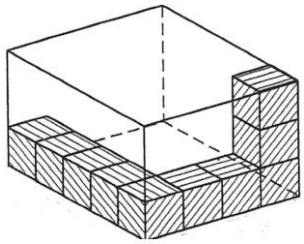
STANDARD 5
MEASUREMENT:
Volume

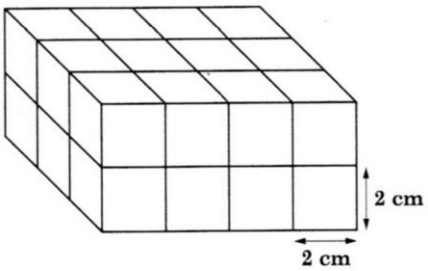
WORKSHEET

1. The cuboid below contains equally sized cubes of side 1 cm.



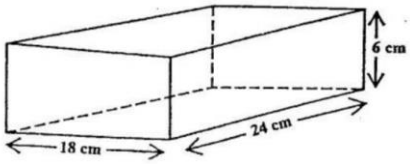
How many <u>more</u> cubes are needed to completely fill the cuboid?

2. The solid below is made up of cubes of the same size.

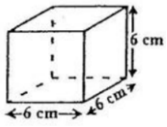


What is the total volume of the solid?

3. A rectangular box is 18 cm wide, 24 cm long and 6 cm deep.

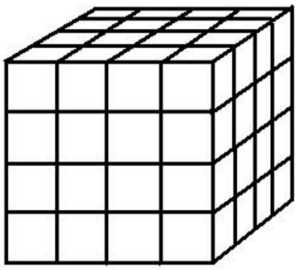


How many cubes with edges 6 cm will completely fill the box?



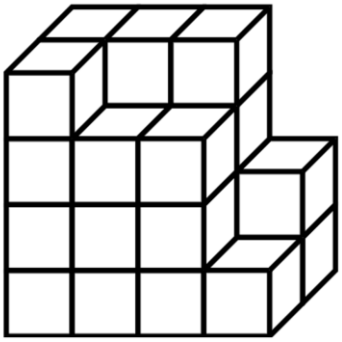
(CPDD)

4. The large cube below is built with small 1 cm^3 cubes.

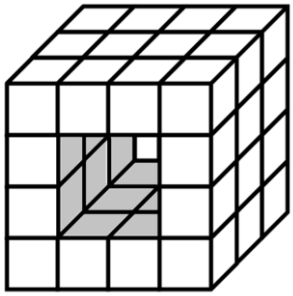


What is the volume of the large cube?

5. The solid shown is made from small cubes of side 2 cm.
What is the volume of this solid?

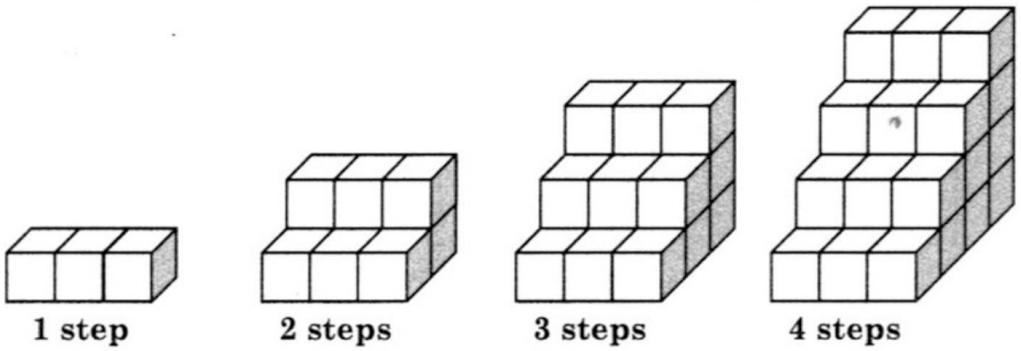


6. The large hollow cuboid is made up of smaller cubes of edge 1 cm.



What is the volume of this hollow cuboid?

