Tutorial 11

1. Find the volume of each of the following cuboids.

(a)
6 cm
4 cm
10 cm

(b)
12 cm
5 cm
8 cm
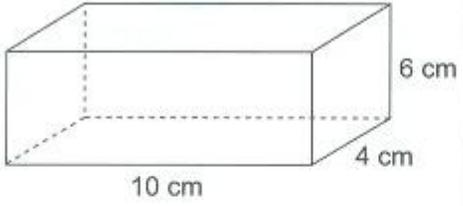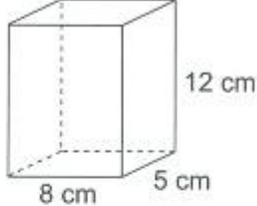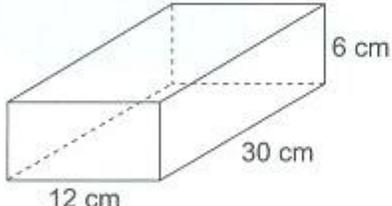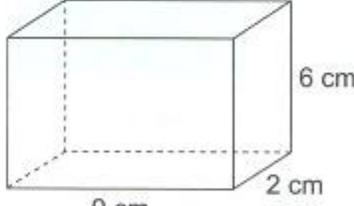
Answer
Question 1

a) 240 cm³
b) 480 cm³
c) 2160 cm³
d) 108 cm³
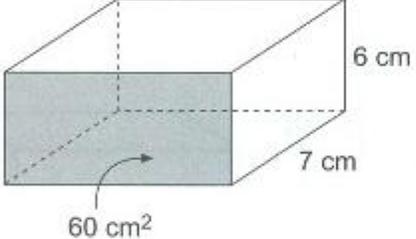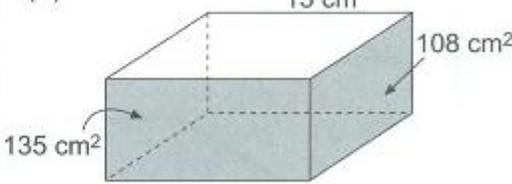
(c)
6 cm
30 cm
12 cm

(d)
6 cm
2 cm
9 cm

(e)

8 cm

120 cm²

(f)

1.5 m

2 m

2.4 m²

(g)

6 cm

7 cm

60 cm²

(h)

15 cm

108 cm²

135 cm²

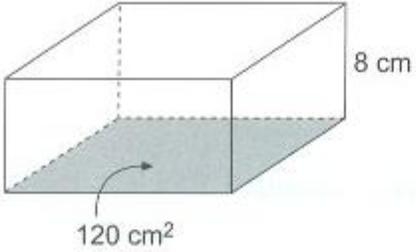2. Find the volume of each of the following cubes.

(a)

5 cm
5 cm
5 cm

(b)

3 cm
3 cm
3 cm

Answer
Question 2

a) 125 cm³
b) 27 cm³
c) 343 cm³
d) 1728 cm³

(c)

7 cm
7 cm
7 cm

(d)

12 cm
12 cm
12 cm

(e)

81 cm²

(f)

16 cm²
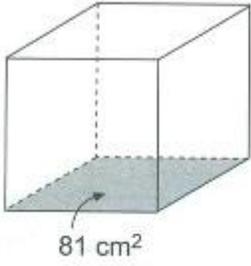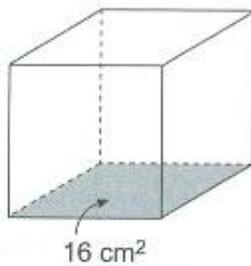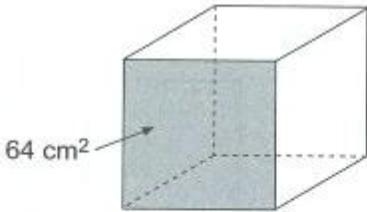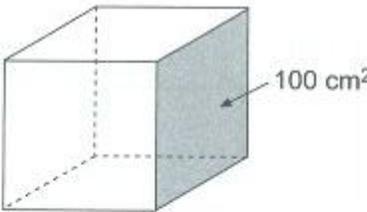
Answer
Question 2

e) 729 cm³
f) 64 cm³
g) 512 cm³
h) 1000 cm³

(g)

64 cm²

(h)

100 cm²

3. Find the unknown side of each of the following cuboids.

(a)

6 cm

3 cm

?

Volume = 144 cm³

(b)

?

4 cm 7 cm

Volume = 252 cm³

(c)

8 cm

?

12 cm

Volume = 480 cm³

(d)

?

Area = 96 cm²
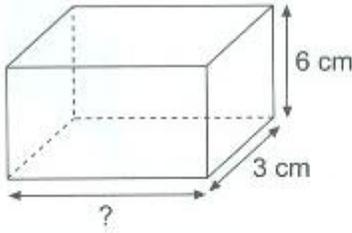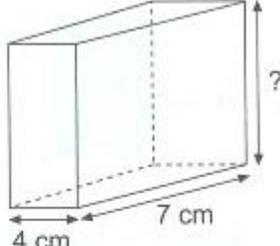
Volume = 768 cm³

Answer
Question 3

a) 8 cm
b) 9 cm
c) 5 cm
d) 8 cm

(e)

Area = 35 cm²

?

Volume = 385 cm³

(f)
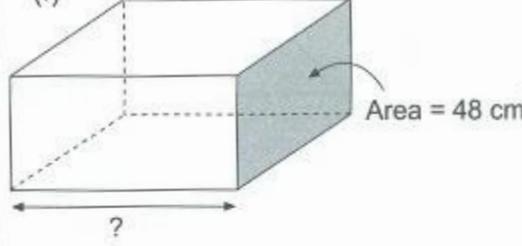
Area = 48 cm²

?

Volume = 720 cm³

4.   Find the shaded area of each of the following cuboids.

(a)

8 cm

Volume = 96 cm³

(b)

7 cm

12 cm

Volume = 504 cm³

(c)
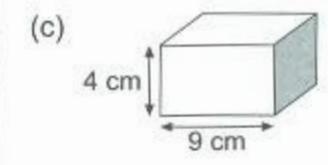
4 cm

9 cm

Volume = 108 cm³

5. Find the answer to each of the following, without the use of a calculator.

(a) $\sqrt{16}$	(b) $\sqrt{36}$	(c) $\sqrt{100}$
(d) $\sqrt{25}$	(e) $\sqrt{49}$	(f) $\sqrt{121}$
(g) $\sqrt{64}$	(h) $\sqrt{144}$	(i) $\sqrt{81}$
(j) $\sqrt[3]{27}$	(k) $\sqrt[3]{8}$	(l) $\sqrt[3]{1000}$
(m) $\sqrt[3]{1}$	(n) $\sqrt[3]{64}$	(o) $\sqrt[3]{125}$

Answer
Question 5

a) 4
b) 6
c) 10
d) 5
e) 7
f) 11
g) 8
h) 12
i) 9
j) 3
k) 2
l) 10
m) 1
n) 4
o) 5

6. Use the calculator to find the answer to each of the following parts. Give your answer correct to 2 decimal places where necessary.

