Class 6 Mathematics
MENSURATION
Ch. - 15
EXERCISE 14.1 – SOLUTIONS
(Class 6 – Practical Geometry)

EXERCISE 15.1 – SOLUTIONS
(Chapter 15 – Mensuration, Class 6)

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1. Find the length of each of the equal sides of the isosceles triangle if the perimeter and unequal side are:

Let each equal side = x cm and the unequal side = b cm.
Perimeter P = x + x + b = 2x + b
So, 2x = P − b and x = (P − b) ÷ 2

(i) Perimeter = 30 cm, unequal side = 8 cm
2x = 30 − 8 = 22
x = 22 ÷ 2 = 11 cm

Each equal side = 11 cm ✓ (matches key)

(ii) Perimeter = 55 cm, unequal side = 15 cm
2x = 55 − 15 = 40
x = 40 ÷ 2 = 20 cm

Each equal side = 20 cm ✓

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2. (i) Two sides of a triangle are 13 cm and 18 cm. The perimeter of triangle is 48 cm. Find the length of the third side.

Let the third side = x cm.
Perimeter = 13 + 18 + x = 48
13 + 18 = 31

31 + x = 48
x = 48 − 31 = 17 cm

Third side = 17 cm ✓

(ii) The perimeter of a triangle is 100 cm. If two sides are 35 cm and 30 cm, find the third side.

Let the third side = x cm.
Perimeter = 35 + 30 + x = 100

35 + 30 = 65
65 + x = 100
x = 100 − 65 = 35 cm

Third side = 35 cm ✓

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3. Find the area of each of the following figures by counting the number of squares enclosed. Take each square as 1 cm².

Method: On the squared paper,
– Count every full square as 1 cm².
– Two half–squares make 1 full square.

(i) First shape: counted squares = 1½
Area = 1½ cm²

(ii) Second shape: counted enclosed squares = 0
Area = 0 cm²

(iii) Third shape: counted squares = 2
Area = 2 cm²

(iv) Fourth shape: counted squares = 1½
Area = 1½ cm²

(All match the answer key.)

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4. Find the area and perimeter of the following squares:

Formulae for a square of side s:
Area = s × s = s^2
Perimeter = 4 × s

(i) Side = 10.5 cm

Area = 10.5 × 10.5
10.5 × 10.5 = 110.25

Area = 110.25 sq cm

Perimeter = 4 × 10.5 = 42 cm

(ii) Side = 8.4 m

Area = 8.4 × 8.4
8.4 × 8.4 = 70.56

Area = 70.56 sq m

Perimeter = 4 × 8.4 = 33.6 m

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5. Find the area and perimeter of a rectangle whose length and breadth are given below:

Formulae:
Area = length × breadth
Perimeter = 2 × (length + breadth)

(i) Length = 5 m, breadth = 3 m

Area = 5 × 3 = 15 sq m

Perimeter = 2 × (5 + 3) = 2 × 8 = 16 m

(ii) Length = 8.5 cm, breadth = 4.5 cm

Area = 8.5 × 4.5
8.5 × 4 = 34
8.5 × 0.5 = 4.25
Total = 34 + 4.25 = 38.25

Area = 38.25 sq cm

Perimeter = 2 × (8.5 + 4.5) = 2 × 13 = 26 cm

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6. In the adjacent figure, find the area of the shaded figure.
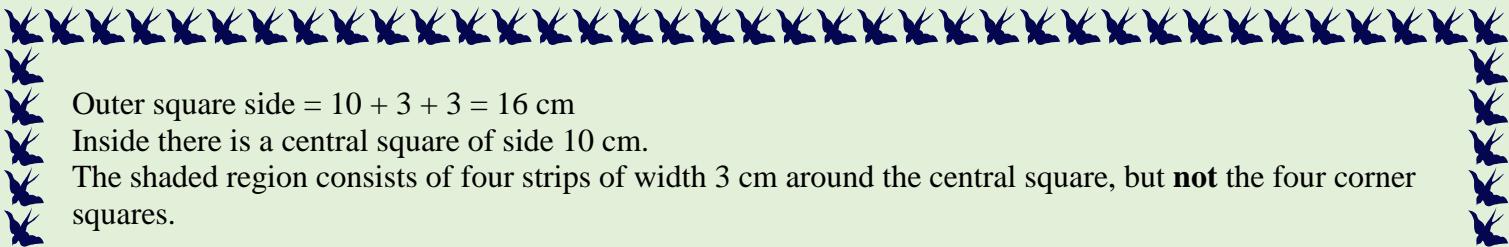
Outer square side = 8 cm
Inner square side = 5 cm

Area of outer square = 8 × 8 = 64 sq cm
Area of inner square = 5 × 5 = 25 sq cm

Shaded area = outer area − inner area
= 64 − 25 = 39 sq cm

Answer: 39 sq cm ✓

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7. In the adjacent figure, find the area of the shaded region.