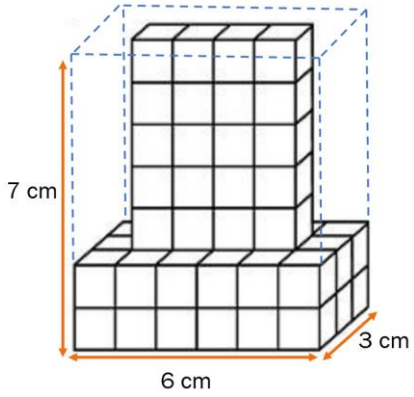
7. Cubes are used to make a pattern to build a staircase as shown below.



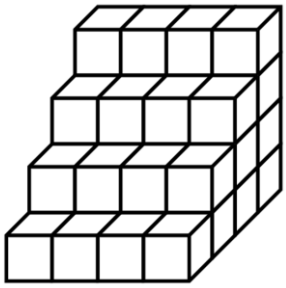
(a) How many cubes will be used to build a staircase with 6 steps?

(b) If 135 cubes are used to build a similar staircase, how many steps will the staircase have?

8. Kwesi is building a cuboid with small cubes of side 1 cm. The cuboid is of length 6 cm, width 3 cm and height 7 cm.
His incomplete cuboid is shown in the figure. How many more cubes does he need?



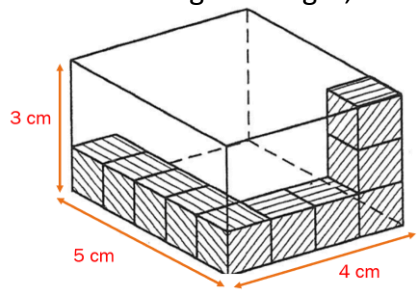
9. Maria was stacking 1 cm cubes to form a large cube of side 4 cm.
How many more cubes does she need to complete her large cube?



(CPDD)

ANSWERS

1. Dimensions or the cuboid are 5 cm, 4 cm and 3 cm which we get by counting the number of cubes along the length, the width and the height.



Volume = L × B × H

= 5 cm × 4 cm × 3 cm

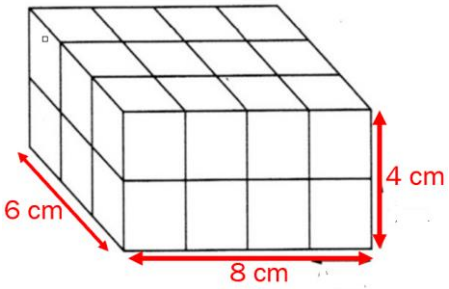
= 60 cm^3

Number of cubes needed = 60

Number of cubes in the box = 10

Answer = 60 – 10 = 50 cubes.

2. Method 1



Dimensions are 8 cm, 6 cm and 4 cm which we get by counting the number of cubes along the length, width and height and multiplying by 2 cm (since each cube has edge 2 cm).

Volume of cuboid = L × B × H

= 8 cm × 6 cm × 4 cm

= 192 cm^3

Method 2

Count the number of cubes and multiply by the volume of 1 cube.

There are 24 small cubes (4 x 3 x 2)OR 12 in top layer and 12 in bottom layer.

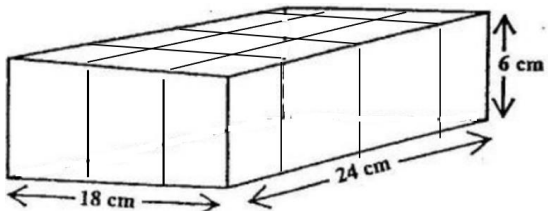
Volume of a small cube = S × S × S

= 2 cm × 2 cm × 2 cm

= 8 cm^3

Volume of cuboid = 24 × 8 cm^3 = 192 cm^3

3. Only 1 cube will fit along the height. Therefore, one layer of cubes is needed.

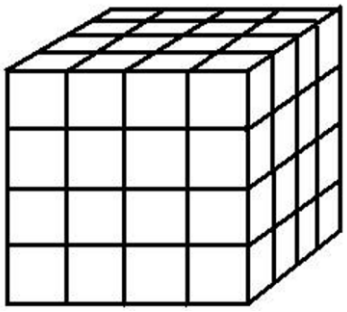


Along the length, 4 cubes will fit.