(a) $\sqrt{196}$	(b) $\sqrt{80}$	(c) $\sqrt{361}$
(d) $\sqrt[3]{729}$	(e) $\sqrt[3]{216}$	(f) $\sqrt[3]{515}$
(g) $\sqrt{1121}$	(h) $\sqrt{576}$	(i) $\sqrt[3]{3375}$
(j) $\sqrt[3]{888}$	(k) $\sqrt{225}$	(l) $\sqrt[3]{4913}$
(m) $\sqrt{9000}$	(n) $\sqrt[3]{289}$	(o) $\sqrt{1156}$
(p) $\sqrt[3]{1728}$	(q) $\sqrt{2304}$	(r) $\sqrt[3]{3025}$

Answer
Question 6

a) 14
b) 8.94
c) 19
d) 9
e) 6
f) 8.02
g) 33.48
h) 24
i) 15
j) 9.61
k) 15
l) 17
m) 94.87
n) 6.61
o) 34
p) 12
q) 48
r) 14.46

7. For each of the following cuboids, find
   (i) the area of the square face,
   (ii) the length of a side of the square face.
   (Give your answer correct to 2 decimal places where necessary.)
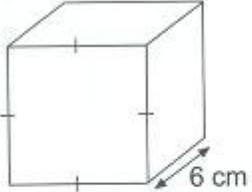
Answer
Question 7

a) (i) 144 cm², (ii) 12 cm
b) (i) 196 cm², (ii) 14 cm
c) (i) 255 cm², (ii) 15 cm
d) (i) 105 cm², (ii) 10.25 cm
e) (i) 47 cm², (ii) 6.86 cm
f) (i) 228 cm², (ii) 15.10 cm

(a)

6 cm

Volume = 864 cm³

(b)

15 cm

Volume = 2940 cm³

(c)

24 cm

Volume = 5400 cm³

(d)

4 cm

Volume = 420 cm³

(e)

18 cm

Volume = 846 cm³

(f)

9 cm

Volume = 2052 cm³

8. For each of the following cubes, find
   (i) the length of an edge of the cube,
   (ii) the area of one of its faces.
   (Give your answer correct to 2 decimal places where necessary.)

(a)

Volume = 216 cm³

(b)

?

Volume = 1728 cm³

a) (i) 6 cm, (ii) 36 cm²
b) (i) 12 cm, (ii) 144 cm²
c) (i) 4 cm, (ii) 16 cm²
d) (i) 7 cm, (ii) 49 cm²
e) (i) 18 cm, (ii) 324 cm²
f) (i) 4.64 cm, (ii) 21.55 cm²
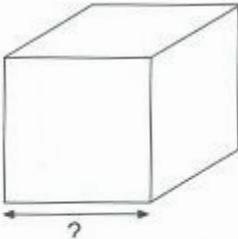
(c)

?
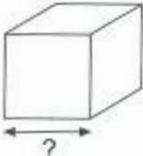
Volume = 64 cm³

(d)

?

Volume = 343 cm³

(e)

?
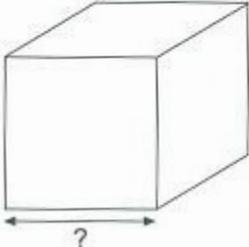
Volume = 5832 cm³

(f)

?
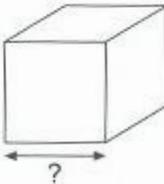
Volume = 100 cm³

9.   Solve the following word problems.

(a)   A rectangular container is $\frac{1}{5}$ filled with liquid. If the volume of liquid is 320 ml, find the capacity of the container.

Answer
Question 9

a)   1600 cm³
b)   5400 ml
c)   160 cm²
d)   12 cm

Ans: _____ cm³

(b)   A rectangular container, with a base area of 360 cm² has a height of 15 cm. Find the capacity of the container.

Ans: _____ ml
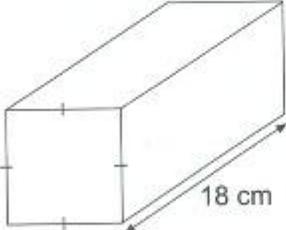
(c)   The capacity of a rectangular tank 1920 cm³. If the height of the tank is 12 cm, find the base area of the tank.

Ans: _____ cm²

(d)   The volume of the rectangular block of wood below is 300 cm³. What is the height of the block?

5 cm

5 cm
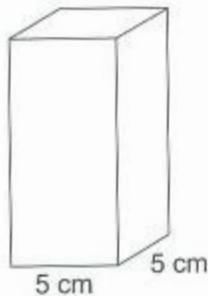
Ans: _____ cm

(e) The length of a cuboid is 10 m. Its breadth is half of its length and its height is 6 m. Find the volume of the cuboid.

Ans: _____ m³

(f) The length of a rectangular tank is twice its breadth. Its breadth is $\frac{1}{4}$ of its height. If the height of the tank is 20 cm, find its capacity.

Ans: _____ cm³

(g) The volume and the base area of a cuboid are 576 cm³ and 48 cm² respectively. Find the height of the cuboid.

48 cm²
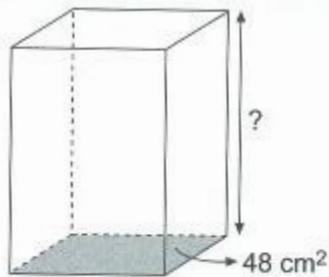
Ans: _____ cm

(h) A rectangular container has a square base of side 8 cm and a height of 10 cm. It is $\frac{3}{4}$ filled with water. Find the volume of water in the container.

10 cm

8 cm

8 cm
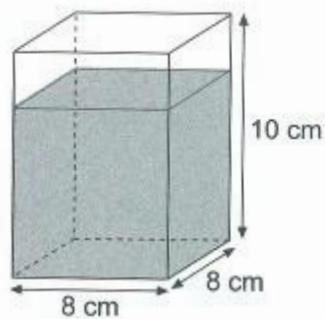
Ans: _____ cm³

Answer
Question 9

e) 300 m³
f) 1000 m³
g) 12 cm
h) 480 cm³

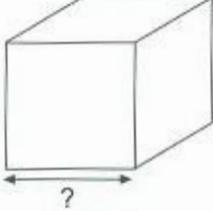(i) A rectangular tank, 60 cm long and 40 cm wide contains 72 litres of water. Find the height of the water level in the tank.

Ans: _____ cm

(j) A rectangular tank is half-filled with water. If the base area of the tank is 12 m² and its height is 7 m, find the volume of water in the tank.

Ans: _____ m³

(k) The rectangular tank below is $\frac{3}{4}$ full. If it contains 54 litres of water, find the height of the tank.

30 cm
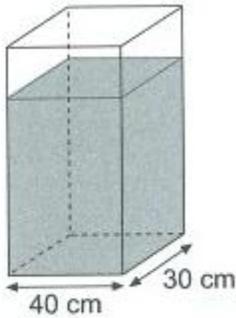
40 cm

Ans: _____ cm

(l) The base area of a rectangular container is 1440 cm². It is filled with 72 litres of liquid and is $\frac{2}{3}$ full. Find the height of the container.

Ans: _____ cm

(m) A rectangular container with a square base of side 20 cm is 30% filled with water. If it is filled with 1.2 litres of water, find the height of the container.

Ans: _____ cm

(n) The figure below shows a cuboid with a square base of area 36 cm². The ratio of its breadth to its height is 2 : 3. Find the volume of the cuboid.

36 cm²
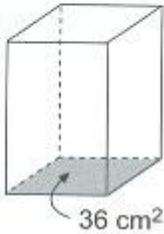
Ans: _____ cm³

(o) The cuboid below has a square base of area 144 cm². The area of the shaded face is 96 cm². Find the volume of the cuboid.

96 cm²
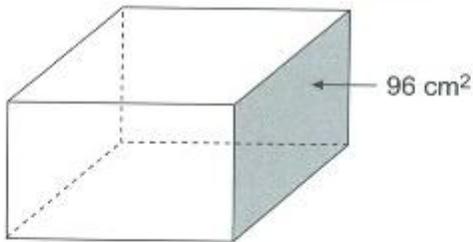
Ans: _____ cm³

(p) The figure below shows a rectangular tank with a square base. If its base area is 9 m² and the area of the shaded face is 18 m², find the height of the tank.

