EXERCISE 21C

1. Each face of a cube has perimeter equal to 32 cm. Find its surface area and its volume.
Solution:

Perimeter of a cube is
Perimeter = 4a where a is the length
It is given that perimeter of the face of the cube = 32 cm
4a = 32 cm
a = 32/4
a = 8 cm

Surface area of a cube with side 'a' = $6a^2$
So the surface area = $6 \times 8^2 = 6 \times 64 = 384$ cm^2

Volume of a cube with side 'a' = a^3
So the volume = $8^3 = 512$ cm^3

2. A school auditorium is 40 m long, 30 m broad and 12 m high. If each student requires 1.2 m^2 of the floor area; find the maximum number of students that can be accommodated in this auditorium. Also, find the volume of air available in the auditorium, for each student.
Solution:

It is given that
Dimensions of the auditorium = 40 m × 30 m × 12 m
Area of the floor = 40 × 30
It is given that each student requires 1.2 m^2 of the floor area
Maximum number of students = (40 × 30)/ 1.2 = 1000

Volume of the auditorium
= 40 × 30 × 12 m^3
= Volume of air available for 1000 students

Air available for each student = (40 × 30 × 12)/ 10000 = 14.4 m^3

3. The internal dimensions of a rectangular box are 12 cm × x cm × 9 cm. If the length of the longest rod that can be placed in this box is 17 cm; find x.
Solution:

We know that
Length of longest rod = Length of the diagonal of the box

$$17 = \sqrt{12^2 + x^2 + 9^2}$$

By squaring on both sides
$17^2 = 12^2 + x^2 + 9^2$
$x^2 = 17^2 - 12^2 - 9^2$

$x^2 = 289 – 144 – 81$
$x^2 = 64$
x = 8 cm

4. The internal length, breadth and height of a box are 30 cm, 24 cm and 15 cm. Find the largest number of cubes which can be placed inside this box if the edge of each cube is
(i) 3 cm
(ii) 4 cm
(iii) 5 cm
Solution:

(i) Number of cubes which can be placed along length = 30/3 = 10
Number of cubes along the breadth = 24/3 = 8
Number of cubes along the height = 15/3 = 5
So the total number of cubes placed = 10 × 8 × 5 = 400

(ii) Number of cubes which can be placed along length = 30/4 = 7.5 (Take 7)
Number of cubes along the width = 24/4 = 6
Number of cubes along the height = 15/4 = 3.75 (Take 3)
So the total number of cubes placed = 7 × 6 × 3 = 126

(iii) Number of cubes which can be placed along length = 30/5 = 6
Number of cubes along the width = 24/5 = 4.5 (Take 4)
Number of cubes along the height = 15/5 = 3
So the total number of cubes placed = 6 × 4 × 3 = 72

5. A rectangular field is 112 m long and 62 m broad. A cubical tank of edge 6 m is dug at each of the four corners of the field and the earth so removed is evenly spread on the remaining field. Find the rise in level.
Solution:

It is given that
Volume of the tank = Volume of the earth spread
$4 \times 6^3\ m^3 = (112 \times 62 - 4 \times 6^2)\ m^2 \times$ Rise in level
We know that

$$Rise\ in\ level = \frac{4 \times 6^3}{112 \times 62 - 4 \times 6^2}$$

$$= \frac{864}{6800}$$

= 0.127 m
= 12.7 cm