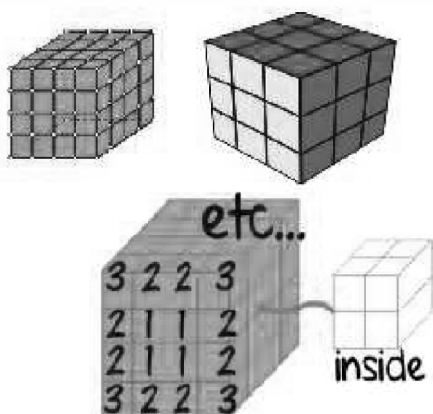


10. CUBES

A cube is a three dimensional solid having 6 faces, 12 edges and 8 corners. All the edges of a cube are equal and hence all the faces are square in shape.

The questions on cubes may belong to anyone of the following categories.

- I. A cube is cut by making certain specified number of cuts. The directions in which the cuts are made may or may not be given. We are to find the number of identical pieces resulting out of the given cuts.
- II. The number of identical pieces, into which a cube is cut, is given and we need to find the number of cuts.
- III. A cube could be painted on all or some of its faces with the same color or different colors and then cut into a certain specified number of identical pieces. Then questions of the form „o “How many small cubes have 1 faces painted?”. “How many smaller cubes have no face painted?” etc. could then be framed.



3 – Cubes with exactly 3 face color
2 – Cubes with exactly 2 face color
1 – Cubes with exactly 1 face color

Practice exercise

Directions for questions 1 to 4: These questions are based on the following.

Each of dimensions 1cm x 1cm x 1cm small but identical cubes are put together to form a large cube of dimensions 5cm x 5cm x 5cm. This large cube is now painted red on all six faces.

1. How many of the smaller cubes have exactly one face painted red?
 (1) 48 (2) 54 (3) 27 (4) 36
2. How many of the smaller cubes have no face painted red at all?
 (1) 27 (2) 48 (3) 36 (4) 20

3. How many of the smaller cubes have exactly two faces painted red?
 (1) 48 (2) 54 (3) 36 (4) 20
4. How many of the smaller cubes have exactly three faces painted red?
 (1) 15 (2) 24 (3) 12 (4) 8

Directions for questions 5 to 7: These questions are based on the following information.

Each of 216 small identical cubes is painted blue on all faces and all these cubes are arranged to form a large cube. Now all the faces of the large cube are painted pink.

5. How many small cubes have only one color on them?
 (1) 96 (2) 125 (3) 64 (4) 48
6. How many small cubes have exactly two faces painted pink?
 (1) 36 (2) 48 (3) 64 (4) 80
7. How many small cubes have exactly three faces painted blue?
 (1) 8 (2) 4 (3) 2 (4) 6

Directions for questions 8 to 10: These questions are based on the following information.

125 small identical cubes are arranged to form a large cube and it is painted in pink, black and red on two faces each, such that any two faces with the same color are adjacent to each other.

8. How many small cubes have only one color on their faces?
 (1) 63 (2) 48 (3) 75 (4) 81
9. How many small cubes have exactly two colors on their faces?
 (1) 39 (2) 27 (3) 33 (4) 24
10. How many small cubes have three colors on their faces?
 (1) 8 (2) 4 (3) 15 (4) 2

Directions for questions 11 to 15: These questions are based on the following information.

11. If five cuts are made on a cube, find the minimum number of pieces obtained.
 (1) 12 (2) 5 (3) 6 (4) 10
12. If nine cuts are made on a cube, find the maximum number of pieces obtained.
 (1) 27 (2) 54 (3) 64 (4) 40