18 m²
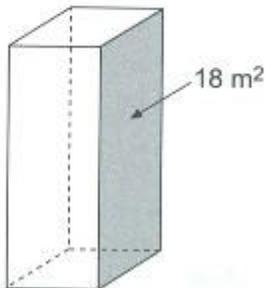
Ans: _____ m

10. Solve the following word problems.

(a) The volume of a cuboid is 4913 cm³. A cube has the same volume as the cuboid. Find the length of an edge of the cube.

Ans: _____ cm

(b) The volume of the cube shown below is 1331 cm³. Find the area of the shaded face.
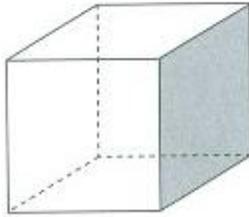
Ans: _____ cm²

(c) The area of a face of the cube shown below is 36 cm². Find the volume of 5 such cubes.

36 cm²
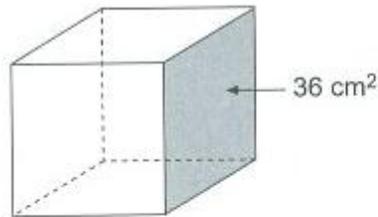
Ans: _____ cm³

(d) The volume of a cube is 512 cm³. Find the total area of the faces of the cube.

Ans: _____ cm²

(e) The figure below shows a cube which is cut to form 3 identical cuboids. If the volume of the cube is 5832 cm³, find the dimensions of each cuboid.
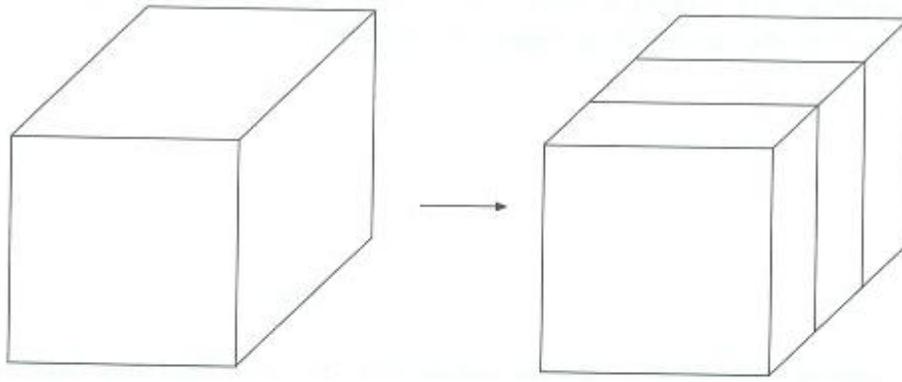
Ans: _____

(f) The volume of Cube A is 64 cm³. The ratio of the length of Cube A to the length of Cube B is 1 : 3. Find the volume of Cube B.
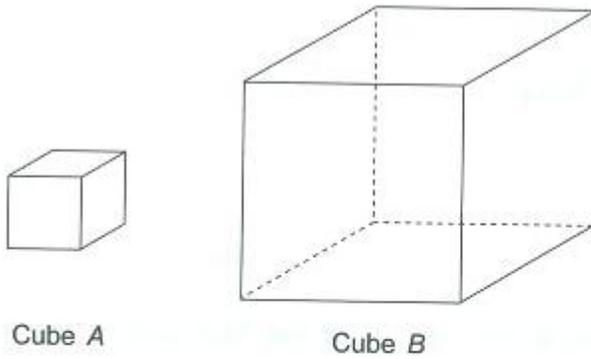
Cube A   Cube B

Ans: _____ cm³

(g) The volume of Cube P is 216 cm³. The ratio of the length of Cube P to the length of Cube Q is 2 : 3. Find the volume of Cube Q.

Ans: _____ cm³

(h) The length of Cube X is twice the length of Cube Y. If the volume of Cube X is 2744 cm³, find the total area of the faces of Cube Y.

Ans: _____ cm²

11. Find the maximum number of 3-cm cubes that can be placed into a rectangular box measuring 25 cm by 14 cm by 20 cm.

20 cm

14 cm

25 cm
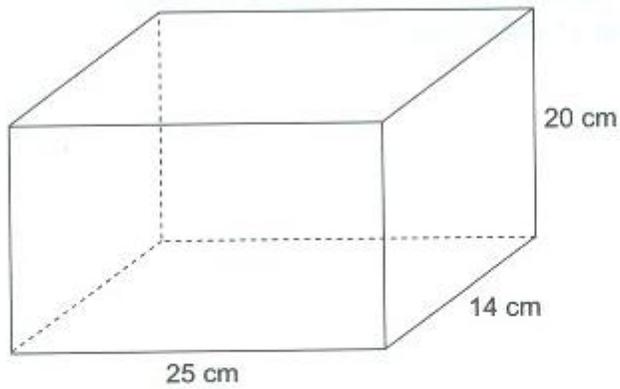
Ans: _____

12. What is the maximum number of 2-cm cubes that can be packed into a rectangular box measuring 15 cm by 7 cm by 10 cm?

10 cm

7 cm
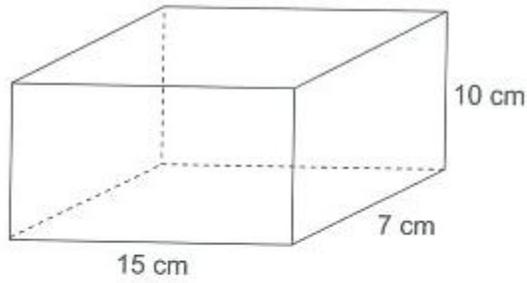
15 cm

Ans: _____

13. The volume of a rectangular block of candle is 840 cm³. Its length is 14 cm and its breadth is 10 cm.
    (a)   Find the height of the block.
    The block is melted down and re-moulded into 105 identical cubes.
    (b)   Find the length of an edge of each cube.

Ans: (a) _____

(b) _____

14. A rectangular block of wood measures 36 cm by 24 cm by 10 cm. It is cut up into cubes of side 3 cm.
    (a) Find the maximum number of cubes that can be obtained.
    (b) Find the volume of wood left.
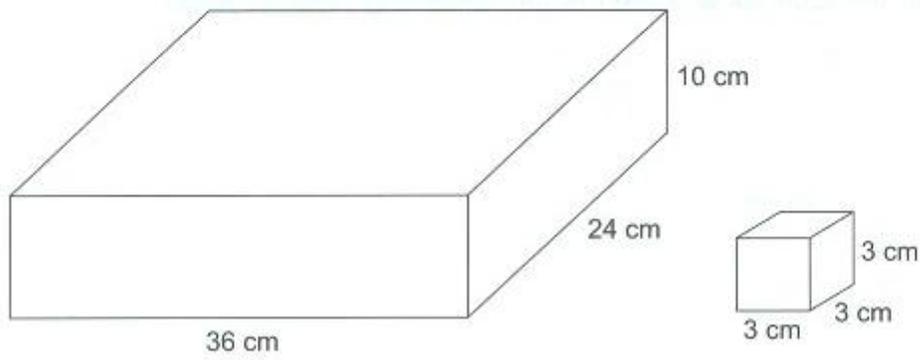
Answer
Question 14
(a) 288
(b) 864 cm³

Ans: (a) _____

(b) _____

15. Figure 1 shows a rectangular block of wood measuring 18 cm by 12 cm by 40 cm. Tom cuts the maximum number of 4-cm cubes from the wood. Figure 2 shows the remaining block of wood.
    (a) Find the number of 4-cm cubes he got.
    (b) Find the total surface area of the remaining block of wood.