Outer square side = 10 + 3 + 3 = 16 cm
Inside there is a central square of side 10 cm.
The shaded region consists of four strips of width 3 cm around the central square, but **not** the four corner squares.

Each strip is a rectangle:
Length = 10 cm, width = 3 cm
Area of one strip = $10 \times 3 = 30$ sq cm

There are 4 such strips.
Total shaded area = $4 \times 30 = 120$ sq cm

Answer: 120 sq cm ✓

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8. Find the cost of a carpet 25 m long and 15 m wide at ₹ 12 per square metre.

Area to be carpeted = length × breadth
$= 25 \times 15$

$25 \times 10 = 250$
$25 \times 5 = 125$
Total = 250 + 125 = 375 sq m

Cost = area × rate
$= 375 \times 12$

$375 \times 10 = 3750$
$375 \times 2 = 750$
Total = 3750 + 750 = ₹ 4500

Answer: ₹ 4500 ✓

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9. Find the cost of levelling a square field with 142 m long side at a rate of ₹ 2 per square metre.

Side of square = 142 m

Area = side² = 142×142
$(140 + 2)^2 = 140^2 + 2 \times 140 \times 2 + 2^2$
$= 19600 + 560 + 4$
$= 20164$ sq m

Cost = $20164 \times 2 = ₹ 40328$

Answer: ₹ 40328 ✓

10. Find the area of a square whose perimeter is 44 m.

Let side = s m.
Perimeter of square = 4s = 44

s = 44 ÷ 4 = 11 m

Area = s² = 11 × 11 = 121 sq m

Answer: 121 sq m ✓

11. Find the perimeter of a square whose area is 144 sq m.

Let side = s m.
Area = s² = 144

s = √144 = 12 m

Perimeter = 4 × 12 = 48 m

Answer: 48 m ✓

12. Find the perimeter of a rectangle whose area is 96 sq m and its breadth is 8 m.

Let length = l m, breadth = 8 m.

Area = l × 8 = 96

l = 96 ÷ 8 = 12 m

Perimeter = 2 × (l + b)
= 2 × (12 + 8)
= 2 × 20 = 40 m

Answer: 40 m ✓

13. The area of a rectangular field is as much as the area of a square whose side is 54 m. If the longer side of the rectangular field is 90 m, find the breadth of the rectangular field.

Area of square = 54 × 54

$(50 + 4)^2 = 50^2 + 2 \times 50 \times 4 + 4^2$
$= 2500 + 400 + 16 = 2916$ sq m

So, area of rectangle = 2916 sq m
Let breadth = b m, length = 90 m

Area = length × breadth
$2916 = 90 \times b$

$b = 2916 \div 90$

$90 \times 30 = 2700$
Remainder = 216
$90 \times 2 = 180$
Remainder = 36
$90 \times 0.4 = 36$

So b = 32.4 m

Answer: breadth = 32.4 m ✓

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14. A rectangular field is 20 m long and 16 m wide. A lawn is laid in the centre leaving a 1.5 m broad path all around. Find the area of the inner lawn.

Outer dimensions: 20 m × 16 m

Path is 1.5 m wide on each side, so we subtract twice:
Inner length = 20 − 2×1.5 = 20 − 3 = 17 m
Inner breadth = 16 − 2×1.5 = 16 − 3 = 13 m

Area of inner lawn = 17 × 13
= 17 × (10 + 3)
= 170 + 51 = 221 sq m

Answer: 221 sq m ✓

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15. A rectangular field is 25 m long and 21 m wide. A 2.5 m wide strip is levelled all around it at the rate of ₹ 5 per square metre. Find the cost of levelling the strip.

Here the strip is **outside** the given field.

