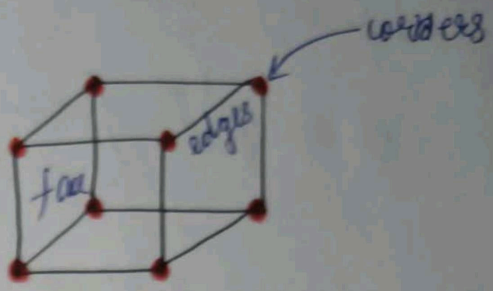
Reasoning → Cube, Dice, Direction

CUBE

(8) corners
(12) edges
(6) faces



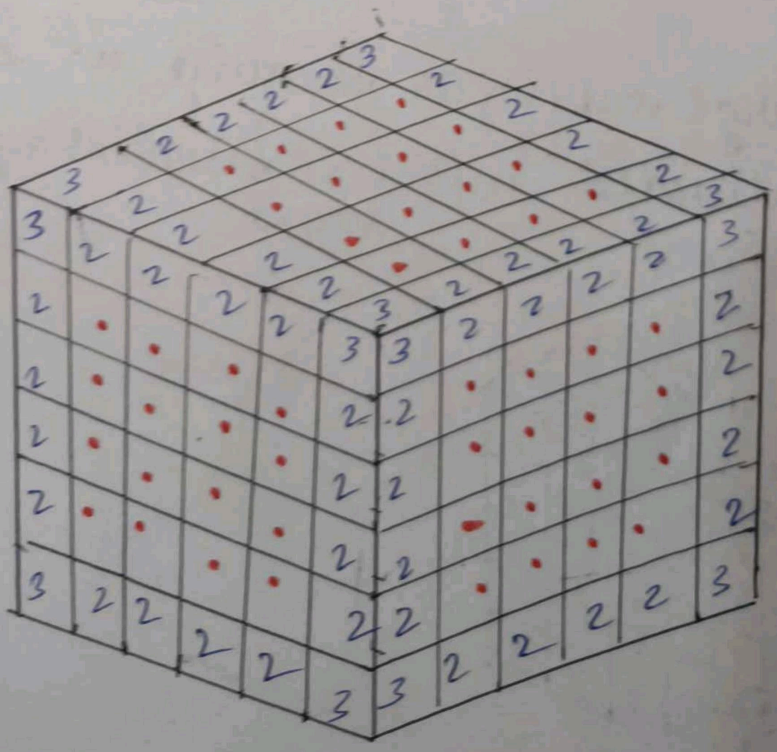
6×6×6 → Smaller cubes 1×1×1

$6 \times 6 \times 6 = n(1 \times 1 \times 1)$

$n = \frac{6 \times 6 \times 6}{1 \times 1 \times 1}$

$n = 216$ Small cubes

No. of edges
⇒ = No. of vertices + No. of face − 2



No. of cubes = 216

outer layer → Printed out of 216 cubes (1×1×1)

How many cubes are having

96 a) only 1 face printed? 6 face × 16

48 b) only 2 face printed? 12 edges × 4

8 c) 3 face printed? 8 corners × 1

64 d) No face printed?

upar neeche layer hata denge uske liye (x-2)

right left layer hata dege (x-2)

front and peeche layer hata denge (x-2)

$(x-2) \times (x-2) \times (x-2)$

$(6-2)(6-2)(6-2)$

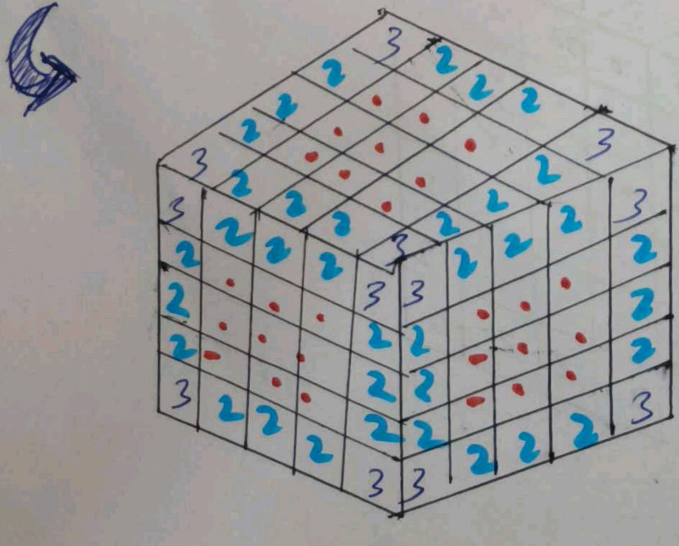
$4 \times 4 \times 4$

64 cubes

workbook Page × 81

3 (Q-1-4) A large cube after painting it on all faces was divided into 125 smaller equal cubes.

$5 \times 5 \times 5$



Q① How many cubes are not painted at all?

$n = 5$

$(n-2) \times (n-2) \times (n-2) \Rightarrow (5-2)(5-2)(5-2) \Rightarrow 3 \times 3 \times 3$

$\Rightarrow$ (27)

Q② How many cubes are painted from 3 sides?

corners = 8 1 corner = 1 cube

∴ 8 corners × 1 ⇒ 8 cubes

Q③ How many cubes are painted from exactly 2 sides?