40 cm

12 cm

18 cm
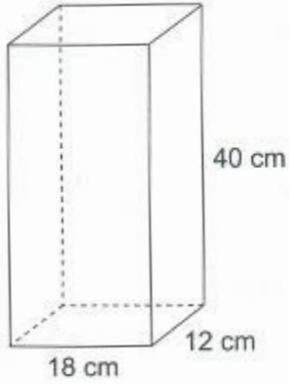
Figure 1   Figure 2

Ans: (a) _____

(b) _____

16. The figure below shows a rectangular tank which is filled with water up to a height of 12 cm. Find the new height of the water level after 12 litres of water is poured into the tank.

12 cm

40 cm
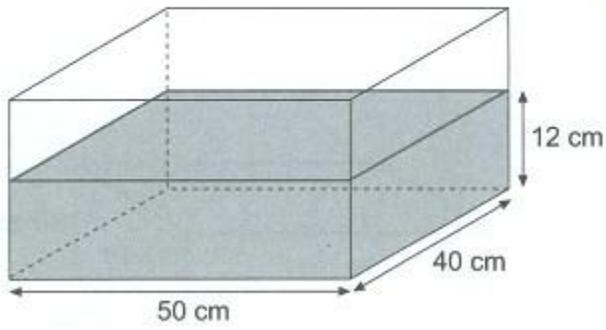
50 cm

Ans: _____

17. A rectangular tank X measuring 8 m by 3 m by 5 m is half-filled with water. All the water in Tank X is poured into a cubical Tank Y of side 4 m which is empty. Find the height of the water level in Tank Y.

5 m

3 m

8 m

Tank X

4 m
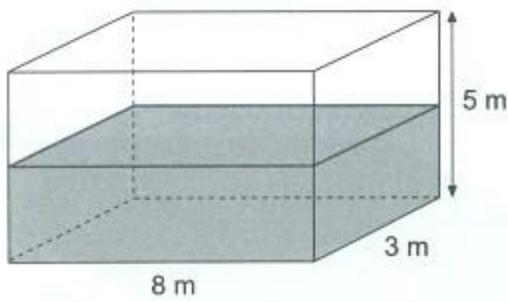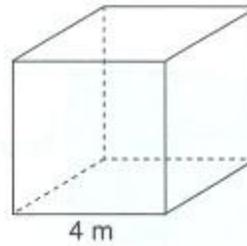
Tank Y

Ans: _____

18. The figures below show two rectangular tanks. Tank M is $\frac{3}{4}$ filled with water and Tank N is empty. All the water in Tank M is poured into Tank N without spilling. Find the height of the water level in Tank N.

60 cm

40 cm

50 cm

Tank M

30 cm

45 cm
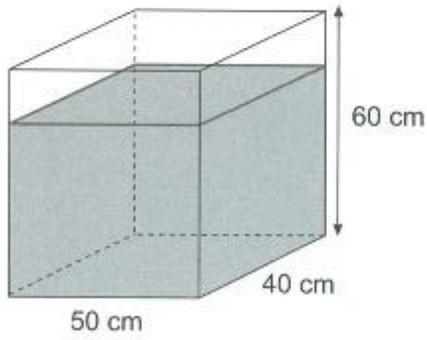
80 cm
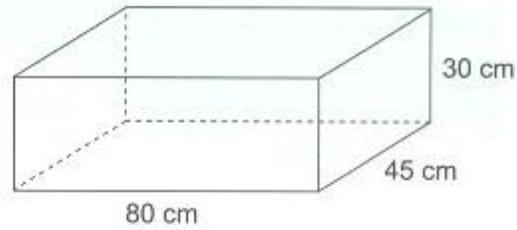
Tank N

Ans: _____

19. The figures below show two rectangular tanks. Tank A is completely filled with water while Tank B is half-filled with water. All the water in Tank A is poured into Tank B without spilling. Find the new height of the water level in Tank B.

30 cm

10 cm

40 cm

Tank A

36 cm

25 cm

60 cm
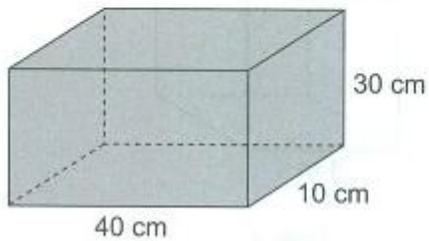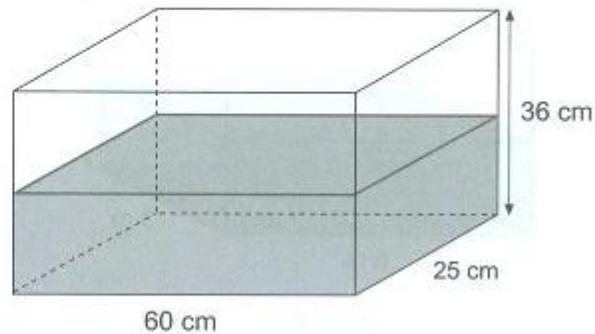
Tank B

Ans: _____

20. Container *A* is $\frac{2}{3}$ filled with water. All the water in Container *A* is poured into Container *B*, which is empty at first.
    (a) Find the height of the water level in Container *A* at first.
    (b) Find the height of the water level in Container *B*.

18 cm

15 cm

24 cm

Container *A*

30 cm

10 cm

16 cm
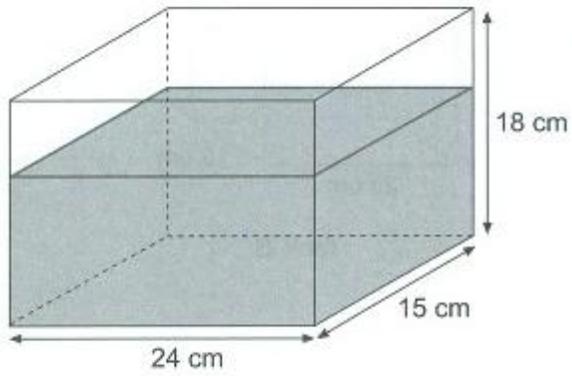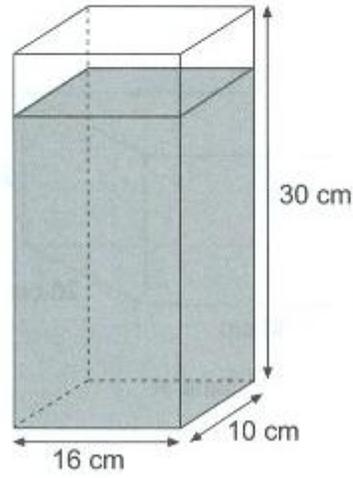
Container *B*

Ans: (a) _____

(b) _____

21. Rani filled up 2 identical pails with water. She emptied each pail of water into each of the empty tanks shown below. If Tank A is $\frac{4}{5}$ filled, find the height of the water level in Tank B.