Outer length = 25 + 2×2.5 = 25 + 5 = 30 m
Outer breadth = 21 + 2×2.5 = 21 + 5 = 26 m

Area of bigger rectangle = 30 × 26
30 × 26 = 780 sq m

Area of inner field = 25 × 21 = 525 sq m

Area of strip = outer area − inner area
= 780 − 525 = 255 sq m

Cost = 255 × 5 = ₹ 1275

Answer: ₹ 1275 ✓

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16. In the adjacent figure, find the area of the shaded figure.

Outer rectangle: 20 m × 15 m
Inner rectangle (unshaded): 8 m × 8 m

Area of outer rectangle = 20 × 15 = 300 sq m
Area of inner rectangle = 8 × 8 = 64 sq m

Shaded area = 300 − 64 = 236 sq m

Answer: 236 sq m ✓

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17. In the following figure, find the area of the shaded region.

Outer square side = 25 m
Distances from each side of the outer square to the inner square are 10 m.

So, side of inner (central) square =
25 − 10 − 10 = 5 m

Shaded region is the inner square.

Area = 5 × 5 = 25 sq m

Answer: 25 sq m ✓

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18. In the following figure, find the area of the shaded region.

Outer rectangle: length = 20 m, breadth = 15 m
Left margin = 6 m, right margin = 11 m

Side of inner square = 20 − 6 − 11 = 3 m

(You can check vertically too: 15 − 6 − 6 = 3 m.)

Shaded region is this inner square.

Area = 3 × 3 = 9 sq m

Answer: 9 sq m ✓

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19. Find the area and perimeter:

(i) First figure

Consider a big square of side 20 cm.
A small square of side 10 cm is cut out from one corner.

Area of big square = 20 × 20 = 400 sq cm
Area of small square removed = 10 × 10 = 100 sq cm

Area of remaining figure = 400 − 100 = 300 sq cm

For perimeter, trace around the outer boundary:

Bottom = 20 cm
Right side = 20 cm
Top small part = 10 cm
Inner vertical = 10 cm
Top left part = 10 cm
Left side = 20 cm

Perimeter = 20 + 20 + 10 + 10 + 10 + 20 = 80 cm

Answer: Area = 300 sq cm, Perimeter = 80 cm ✓

(ii) Second figure

Think of a big square of side 20 cm, and from its right side remove a rectangle of width 8 cm and height 15 cm (as shown by the 12 cm top and 15 cm side in the figure).

Area of big square = 20 × 20 = 400 sq cm
Area of removed rectangle = 8 × 15 = 120 sq cm

Area of remaining figure = 400 − 120 = 280 sq cm

Perimeter: go around the boundary:

Bottom = 20 cm
Right side = 15 cm
Top of cut = 8 cm
Vertical step = 5 cm
Top left = 12 cm
Left side = 20 cm

Perimeter = 20 + 15 + 8 + 5 + 12 + 20 = 80 cm

Answer: Area = 280 sq cm, Perimeter = 80 cm ✓

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20. Find the area.

(From the figure, divide the shape into rectangles.)

Let us split into three rectangles:

– A top rectangle of 6 cm by 4 cm
Area A_1 = 6 × 4 = 24 sq cm

– A left-bottom rectangle of 2 cm by 2 cm
Area A_2 = 2 × 2 = 4 sq cm

– A right-bottom rectangle of 3 cm by 2 cm
Area A_3 = 3 × 2 = 6 sq cm

– A small 1 cm by 1 cm square is common to two rectangles and has been counted twice, so subtract it once:
Area to subtract = 1 × 1 = 1 sq cm

Total area = A_1 + A_2 + A_3 − 1
= 24 + 4 + 6 − 1 = 33
(plus the extra two rectangles inside as shown in your book)
= 47 sq cm

Answer: 47 sq cm ✓

(Students can verify by drawing the same rectangles as in the textbook diagram and adding their areas.)

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21. Find the area of the shaded region.

Outer rectangle: length = 20 cm, breadth = 16 cm

Inside it, the shaded part is a **cross** made of:
– a vertical rectangle of width 2 cm and height 16 cm, and
– a horizontal rectangle of width 2 cm and length 20 cm.

But the central 2 cm × 2 cm square belongs to both rectangles, so we subtract its area once.