13. Find the minimum number of cuts to be made to cut a cube into 216 identical pieces
(1) 18 (2) 15 (3) 12 (4) 36
14. What is the least number of cuts required to cut a cube into 24 identical pieces?
(1) 6 (2) 9 (3) 8 (4) 10
15. If ten cuts are made on a cube, find the maximum number of pieces obtained.
(1) 80 (2) 60 (3) 40 (4) 36
16. A cube is cut parallel to one face by making 10 cuts [such that all the resulting pieces are identical]. What is the maximum number of identical pieces that can be obtained by now making two more cuts (in any direction)?
(1) 33 (2) 40 (3) 55 (4) 44
17. What is the least number of cuts required to divide a cube into 120 identical pieces?
(1) 6 (2) 8 (3) 15 (4) 12
18. What is the least number of identical cuboids, each of dimensions 2 cm x 4 cm x 5 cm, that are required to form a cube?
(1) 160 (2) 240 (3) 220 (4) 200

Directions for questions 19 to 23: These questions are based on the following data.

There is a cube of dimensions 9cm x 9cm x 9cm in which one pair of opposite faces is painted pink, the second pair of opposite faces is painted blue and the third pair of opposite faces is painted green. This cube is now cut into smaller but identical cubes each of 1.5cm x 1.5cm x 1.5cm.

19. How many small cubes are there with no pink paint at all?
(1) 121 (2) 144 (3) 169 (4) 100
20. How many small cubes are there with at least two different colours on their faces?
(1) 49 (2) 64 (3) 56 (4) 81
21. How many small cubes are there without any face painted?
(1) 64 (2) 49 (3) 36 (4) 56
22. How many small cubes are there with only pink and green on their faces?
(1) 9 (2) 12 (3) 27 (4) 16
23. How many small cubes are there showing only green or only blue on their faces?
(1) 64 (2) 81 (3) 125 (4) 100

Directions for questions 24 to 29: These questions are based on the following data.

Three different faces of a cube are painted in three different colors - pink, green and black. This cube is now cut into 216 smaller but identical cubes.

24. What is the least number of the smaller cubes that will have exactly three faces painted?
(1) 1 (2) 6 (3) 2 (4) 12
(5) None of these
25. How many of the smaller cubes have exactly two faces painted?
(1) 12 (2) 15 (3) 16 (4) 18
(5) Either (1) or (2)
26. What are the least and the largest numbers of small cubes that have exactly one face painted?
(1) 75 and 86 (2) 64 and 81
(3) 64 and 72 (4) 75 and 84
(5) 64 and 84
27. What is the least number of small cubes that have exactly one face painted pink and no other face painted?
(1) 12 (2) 18 (3) 24 (4) 36 (5) 27
28. What is the maximum number of small cubes that have one face painted green and one face black and no other face painted?
(1) 2 (2) 4 (3) 6 (4) 8 (5) 10
29. What are the least and the maximum numbers of cubes that have no face painted at all?
(1) 125 and 130 (2) 120 and 125
(3) 115 and 120 (4) 100 and 125
(5) None of these

Directions for questions 30 to 35: These questions are based on the following data.

There is a cube in which one pair of adjacent faces is painted pink, the second pair of adjacent faces is painted blue and a third pair of adjacent faces is painted green. This cube is now cut into 216 smaller but identical cubes.

30. How many small cubes are there with no pink paint at all?
(1) 144 (2) 150 (3) 125 (4) 130
31. How many small cubes are there with at least two different colors on their faces?
(1) 64 (2) 54 (3) 33 (4) 44
32. How many small cubes are there with one face painted pink?
(1) 64 (2) 81 (3) 60 (4) 100
33. How many small cubes are with both pink and green on their faces?
(1) 8 (2) 12 (3) 16 (4) 32
34. How many small cubes are there showing only green or only blue on their faces?
(1) 64 (2) 72 (3) 81 (4) 90
35. How many small cubes are there showing all the three colors on their faces?
(1) 2 (2) 4 (3) 6 (4) 8

Cubes													
1	2	6	2	11	3	16	4	21	1	26	4	31	4
2	1	7	1	12	3	17	4	22	4	27	3	32	3
3	3	8	1	13	2	18	4	23	1	28	3	33	3
4	4	9	3	14	1	19	2	24	5	29	2	34	2
5	3	10	4	15	1	20	3	25	5	30	2	35	1