20 cm

50 cm

20 cm

12 cm

30 cm

25 cm
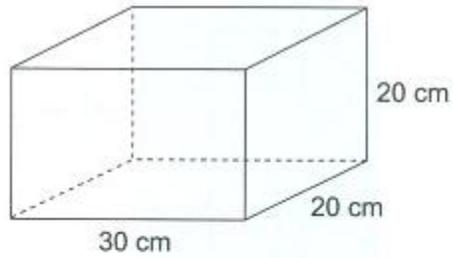
Tank A
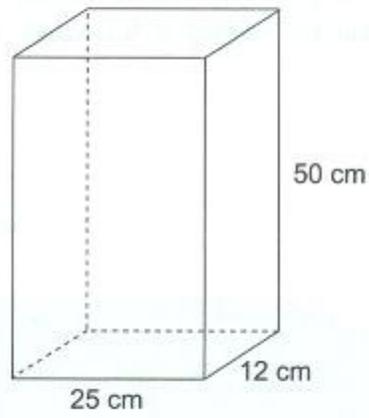
Tank B

Ans: _____

22. An empty rectangular container measures 60 cm by 40 cm by 45 cm. Marc poured 5 pails of water into the container. The capacity of each pail is 6 l. How many more pails of water must be poured into the container to make it $\frac{2}{3}$ full?

Ans: _____

23. Tank X, measuring 60 cm by 40 cm by 36 cm is completely filled with water. Tank Y, with a base area of 900 cm² is empty. When $\frac{2}{3}$ of the water is poured from Tank X into Tank Y, Tank Y is filled with water to the brim.
    (a) How much water is poured into Tank Y?
    (b) Find the height of Tank Y.

Ans: (a) _____

(b) _____

24. A rectangular tank was $\frac{1}{4}$ filled with water. Its base measures 30 cm by 20 cm. When 600 cm³ of water was poured into the tank, it became $\frac{1}{3}$ full.

    (a) Find the capacity of the tank.
    (b) Find the height of the water level when the tank was $\frac{1}{3}$ full.

Answer
Question 24
(a) 7200 cm³
(b) 4 cm

Question 25
(a) 6 cm
(b) 20 cm

Ans: (a) _____

(b) _____

25. A rectangular tank A measuring 10 cm by 6 cm by 12 cm is $\frac{2}{3}$ filled with water. A rectangular tank B which has a square base is empty. Some water is poured from Tank A into Tank B such that the height of the water level in both tanks are 5 cm.
    (a) What is the length of a side of the square base of Tank B?
    (b) Find the height of Tank B if another 540 cm³ is needed to fill it to the brim.

Ans: (a) _____

(b) _____

26. Figure 1 shows two rectangular glass vases. Vase *A* is completely filled with water and Vase *B* is empty. Water is poured from Vase *A* to Vase *B* without spilling such that the heights of the water level in both vases are equal as shown in Figure 2. Find the height of the water level in Vase *B* in the end.

Answer
Q26) 40 cm

90 cm

10 cm
20 cm

25 cm

10 cm

Vase *A*   Vase *B*

Vase *A*   Vase *B*
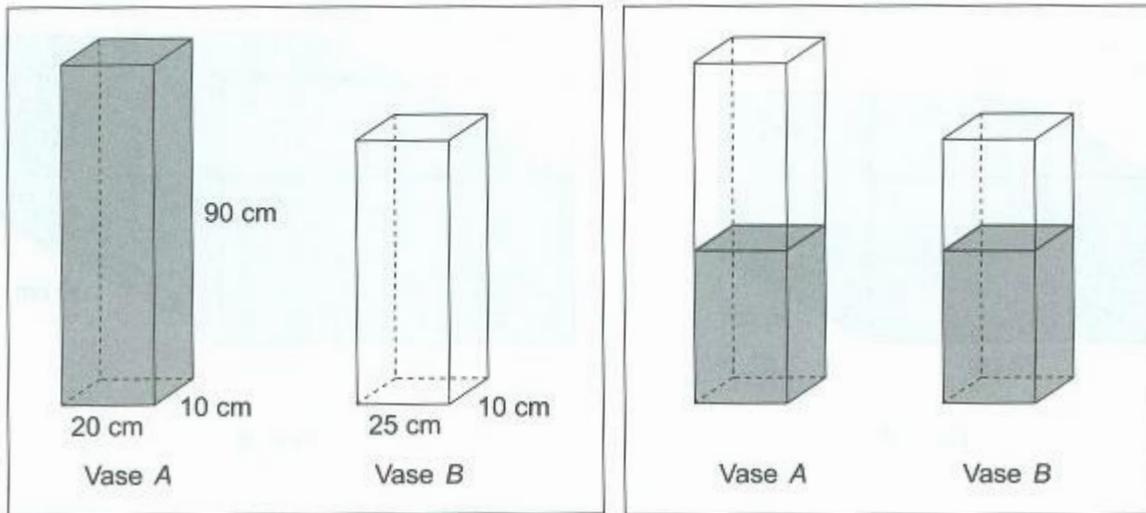
Figure 1

Figure 2

Ans: _____

27. Marc poured 12.6 litres of water into two empty tanks such that the heights of the water level in both tanks are equal as shown in the figures below. Find the height of the water level in Tank *A*.
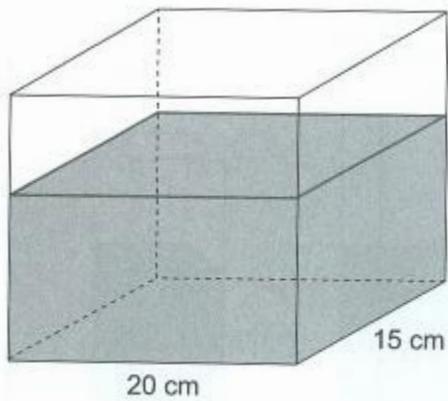
15 cm

20 cm
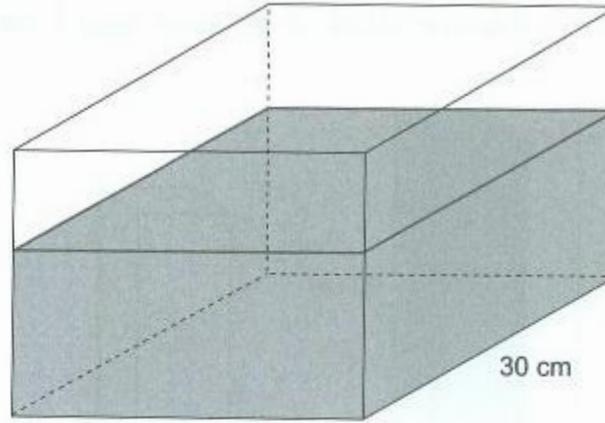
Tank *A*

30 cm

25 cm

Tank *B*

Ans: _____

28. Two rectangular tanks, *A* and *B* are empty at first. The base area of Tank *A* is 180 cm² and the base area of Tank *B* is 240 cm². 10.5 litres of water is poured into each tank such that the heights of the water level in both tanks are equal. Find the height of the water level in Tank *B*.

Ans: _____

29. Tank *P* measuring 50 cm by 30 cm by 40 cm is completely filled with water. Tank *Q* which has a base measuring 25 cm by 20 cm is filled with water to a depth of 4 cm. Some water was poured from Tank *P* into Tank *Q* until the heights of the water level in both tanks are the same. Find the new height of the water level in Tank *Q*.