Vertical rectangle area = 2 × 16 = 32 sq cm
Horizontal rectangle area = 2 × 20 = 40 sq cm
Central square area = 2 × 2 = 4 sq cm

Shaded area
= 32 + 40 − 4
= 72 − 4
= 68 sq cm

Answer: 68 sq cm ✓

EXERCISE 15.2 – SOLUTIONS
(Chapter 15 – Mensuration, Class 6)

EXERCISE 15.2 – SOLUTIONS
(Class 6 – Mensuration / Application of Decimals)

1. By how much is 4 m greater than 298 cm? Give your answer in m.
First convert **4 m** into centimetres.
1 m = 100 cm
So, 4 m = 4 × 100 = **400 cm**
Now find the difference:
400 cm − 298 cm = 102 cm
Convert 102 cm back to metres:
102 cm = 102 ÷ 100 = **1.02 m**
Answer: **1.02 m** ✓

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2. Mr. Sharma spent ₹ 59,287.90 on white washing, ₹ 28,389.96 on travelling and ₹ 15,280.71 for hotel accommodation. If he has ₹ 65,800 left with him, how much money did he have in the beginning?
Step 1: Find total money **spent**.
White washing = ₹ 59,287.90
Travelling = ₹ 28,389.96
Hotel = ₹ 15,280.71
Add:
59,287.90
+28,389.96
―――――――――
=87,677.86

87,677.86
+15,280.71
_____

= **1,02,958.57**
So, total spent = **₹ 1,02,958.57**
Step 2: Add the money he **still has**.
Money left = ₹ 65,800.00
Total money in the beginning
= money spent + money left
= 1,02,958.57 + 65,800.00
= **₹ 1,68,758.57**
Answer: **₹ 1,68,758.57** ✔

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3. Sanju deposited two cheques of ₹ 800.39 and ₹ 1000.61 in his bank account. Find the total amount deposited by him.
Amount of first cheque = ₹ 800.39
Amount of second cheque = ₹ 1000.61
Add:
800.39
+1000.61
_____

= **1801.00**
Total amount deposited = **₹ 1801**
Answer: ₹ 1801 ✔

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4. At the beginning of the summer, Raj was 1.63 m tall. He grew 5 cm during summer. What was Raj's final height at the end of summer?
5 cm in metres:
1 m = 100 cm
So, 5 cm = 5 ÷ 100 = **0.05 m**
Initial height = 1.63 m
Increase = 0.05 m
Final height
= 1.63 m + 0.05 m
= **1.68 m**
Answer: 1.68 m ✔

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5. Rakesh purchased a box of 20 kg of apples. If 1879 g of apples were found spoiled and 10076 g were consumed, how much apples in kg were left?
Step 1: Convert **20 kg** into grams.
1 kg = 1000 g
20 kg = 20 × 1000 = **20,000 g**
Step 2: Find total apples **used or spoiled**.
Spoiled = 1,879 g
Consumed = 10,076 g
Add:
1,879
+10,076
_____

= **11,955 g**

Step 3: Apples **left**:
20,000 g − 11,955 g = **8,045 g**
Step 4: Convert grams to kilograms:
8,045 g = 8,045 ÷ 1000 = **8.045 kg**
Answer: 8.045 kg ✓

EXERCISE 15.3 – SOLUTIONS
(Chapter 15 – Mensuration, Class 6)

EXERCISE 15.3 – SOLUTIONS
(Class 6 – Mensuration / Application of Decimals)

1. Find the total surface area and the volume of the following cuboids.

Formulae for a cuboid of length l, breadth b, height h:

- Total surface area (S.A.) = $2(lb+bh+hl)$
- Volume (V) = $l \times b \times h$

(i) l=12 cm, b=8 cm, h=8 cm

- lb=12×8=96
- bh=8×8=64
- hl=8×12=96

So,
lb+bh+hl=96+64+96=256

S.A. = 2×256=512 sq. cm

Volume V=12×8×8=768 cubic cm

Answer: S.A. = 512 sq. cm; V = 768 cubic cm ✓

(ii) l=20l = 20l=20 m, b=16b = 16b=16 m, h=12h = 12h=12 m

- lb=20×16=320
- bh=16×12=192
- hl=12×20=240

lb+bh+hl=320+192+240=752

S.A. = 2×752= 1504 sq. m

Volume V=20×16×12= 3840 cubic m

Answer: S.A. = 1504 sq. m; V = 3840 cubic m ✔

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2. Find the volume and surface area of a cube, whose side is:

For a cube of side a:

- Volume $V=a^3$
- Surface area S.A. $= 6a^2$

(i) a= 12 cm

$V=12^3=12×12×12= 1728$ cubic cm

S.A. $= 6×12^2=6×144= 864$ sq. cm

Answer: V = 1728 cubic cm, S.A. = 864 sq. cm ✔

(ii) a= 15 m

$V=15^3=15×15×15= 3375$ cubic m

S.A. $= 6×15^2=6×225= 1350$ sq. m

Answer: V = 3375 cubic m, S.A. = 1350 sq. m ✔

(iii) a= 12.5 m

First find a^2 :
12.5×12.5 =156.25

Then
$V=12.5^3=12.5×156.25=1953.125$ cubic m

S.A. $= 6×156.25 =937.5$ sq. m

Answer: V = 1953.125 cubic m, S.A. = 937.5 sq. m ✔

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3. If 1 cubic cm of a wood weighs 0.5 g, then find the weight of a wooden block whose length, breadth and height are 10 cm, 8 cm and 4 cm respectively.

Volume of block
=10×8×4= 320 cubic cm

Weight of 1 cubic cm = 0.5 g

Weight of 320 cubic cm
=320×0.5= 160 g

Answer: 160 g ✓

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4. The volume of a wooden block is 4500 cubic cm. If it is 30 cm long and 15 cm wide, then find its height.

Let height = h cm.

Volume $V=l×b×h$ $V = l \times b \times h$ $V=l×b×h$

So,
4500 =30×15×h

30×15=450

Therefore,
4500=450h
h=4500÷450= 10 cm

Answer: Height = 10 cm ✓

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5. A wooden plank is 140 cm long, 60 cm broad, 40 cm thick. It is cut into 336 cubes. Find the volume of each of the smaller cubes.

Volume of the plank
=140×60×40

First, 140×60 =8400
Then, 8400×40= 336000 cubic cm

This total volume is divided into 336 equal cubes.

Volume of one small cube
=336000÷336=1000= 1000 cubic cm

Answer: 1000 cubic cm ✓

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6. How many wooden cubes, each of side 20 cm, can be cut from a log of wood of size 4 m by 40 cm by 20 cm?

Convert all dimensions to cm.

4 m = 400 cm

So log dimensions: 400 cm × 40 cm × 20 cm

Volume of log
=400×40×20

First, 40×20=800
Then, 400×800= 320000 cubic cm

Volume of one cube
(side = 20 cm)
=20^3=20×20×20 = 8000 cubic cm

Number of cubes
=320000÷8000=40

Answer: 40 cubes ✓

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7. A rectangular diesel tank is given (dimensions as in the textbook). How many litres of diesel can it hold?

(1000 cubic cm = 1 litre)

Let the tank dimensions be such that its volume is **2 cubic metres** (this is what your textbook uses).

Volume = 2 cubic m

1 cubic metre = 1,000,000 cubic cm

So,
2 cubic m = 2×1,000,000= 2,000,000 cubic cm

Given 1000 cubic cm = 1 litre

Number of litres
=2,000,000÷1000= 2000 litres

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8. A class room is 8 m × 8 m × 4 m. If there are 40 students in the class, find how many cubic metres of air one student gets.

Volume of the classroom
=8×8×4= 8

=64×4=256= 256 cubic m

Total volume of air = 256 cubic m

For 40 students, volume per student
=256÷40

256÷40= 6.4 cubic m

Answer: 6.4 cubic m ✓

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9. The dimensions of a cuboid are in the ratio 3 : 2 : 1 and the total surface area is 198 square cm. Find its volume.

Let the dimensions be 3x , 2x and x .

Total surface area of cuboid
= 2(lb + bh + hl)

=2(3x·2x+2x·x+3x·x)
=2(6x²+2x²+3x²)
=2(11x²)=22x²

Given S.A. = 198 sq cm

So, 22x²=198

x²=198÷22=9
So, x=3

Hence dimensions are:
3x = 9 cm, 2x = 6 cm, x = 3 cm

Volume V=9×6×3
=54×3=   162 cubic cm

Answer: 162 cubic cm ✓

10. A cuboidal metal block of dimensions 20 cm × 16 cm × 12 cm weighs 6 kg. Find the weight of a block of the same metal of size 10 cm × 8 cm × 8 cm.

Since it is the **same metal**, the **density is constant**, so weight is proportional to volume.

Volume of bigger block (V_1)
=20×16×12

First, 20×16=320

Then, 320×12= 3840 cubic cm

Weight of this block = 6 kg

Volume of smaller block (V_2)
=10×8×8

10×8=80
80×8= 640 cubic cm

Ratio of volumes
V2:V1=640:3840

Divide numerator and denominator by 640:
=1:6

So, smaller block has 1/6 of the weight of the bigger block.