Along the breadth, 3 cubes will fit.

Answer 3 x 4 = 12 cubes.

4.



Method 1

Cube has edge 4 cm

Volume of cube = S × S × S

= 4 cm × 4 cm × 4 cm

= 64 cm^3

Method 2 (Count the number of small cubes and multiply by volume of 1 small cube)

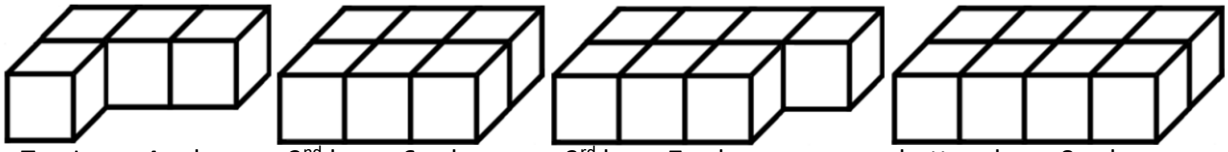
There are 4 layers of 16 small cubes.

Number of small cubes in the large cube = 4 x 16 = 64

Each small cube has volume 1 cm^3

Volume of large cube = 64 x 1 cm^3

5. This solid is irregular so that the only way of finding the volume is to count the number of cubes and multiply by the volume of one of the cubes.
   The solid is made up of 4 layers.



Top Layer 4 cubes 2nd layer 6 cubes 3rd layer 7 cubes bottom layer 8 cubes

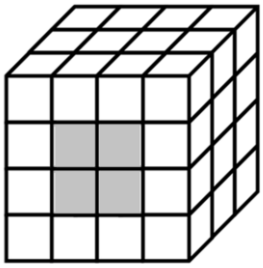
Number of cubes = 4 + 6 + 7 + 8 = 25

Volume of one cube = s x s x = 2 x 2 x 2 = 8 cm^3

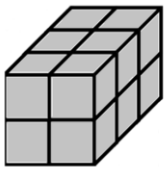
Volume of solid = 25 x 8 = 200 cm^3

6. Method 1

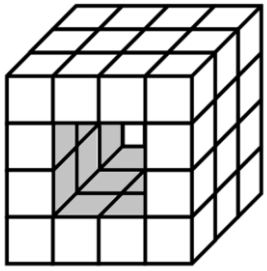
Find the volume of the entire cube and minus the part that was removed.



Volume of the whole cuboid
= L × B × H
= 4 cm × 3 cm × 4 cm
= 48 cm^3



Volume of cut-out
= L × B × H
= 3 cm × 2 cm × 2 cm
= 12 cm^3

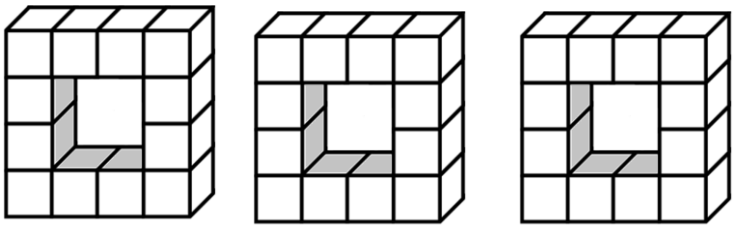


Volume of hollow cuboid
= 48 cm^3 – 12 cm^3
= 36 cm^3

Method 2

Find the number of cubes and multiply by the volume of one of the cubes.

Cut the cuboid into 3 identical slices.



Each slice contains 12 cubes.

Number of cubes = 12 x 3 = 36 cubes.