40 cm

30 cm

50 cm

Tank *P*

4 cm

20 cm

25 cm
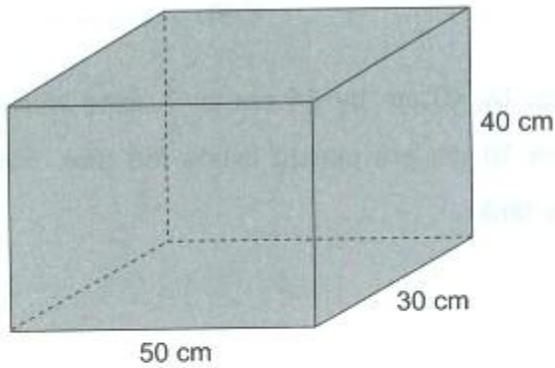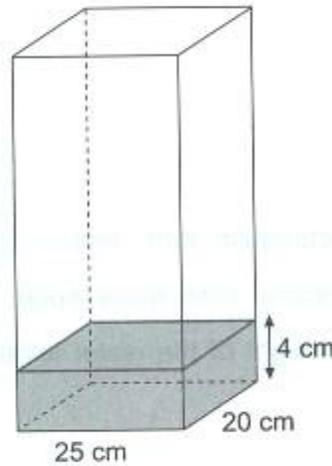
Tank *Q*

Ans: _____

30. The rectangular tank below contains a metal ball and it is filled with water to a depth of 12 cm. When the ball is removed, the water level dropped to 10 cm. Find the volume of the metal ball.

12 cm

8 cm

18 cm
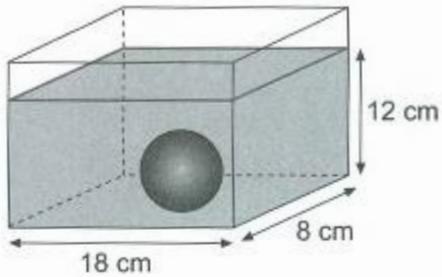
Ans: _____

31. A rectangular tank measuring 80 cm by 40 cm by 50 cm is half-filled with water. A solid metal cube of side 20 cm is placed at the base of the tank. Find the new height of the water level in the tank.

Ans: _____

32. A rectangular tank measuring 50 cm by 40 cm by 54 cm is $\frac{2}{3}$ filled with water. 4 identical solid metal cubes of side 10 cm are placed inside the tank. Find the new height of the water level in the tank.

Ans: _____

33. An empty rectangular tank contained 6 solid metal cubes, each of side 4 cm. It is filled with water to a height of 15 cm as shown in the figure below.
    (a) Find the volume of water in the tank.
    (b) If half of the cubes are removed from the tank, what is the new height of the water level?
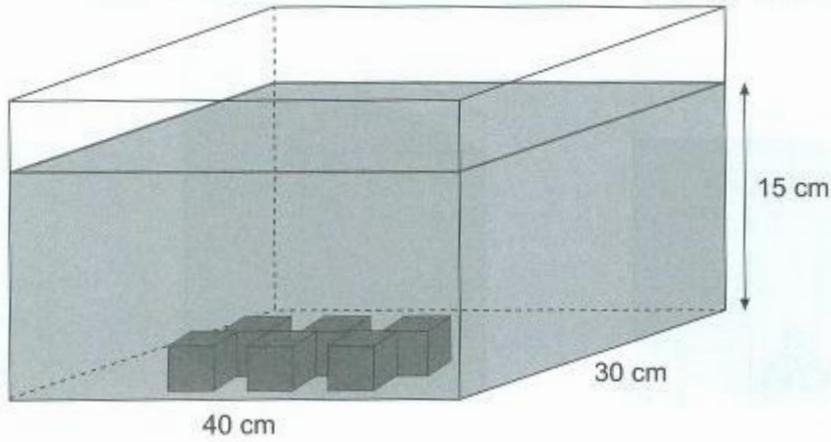
Ans: (a) _____

(b) _____

34. A rectangular tank contained some water. When 3 identical metal balls were placed into the tank, the water level rises to $\frac{3}{4}$ of the height of the tank as shown in Figure 1. After a stone is added in, the water level rises to $\frac{5}{6}$ of the height of the tank as shown in Figure 2. The volume of the stone is 4 times the volume of each ball. Find the volume of water in the tank, giving your answer in litres.
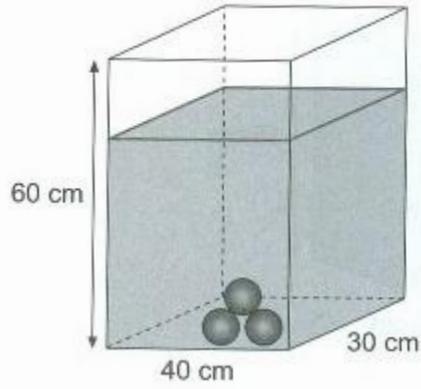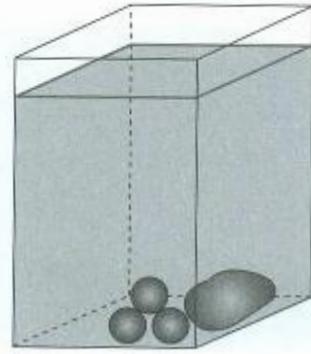
Figure 1

Figure 2

Ans: _____

35. An empty rectangular tank measures 80 cm by 50 cm by 40 cm. Water flows into the tank from a tap at a rate of 20 litres per minute. How long will it take to fill the tank to the brim?

40 cm

80 cm

50 cm
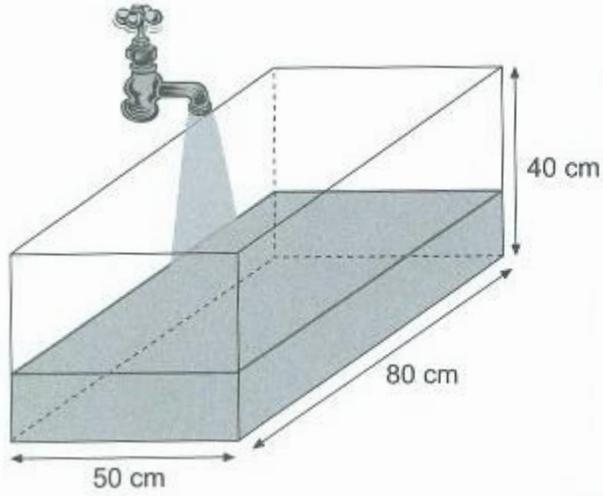
Ans: _____

36. A rectangular storage tank, measuring 80 cm by 60 cm by 70 cm was filled with water to its brim. The water in the tank is emptied from a tap at a rate of 21 litres per minute. How long will it take empty the tank completely?

60 cm

70 cm

80 cm
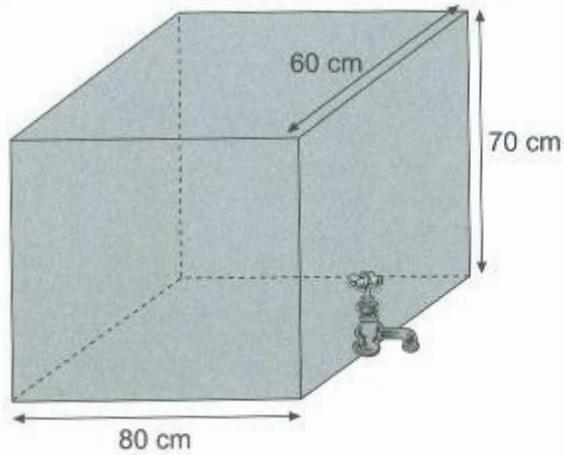
Ans: _____

37. The figure below shows an empty rectangular tank with a square base of side 20 cm. Water flowed into the tank from Tap *A* at a rate of 500 ml per minute and from Tap *B* at a rate of 450 ml per minute. Both taps were turned on for 8 minutes. Find the height of the water level in the tank in the end.