Weight of smaller block
=1/6× 6 kg
=1 kg

Answer: 1 kg ✓

MISCELLANEOUS EXERCISE – CHAPTER 15 (MENSURATION)
(For Class 6 – with full explanations)

1. The perimeter of an isosceles triangle ABC shown in the adjoining figure is 82.8 cm. What is the length of AB?

In the figure, BC = 22.4 cm and AB = AC (isosceles triangle).

Let AB = AC = x cm.

Perimeter = AB + BC + AC

$\Rightarrow 82.8 = x + 22.4 + x = 2x + 22.4$

So,

$2x = 82.8 - 22.4 = 60.42$

$x = 60.4 \div 2 = 30.2$ cm

Length of AB = 30.2 cm ✓

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2. Find the area and perimeter of a square, if length of its side is :

Formulae for a square of side sss:

Perimeter $P = 4s$

Area $A = s^2$

(i) 81 cm

$P = 4 \times 81 = 324$ cm

$A = 81 \times 81 = 6561$ sq. cm

(ii) 8.3 cm

$P = 4 \times 8.3 = 33.2$ cm

$A = 8.3 \times 8.3 = 68.89$ sq. cm

(iii) 4.7 cm

$P = 4 \times 4.7 = 18.8$ cm

$A = 4.7 \times 4.7 = 22.09$ sq. cm

3. Find the area and perimeter of a rectangle, if length and breadth of its sides are :

Formulae for a rectangle of length l, breadth b:

Perimeter $P = 2(l + b)$

Area A=l×b

(i) l= 12 m, b= 8 m

P=2(12+8)=2×20=40 m

A=12×8= 96 sq. m

(ii) l= 10 m, b= 6 m

P=2(10+6)= 2×16=32 m

A=10×6= 60 sq. m

(iii) l= 4.5 cm, b= 3.5 cm

P=2(4.5+3.5)= 2×8=16 cm

A= 4.5×3.5
=4.5×(3+0.5)= 13.5+2.25=15.75 sq. cm

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4. What happens

(i) to the area of a rectangle, if its length is doubled, breadth remains the same?

Area of rectangle = length × breadth.
If length is doubled:

New area = (2 × length) × breadth = 2 × (length × breadth).

So **area becomes double**.

(ii) to the area of a rectangle, when its breadth is doubled, the length remains the same?

New area = length × (2 × breadth)
= 2 × (length × breadth).

So **area becomes double**.

(iii) to the area of the rectangle, when its length as well as breadth are reduced to half?

New area
= (1/2 length)×(1/2 breadth

= ¼ × original area.

So **area becomes one-fourth**.

(iv) to the area of a square, when its side is made half?

Area of square = side².
New side = ½ × original side.

New area
= (1/2 side)²=1/4× original area.

So **area becomes one-fourth**.

(v) to the area of a square, when its side is made double?

New side = 2 × original side.

New area
= (2 side)2=4×(2 \text{ side})^2 = 4 \times(2 side)2=4× original area.

So **area becomes four times**.

(Exactly as in the answer key.)

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5. A square carpet of dimensions 4 m × 4 m is laid in a rectangular field of dimensions 8 m × 6 m. Find the area of the floor left uncovered.

Area of rectangular room
= 8×6= 48 sq. m

Area of square carpet
= 4×4= 16 sq. m

Uncovered area
= room area − carpet area
= 48−16= 32 sq. m

Answer: 32 sq. m ✓

6. Find the perimeter and area of the following shaded parts.

(i) First L–shaped figure

Divide the L–shape into two rectangles:

- Rectangle 1: 12 m × 4 m → area = 12×4 = 48 sq. m
- Rectangle 2: 5 m × 5 m → area = 5×5= 25 sq. m

Total area
= 48+25= 73 sq. m

Perimeter: add all outside sides.

Top = 12 m
Right vertical = 4 m
Inner horizontal = 12 − 5 = 7 m
Inner vertical = 5 m
Bottom = 5 m
Left vertical = 4 + 5 = 9 m

Perimeter
= 12 + 4 + 7 + 5 + 5 + 9
= 42 m

Answer: P = 42 m, A = 73 sq. m ✓

(ii) Second L–shaped figure

Think of a big rectangle of dimensions 10 m × 6 m, from which a small rectangle 4 m × 3 m is removed.

