## **QUESTION BASED ON CUBE**

## What is Cube?

A cube is three dimensional figure whose length, breath and height are equal and any two adjacent faces are inclined to each other at 90°. It has 6 faces, 8 corners and 12 edges.



- Corners of the cube are A, B, C, D, E, F, G and H.
- Edges of the cube are AB, BE, EF, AF, AD, CD, BC, EH, CH, GH, DG and FG.
- Faces of the cube are ABCD, EFGH, CDGH, BCHE, ABEF and ADFG.
- When a cube is painted on all of its faces with any color and further divided into various smaller cubes of equal size, we get following results.
- Smaller cubes with no face painted will present inside faces of the undivided cube.
- Smaller cubes with one face painted will present on the faces of the undivided cube.
- Smaller cubes with two faces painted will present on the edges of undivided cube.
- Smaller cubes with three faces painted will present on the corners of the undivided cube.



The above figure may be analyzed by dividing it into three horizontal layers:

**Layer I or top layer:** The central cube has only one face colored, four cubes at the corner have three faces coloured and the remaining 4 cubes have two faces colored.



**Layer II or middle layer:** The central cube has no face coloured, the four cubes at the corner have two faces coloured and the remaining 4 cubes have only face coloured.



Layer III or bottom layer: The central cubes has only one face coloured, four cubes at the corner have three faces coloured and the remaining 4 cubes have two faces coloured.



Also, if n, = no. of divisions on the faces of cube

Then,

(i) Number of smaller cubes with no face painted =  $(n-2)^3$ 

(ii) Number of smaller cubes with one face painted =  $(n-2)^2 \times 6$ 

- (iii) Number of smaller cubes with two faces painted =  $(n-2) \times 12$
- (iv) Number of smaller cubes with three faces painted = 8

## EXAMPLE #

A cube is painted blue on all faces is cut into 125 cubes of equal size. Now, answer the following questions:

## • How many cubes are not painted on any face?

(a) 8

(b) 16

- (c) 18
- (d) 27
- How many cubes are painted on one face only?
  - (a) 8
  - (b) 16
  - (c) 36
  - (d) 54

**Sol.** Since there are 125 smaller cubes of equal size, therefore, n = no. of divisions on the face of undivided cube =5

- (d) Number of cubes with no face painted =  $(n 2)^3 = (5 2)^3 = 27$
- (d) Number of cubes with one face painted = $(n 2)^2 \times 6 = (5 2)^2 \times 6 = 54$