Tap B

Tap A
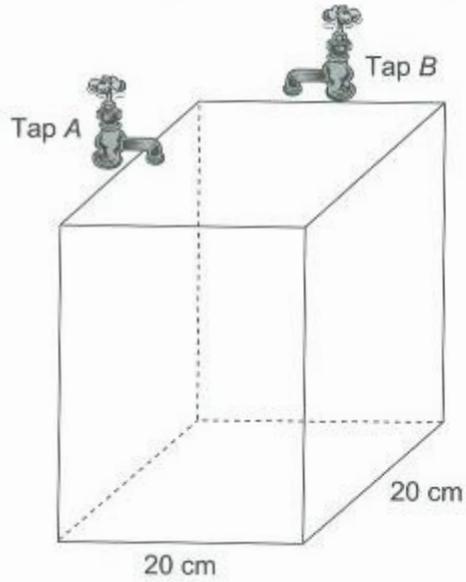
20 cm

20 cm

Ans: _____

38. The base area of an empty rectangular container is 1800 cm². Water flows into the container at a rate of 3 *l* per minute.
    (a)   How long will it take the water in the container to reach a height of 20 cm?
    (b)   If it takes 15 minutes to completely to fill up the container, find the height of the container.

Ans: (a) _____

(b) _____

39. A rectangular tank measuring 50 cm by 30 cm by 60 cm is $\frac{3}{5}$ filled with water. Water is drained from the tank at a rate of 1.5 litres per minute. How long will it take for the tank to be half-full?

Ans: _____

40. A rectangular tank measuring 80 cm by 35 cm by 60 cm is $\frac{3}{4}$ filled with water. Water is drained out from the tank at a rate of 840 ml per minute. Find the depth of water in the tank after 10 minutes.

Ans: _____

41. A rectangular tank measures 50 cm by 40 cm by 45 cm. It is filled with water to a depth of 15 cm. Water leaks out from 2 holes on the base of the tank at a rate of 450 cm³ per minute and 350 cm³ per minute respectively. Find the height of the water level after 6 minutes.

Ans: _____

42. The base of an empty tank measures 50 cm by 40 cm. The tap was turned on and water flowed into the tank at a rate of 1250 cm³ per minute. After half an hour, the tap was turned off, but 1500 cm³ of water had overflowed.
    (a) Find the volume of water in the tank after the tap was turned off.
    (b) Find the height of the tank.

Ans: (a) _____

(b) _____

43. An empty tank contained a solid cube of side 5 cm. The tap was turned on and water flowed into the tank at a rate of 1200 cm³ per minute. After 15 minutes, the tap was turned off, but 875 cm³ of water had overflowed.
    (a) Find the volume of water in the tank after the tap was turned off.
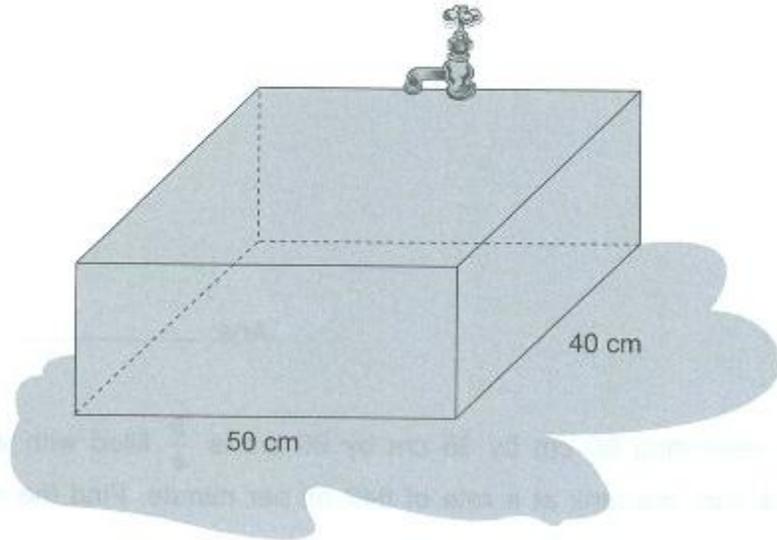   (b) Find the height of the tank.
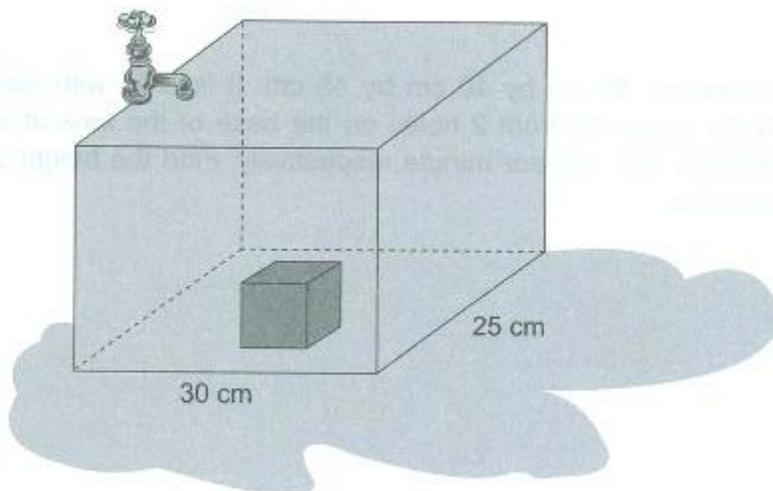
Ans: (a) _____

(b) _____

44. The empty rectangular tank shown below measures 50 cm by 40 cm by 45 cm. Tap *A* was turned on and water flowed into the tank at a rate of 2 litres per minute. After 4 minutes, Tap *B* and Tap *C* were turned on. Water flowed from Tap *B* into the tank at a rate of 5 litres per minute. Water drained out of the tank from Tap *C* at a rate of 4 litres per minute. After another 6 minutes, all 3 taps were turned off. Find the height of the water level in the tank in the end.

Answer
Q44) 13 cm

Question 45
a)   7 minutes
b)   25.9 ʃ
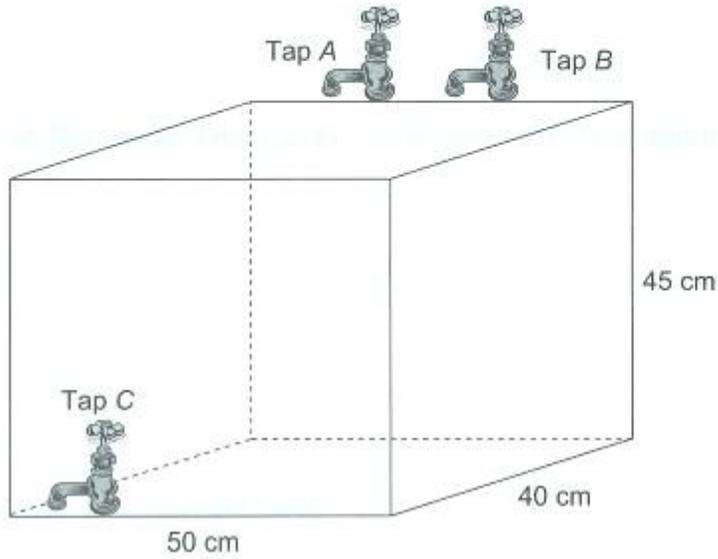
Ans: _____

45. The capacity of an empty rectangular tank is 50.9 litres. Water flowed from two taps, *X* and *Y* into the tank at a rate of 2.5 litres per minute and 3.7 litres per minute respectively. Tap *Y* was turned on after Tap *X* had been turned on for 3 minutes. Both taps were turned off at the same time once the tank is completely filled.
(a)   How long was Tap *Y* turned on?
(b)   How much water flowed from Tap *Y*?