edges = 12 1 edge = 3 cubes

12 × 3 = 36 cubes

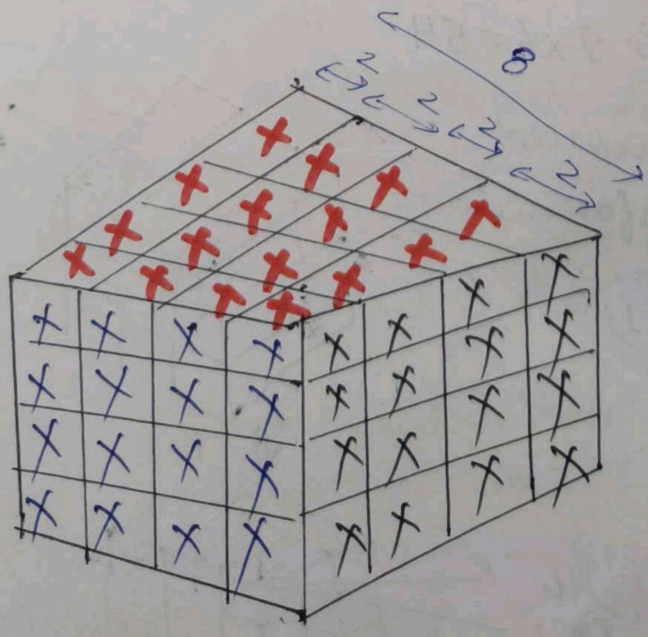
Q④ How many cubes are painted from only one?

faces = 6 1 face = 9 cubes

6 faces = 9 × 6 cubes = 54 cubes.

(Q.5–7)

A cube of side 8 cm (2×2×3) has been painted black, red and blue on pair of opposite faces. Then it is divided into smaller equal cubes of side 2 cm each. Answer the following.



Gate 2017 question

(5) How many cubes will be having two face painted black.

⇒ 0

(6) How many cubes will have one face painted blue and one face painted red? (The other faces may or may not be painted)

⇒ 16

(7) How many cubes will have exactly one face painted and that too with red colour?

⇒ 8

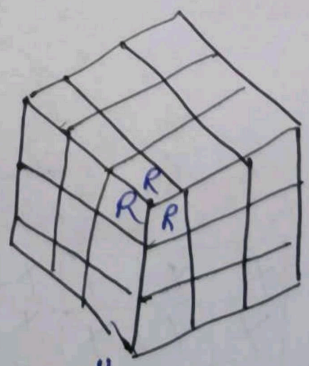
★ Surface area of a dice = Cubes on one face × no. of face
= Cubes on one face × 6

Q) Surface Area ⇒ 9 × 6 = 54

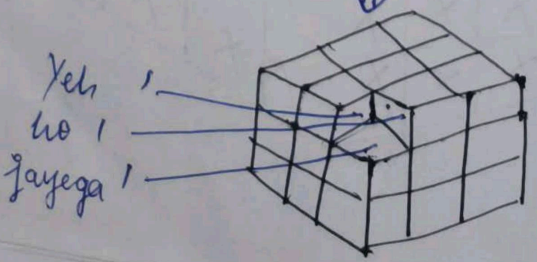
If one cube removed then what is surface area?

54 − 3 = (51)

51 + 3 = (54)

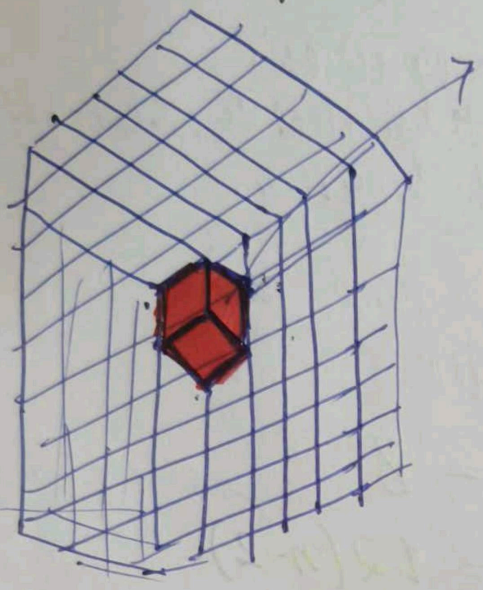


R = Remove



Q) 5X5X5

from 1 corner 1 cube is taken out. now painted all from outside with ① colour.



1 hatega toh 3 ho jayenge.

ⓐ Exactly 3 faces? ⇒ 10

ⓑ Exactly 2 faces? ⇒ 34

ⓒ Exactly 1 faces? ⇒ 9×6 54

ⓓ No face? ⇒ 125 − 98

Doubt

⇒ 27

for own purpose

NOTES

* If n equidistanced cuts are made (all parallel to same surface), cube will be divided into (n+1) identical cuboidal pieces with each such cut there will $2a^2$ new surface area will be generated which will be unpainted.

* If I want to cut my bigger cube into identical n^3 cubelets, using minimum number cuts, I need total $3(n-1)$ cuts, such that $(n-1)$ cuts parallel to each of these faces which are going to corner.

* If no. of cuts are not multiple of three then cube can never be cut into identical cubes but still it can be cut into maximum number of identical cuboidal pieces. To maximize such number of pieces we need to split the no. of cuts into three parts which are closest.

for own purpose

If a cube is cut into n^3 identical cubelets using minimum no. of cuts, after painting all faces of cube with white color, then answer the following questions.

① What is minimum no. cuts required?

$3(n-1)$ ⇒ $(n-1)$ equidistant cuts parallel to each of 3 face which are joining to corner.

② How many cubelets will have

(i) exactly 3 faces painted = 8

(ii) exactly 2 faces painted = $12(n-2)$ → ek edge mai upar aur neeche wal nat jayenge kyunki woh 3 face painted wale honge

(iii) exactly 1 face painted = $6(n-2)^2$

(iv) painted from none face = $(n-2)^3$

③ (v) atmost 2 faces painted = $(n^3 - 8)$ → No of cubes with 3 face painted; n^3 → Total no. of cube

(vi) atleast 1 face painted = $n^3 - (n-2)^3$ — n^3 → Total; $(n-2)^3$ → no face painted

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