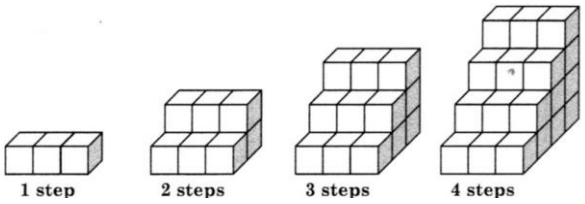
Volume of 1 cube = $1cm^3$

Volume of hollow cuboid = 36 x 1 cm^3 = 36 cm^3

7. (a) Method 1

Step Number	Number of cubes
1	3
2	9
3	18
4	30

Add 6
Add 9
Add 12
Add 15
Add 18



Number of cubes in 5th step = 30 +15 = 45

Number of cubes in 6th step = 45+18=63

Answer : 63 cubes

Method 2

Step Number	Number of sets of 3
1	1
2	3
3	6
4	10
5	15
6	21

Add 2
Add 3
Add 4
Add 5
Add 6

Answer = 21x3 = 63 cubes

(CPDD)

(b) Method 1

Continue the table from (a) Method 1

Step Number	Number of cubes	
5	45	Add 18
6	63	Add 21
7	84	Add 24
8	108	Add 27
9	135	Answer 9 steps

Method 2

We were looking at sets of 3.

135 cubes will give $135 \div 3 = 45$ sets of 3

Continue the pattern until the number in the second column is equal to 45.

Step Number	Number of sets of 3	
1	1	Add 2
2	3	Add 3
3	6	Add 4
4	10	Add 5
5	15	Add 6
6	21	Add 7
7	28	Add 8
8	36	Add 9
9	45	

Answer: 9 steps

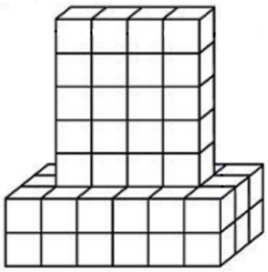
8. Method 1

Number of cubes needed for complete cuboid
= No. in length × No. in width × No. in height
= 6 × 3 × 7
= 126 cubes

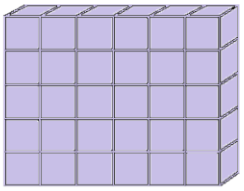
He already used 18 + 18 + 20 = 56

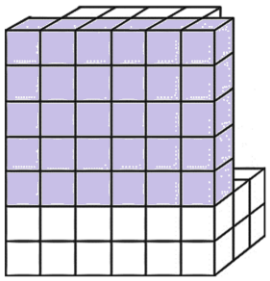
He needs 126 – 56 = 70 more cubes

Method 2

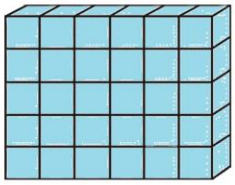


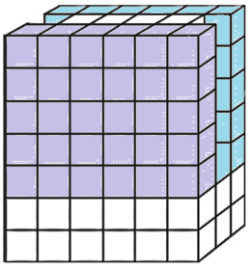
Kwesi needs to add a face consisting of
5 by 6 cubes to the front.
He therefore adds 30 cubes.



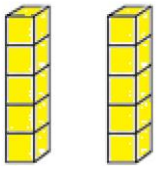


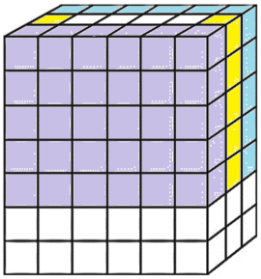
He needs to add a similar face to the
back with 30 more cubes.



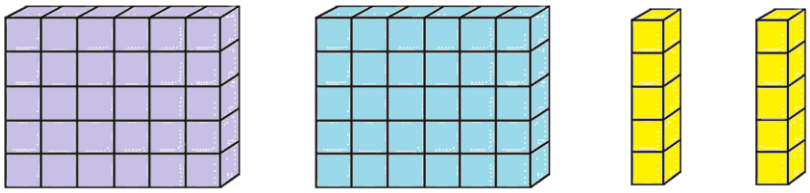


He would have to add two sets of 5 cubes
to fill the remaining spaces at the sides.