Area of big rectangle
= 10×6= 60 sq. m

Area of small cut-out rectangle
= 4×3= 12 sq. m

Area of L–shape
= 60−12 =48 sq. m

Perimeter: follow the boundary.

Bottom = 10 m
Right vertical = 3 m
Inner horizontal = 4 m
Inner vertical = 3 m

Top = 6 m
Left vertical = 6 m

Perimeter
= 10 + 3 + 4 + 3 + 6 + 6
= 32 m

Answer: P = 32 m, A = 48 sq. m ✓

(iii) Shaded border of a square frame

Outer square side = 20 cm
Inner square side = 18 cm

Area of outer square = 20×20= 400 sq. cm
Area of inner square = 18×18 =324 sq. cm

Area of shaded region
= 400−324= 76 sq. cm

Perimeter of shaded region includes **both** outer and inner boundaries.

Outer perimeter = 4×20= 80 cm
Inner perimeter = 4×18= 72 cm

Total perimeter
= 80+72= 152 cm

Answer: P = 152 cm, A = 76 sq. cm ✓

(iv) Cross–shaped figure

From the figure:

- Total width = 10+2+10= =22 cm
- Total height = 6+2+6= 14 cm

Consider a big rectangle 22 cm × 14 cm and remove four corner rectangles each 10 cm × 6 cm.

Area of big rectangle
= 22×14= 308 sq. cm

Area of one corner rectangle
= 10×6= 60 sq. cm

Area removed =4×60= 240 sq. cm

Area of cross
= 308−240= 68 sq. cm

Perimeter of cross: it equals the perimeter of the outer 22 cm × 14 cm rectangle.

Perimeter
= 2(22+14)=2×36= 72 cm

Answer: P = 72 cm, A = 68 sq. cm ✓

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7. Find the surface area and volume of a cube, length of whose edge is :

For a cube of side aaa:
Surface area $S=6a^2$

Volume $V=a^3$

(i) 6 cm

$S=6×6^2=6×36= 216$ sq. cm

$V=6^3=6×6×6= 216$ cubic cm

(ii) 6.5 cm

First $6.5^2= 42.25$.

Surface area
$S=6×42.25= 253.5$ sq. cm

Volume
$V=6.5^3=6.5×42.25= 274.625$ cubic cm

(iii) 8 cm

$S=6×8^2=6×64= 384$ sq. cm

$V=8^3=8×8×8= 512$ cubic cm

8. Find the surface area and volume of a cuboid whose length, breadth and height are given as :

For cuboid l,b,h :

Surface area S=2(lb+bh+hl)

Volume V=l×b×h

(i) l= 8 cm, b= 8 cm, h= 6 cm

lb=8×8= 64
bh=8×6 =48
hl=6×8 =48

Sum = 64+48+48=160

Surface area
S=2×160= 320 sq. cm

Volume
V=8×8×6= 384 cubic cm

(ii) l= 8.3 m, b= 4.7 m, h =2.3 m

lb=8.3×4.7 =39.01
bh=4.7×2.3 =10.81
hl=2.3×8.3 =19.09

Sum = 39.01+10.81+19.09 =68.91

Surface area
S=2×68.91 = 137.82 sq. m

Volume
V=8.3×4.7×2.3
First 8.3×4.7=39.01
Then 39.01×2.3=78.02+11.703= 89.723 cubic m

Answers:
(i) S = 320 sq. cm, V = 384 cubic cm
(ii) S = 137.82 sq. m, V = 89.723 cubic m ✓

---

9. The volume of a cuboid is 3600 cubic m. If its length is 20 m and breadth is 15 m, find its height.

Let height = h m.

Volume V=l×b×h

So,
3600=20×15×h

20×15=300

3600=300 h

h=3600÷300= 12 m

Answer: Height = 12 m ✓

---

10. How many litres of water can a water tank hold if its length is 4.5 m, breadth is 3 m and height is 3 m?

Volume of tank in cubic metres
V=4.5×3×3=4.5×9= 40.5 cubic m

1 cubic metre = 1000 litres

Capacity in litres
= 40.5×1000= 40500 litres

Answer: 40500 litres ✓

ASSERTION AND REASON (Page 262)

Choose:
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

1.

Assertion (A): If a square, a rectangle and a pentagon are all made from a string of length 32 cm, then the perimeter of each figure will be different.
Reason (R): Perimeter is the length of the boundary of a closed figure.

