firstly, we need to find out prime factors of 1000

2|1000
2|500
2|250
5|125
5|25
5|5
|1

So, prime factors of 1000 = 2 x 2 x 2 x 5 x 5 x 5
Since in prime factors, each prime factor is appearing in triplet form.
Thus, 1000 is a perfect cube.

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(iv) Firstly, we need to find out prime factors of 100:

2|100
2|50
5|25
5|5
|1

So, prime factors of 1000 = 2 x 2 x 5 x 5
Since in prime factors, each prime factor is not appearing in triplet form.
Thus, 100 is not a perfect cube.

(v) Firstly, we need to find out prime factors of 46656:

2|46656
2|23328
2|11664
2|5832
2|2916
2|1458
3|729
3|243
3|81
3|27
3|9
3|3
|1

So, prime factors of 46656 = 2 x 2 x 2 x 2 x 2 x 2 x 3 x 3 x 3 x 3 x 3 x 3
Since in prime factors, each prime factor is appearing in triplet form.
Thus, 46656 is a perfect cube.

Q.2 Find the smallest number by which each of the following numbers must be multiplied to obtain a perfect cube.
(i) 243 (ii) 256 (iii) 72 (iv) 6750 (v) 100
Sol. **(i)** Firstly, we need to find out prime factors of 243:

3|243
3|81
3|27
3|9
3|3
|1

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So, prime factors of 243 = 3 x 3 x 3 x 3 x 3
In prime factors, '3' is not in triplet form. So, we need one more '3' to be multiplied so that 243 becomes a cube number.
So, 243 x 3 = 3 x 3 x 3 x 3 x 3 x 3
= 729
Which is a perfect cube.
Thus, the 3 is smallest number by which 243 should be multiplied to obtain a perfect cube.

(ii) Firstly, we need to find out prime factors of 256:

2|256
2|128
2|64
2|32
2|16
2|8
2|4
2|2
|1

So, prime factors of 256 = 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2
In prime factors, '2' is not in triplet form. So, we need one more '2' to be multiplied so that 256 becomes a cube number.
So, 256 x 2 = 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2 = 512 is a perfect cube.
Thus, the smallest number is 2 by which 256 should be multiplied to obtain a perfect cube.

(iii) Firstly, we need to find out prime factors of 72:

2|72
2|36
2|18
3|9
3|3
|1

So, prime factors of 72 = 2 x 2 x 2 x 3 x 3
In prime factors, '3' is not in triplet form. So, we need one more '3' to be multiplied so that 72 becomes a cube number.
So, 72 x 3 = 2 x 2 x 2 x 3 x 3 x 3
= 216 is a perfect cube.
Thus, the smallest number is 3 by which 72 must be multiplied to obtain a perfect cube.

(iv) Firstly, we need to find out prime factors of 675:

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3|675
3|225
3|75
5|25
5|5
|1

So, prime factors of 675 = 3 x 3 x 3 x 5 x 5
In prime factors, '5' is not in triplet form. So, we need one more '5' to be multiplied so that 675 becomes a cube number.
So, 675 x 5 = 3 x 3 x 3 x 5 x 5 x 5
= 3375 is a perfect cube.
Thus, the smallest number is 5 by which 675 must be multiplied to obtain a perfect cube.

(v) Firstly, we need to find out prime factors of 100:

2|100
2|50
5|25
5|5
|1

So, prime factors of 100 = 2 x 2 x 5 x 5
In prime factors, '2 and 5' is not in triplet form. So, we need one more '2 and 5' to be multiplied so that 100 becomes a cube number.
So, 100 x 2 x 5 = 2 x 2 x 2 x 5 x 5 x 5
= 1000 is a perfect cube.
Thus, the smallest number is 2x5 = 10 by which 100 must be multiplied to obtain a perfect cube.

Q.3 Find the smallest number by which each of the following numbers must be divided to obtain a perfect cube.
(i) 81 (ii) 128 (iii) 135 (iv) 192 (v) 704
Sol. **(i)** Firstly, we need to find out prime factors of 81:

3|81
3|27
3|9
3|3
|1

So, prime factors of 81 = 3 x 3 x 3 x 3
In prime factors, '3' is not in triplet form. So, we need to reduce one '3' by dividing so that 81 becomes a cube number.
So, 81 ÷ 3 = 3 x 3 x 3
= 27 is a perfect cube.
Thus, the smallest number is 3 by which 81 should be divided to obtain a perfect cube.

(ii) Firstly, we need to find out prime factors of 128:

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2|128
2|64
2|32
2|16
2|8
2|4
2|2
|1

So, prime factors of 128 = 2 x 2 x 2 x 2 x 2 x 2 x 2
In prime factors, '2' is not in triplet form. So, we need to reduce one '2' by dividing so that 128 becomes a cube number.
So, 128 ÷ 2 = 2 x 2 x 2 x 2 x 2 x 2
= 64 is a perfect cube
Thus, the smallest number is 2 by which 128 must be divided to obtain a perfect cube.

(iii) Firstly, we need to find out prime factors of 135:

3|135
3|45
3|15
5|5
|1

So, prime factors of 135 = 3 x 3 x 3 x 5
In prime factors, '5' is not in triplet form. So, we need to reduce one '5' by dividing so that 135 becomes a cube number.
So, 135 ÷ 5 = 3 x 3 x 3
= 27 is a perfect cube.
Thus, the smallest number is 5 by which 135 must be divided to obtain a perfect cube.

(iv) Firstly, we need to find out prime factors of 192:

2|192
2|96
2|48
2|24
2|12
2|6
2|3
|1

So, prime factors of 192 = 2 x 2 x 2 x 2 x 2 x 2 x 3
In prime factors, '3' is not in triplet form. So, we need to reduce one '3' by dividing so that 192 becomes a cube number.
So, 192 ÷ 3 = 2 x 2 x 2 x 2 x 2 x 2
= 64 is a perfect cube.
Thus, the smallest number is 3 by which 192 must be divided to obtain a perfect cube.

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(v) Firstly, we need to find out prime factors of 704:

2|704
2|352
2|176
2|88
2|44
2|22
11|11
|1

So, prime factors of 704 = 2 x 2 x 2 x 2 x 2 x 2 x 11
In prime factors, '11' is not in triplet form. So, we need to reduce one '11' by dividing so that 704 becomes a cube number.
So, 704 ÷ 11 = 2 x 2 x 2 x 2 x 2 x 2
= 64 is a perfect cube.
Thus, the smallest number is 11 by which 704 must be divided to obtain a perfect cube.

Q.4 Parikshit makes a cuboid of plasticine of sides 5 cm, 2 cm, 5 cm. How many such cuboids will he need to form a cube?

Sol. Given: sides of cuboidal plasticine: 5 cm, 2 cm, 5 cm.
Since, volume of cuboid = l x b x h
= 5 cm x 2 cm x 5 cm
= (5 x 5 x 2) cm^3
Since, in given volume two 5s and one 2 are not in a triplet form.
So, multiplying is volume by 2 x 2 x 5 = 20, so that it will be a perfect cube.
Therefore, (5 x 5 x 2 x 2 x 2 x 5) = (5 x 5 x 5 x 2 x 2 x 2)
= 1000 is a perfect cube.
Thus, 20 cuboids will be required to form a cube.

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