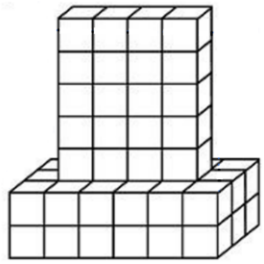
Total number of cubes needed:



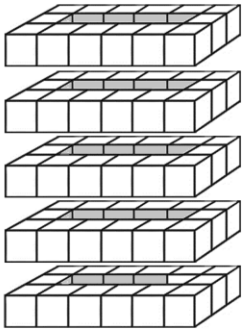
30 cubes + 30 cubes + 5 cubes + 5 cubes = 70 cubes

Answer = 70 cubes

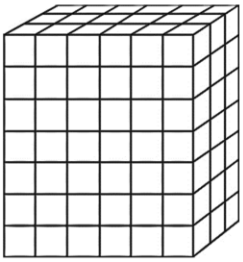
Method 3



Incomplete cuboid

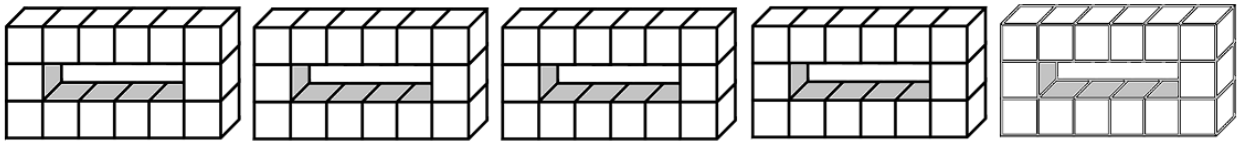


5 hollow layers needed



Complete cuboid

Turning the hollow layers to face the front, we get :

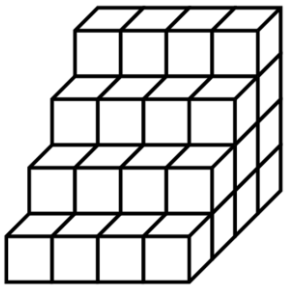


Each layer contains 14 cubes.

Total number of cubes = 14 x 5 = 70 cubes.

9. Method 1

If we know how many cubes the large cube needs and we subtract the number of cubes already used, we will get the answer



Number of cubes needed = s x s x s = 4 x 4 x 4 = 64 cubes

Number already used = 4 (top layer) + 8(2nd layer) + 12(3rd layer) +16(last)

= 40 cubes.

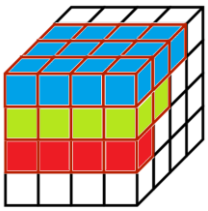
She needs 64 – 40 = 24 more cubes .

Method 2

She will need 4 to complete the 3rd layer

She will need 8 to complete the 2nd layer

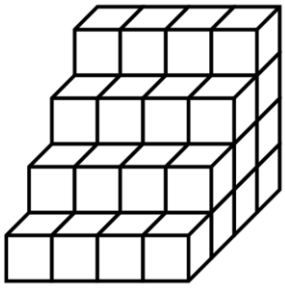
She will need 12 to complete the top layer

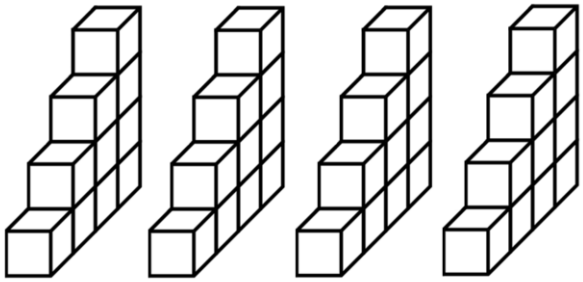


Total number needed = 12 + 8 + 4 = 24 cubes

Method 3

Divide the figure into 4 identical slices.





Maria needs 4 x 4 x 4 = 64 cubes

Each slice has 10 cubes

She has used 10 x 4 = 40 cubes.

She needs 64 – 40 = 24 more cubes.