Ans: (a) _____

(b) _____

46. Jack and Terence each has 30 cubes of side 3 cm.
    (a) Jack used all his cubes to make a cuboid. The base of the cuboid he made is shown below. Find the height of the cuboid.
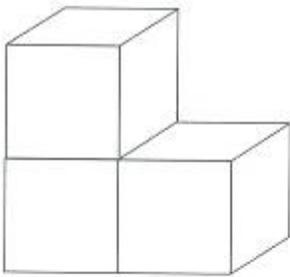
   (b) Terence wants to make a cube of side 9 cm. How many cubes will he have left?

Ans: (a) _____

(b) _____

47. The solid below is made up of 3 identical cubes. The volume of the solid is 192 cm³.
    (a) Find the length of each cube.
    (b) Find the total surface area of the solid.

Ans: (a) _____

(b) _____

48. Three cubes are joined together to form the cuboid shown below. If the total length of the edges of the cuboid is 100 cm, find the volume of the cuboid.
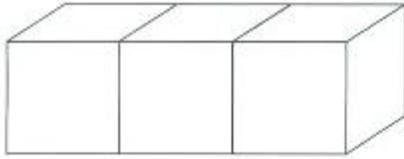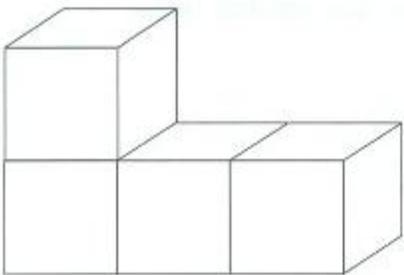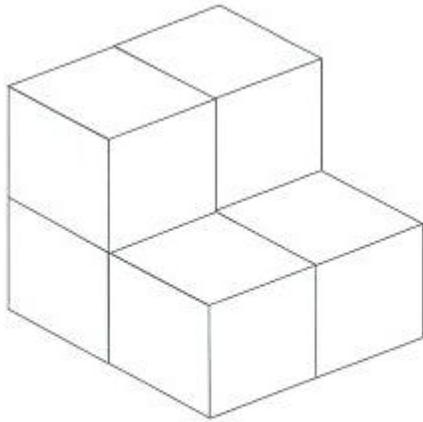
Ans: _____

49. The solid below is made up of 4 identical cubes. The whole solid is painted green. If the total area which is painted green is 450 cm^2, find the volume of the solid.

Ans: _____

50. The solid below is made up of cubes of side 6 cm.
    (a)   Find the volume of the solid.
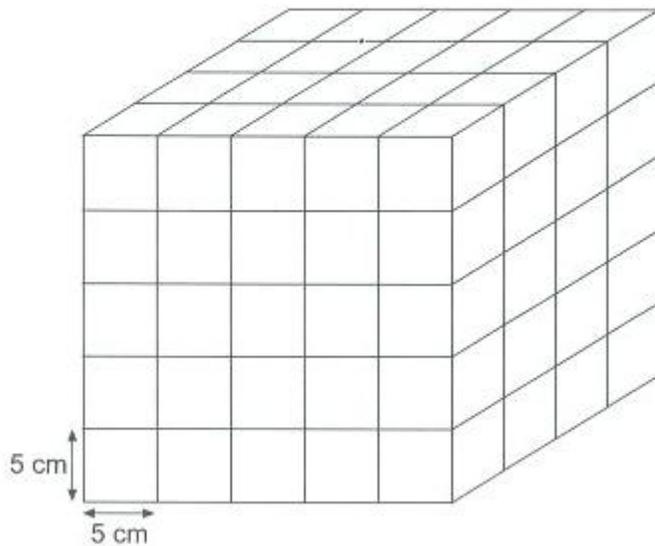   (b)   If the whole solid is painted gold, find the total area which is painted gold.

Ans: (a) _____

(b) _____

51. The cuboid below is made up of 5-cm cubes. The whole cuboid is painted. Find the ratio of the number of cubes with 3 painted faces to the number of cubes with 2 painted faces to the number of cubes without any painted faces.
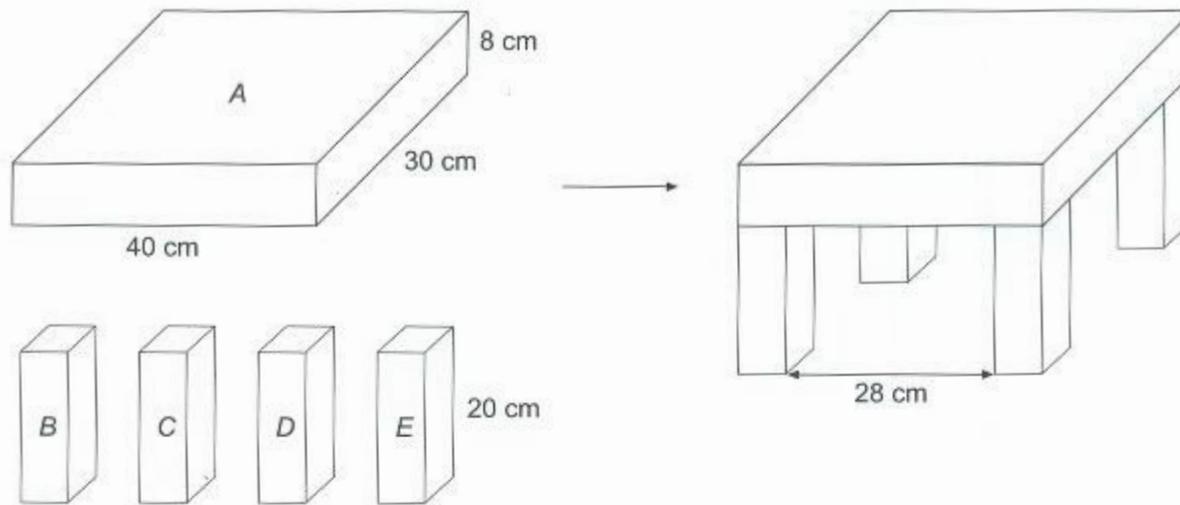
5 cm

5 cm

Ans: _____

52. The figure below shows an empty water container. It is made up of a cube of side 14 cm and a cuboid which has a square base of side 6 cm and a height of 30 cm. 3.5 litres of water is poured into the container. Find the height of the water level in the container.

6 cm

30 cm
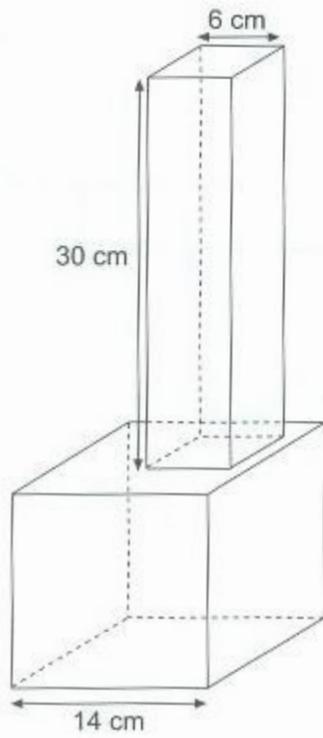
14 cm

Ans: _____

53. The figure below show 5 blocks of wood which are assembled to form a stool. Blocks *B*, *C*, *D* and *E* have square bases and are identical.
    (a) Find the length of an edge of the square base of Block *B*.
    (b) Find the volume of wood used to make the stool.

8 cm

A

30 cm

40 cm

B   C   D   E

20 cm

28 cm

Ans: (a) _____

(b) _____