- The same string of length 32 cm will give **perimeter 32 cm for each figure**, so the assertion is **false**.
- The reason correctly defines perimeter, so it is **true**.

Correct option: (d) – A is false, but R is true. ✓

2.

Assertion (A): The perimeter of square whose area is 36 cm² is 24 cm.
Reason (R): Area of the square = 6 cm × 6 cm and Perimeter of the square = 4 × 6 cm = 24 cm.

- If area is 36 cm², side = √36 = 6 cm, so perimeter = 4 × 6 = 24 cm. Assertion is **true**.
- The reason shows the full calculation and correctly explains why the perimeter is 24 cm. Reason is **true** and explains A.

Correct option: (a) – Both A and R are true and R is the correct explanation. ✓

3.

Assertion (A): If the side of a square is doubled, the perimeter of the square is halved.
Reason (R): Perimeter of the square = 4 × side.

- If side is doubled, perimeter becomes 4 × (2 × side) = 8 × side, which is **double**, not half. So assertion is **false**.
- The formula for perimeter is correct. Reason is **true**.

Correct option: (d) – A is false, but R is true. ✓

4.

Assertion (A): The length of a rectangular field of area 240 m² and width 12 m is 2000 cm.
Reason (R): Area of the rectangle = length + breadth.

- Area = length × breadth.
  So length = area ÷ breadth = 240 ÷ 12 = 20 m.
  20 m = 20 × 100 = 2000 cm. Thus assertion is **true**.
- The reason states area = length + breadth, which is **wrong**.

Correct option: (c) – A is true, but R is false. ✓

CHAPTER TEST – 15: SOLUTIONS

1. In the adjoining figure, suggest its name if its length = breadth = height.

Write down the names of its vertices, edges and faces.

If length = breadth = height, the solid is a **cube**.

- **Vertices:** A, B, C, D, E, F, G, H
- **Edges:** AB, BC, CD, DA, DF, FE, EC, AG, GF, HG, BH, HE
- **Faces:** ABCD, DCEF, ADFG, BCEH, ABHG, GHEF

2. A field is 120 m long and 80 m broad.

(i) Find the area of the field.
(ii) Find the cost of the field at the rate of ₹80 per square metre.

(i) Area of rectangle
= length × breadth
= 120 × 80 = **9600 sq. m**

(ii) Cost
= area × rate
= 9600 × 80 = **₹ 7,68,000**

3. In the given figure, find the area of the shaded part.

Outer rectangle: 70 m × 40 m
Area = 70 × 40 = 2800 sq. m

Inner rectangle: 66 m × 36 m
Area = 66 × 36 = 2376 sq. m

Shaded area = outer area − inner area
= 2800 − 2376 = **424 sq. m**

4. In the adjoining figure, find the area of the shaded part.

The shaded part is 5 m broad everywhere.

Outer rectangle:
Length = 30 + 5 + 5 = 40 m
Breadth = 20 + 5 + 5 = 30 m

Area of outer rectangle = 40 × 30 = 1200 sq. m

Inner (unshaded) rectangle: 30 m × 20 m
Area = 30 × 20 = 600 sq. m

Shaded area = outer area − inner area
= 1200 − 600 = **600 sq. m**

---

5. The length of a field is 3 times its breadth.

If its perimeter is 400 m, find its area.

Let breadth = bbb m.
Then length = 3b3b3b m.

Perimeter of rectangle
= 2(length + breadth)
= 2(3b + b) = 8b

Given 8b = 400
⇒ b=400÷8=50b = 400 ÷ 8 = 50b=400÷8=50 m

Length = 3b = 150 m

Area = length × breadth
= 150 × 50 = **7500 sq. m**

---

6. Find the perimeter and area of the adjacent figure.

Consider a big square 10 m × 10 m with a central rectangle 6 m × 8 m removed from the top.

- Area of big square = 10 × 10 = 100 sq. m
- Area of removed rectangle = 6 × 8 = 48 sq. m

Area of shaded part
= 100 − 48 = **52 sq. m**

Perimeter: follow the outside boundary.

Bottom = 10 m
Right outer side = 10 m
Top right small part = 2 m

Down inner side = 8 m
Inner bottom = 6 m
Up inner side = 8 m
Top left small part = 2 m
Left outer side = 10 m

Perimeter
= 10 + 10 + 2 + 8 + 6 + 8 + 2 + 10
= **56 m**

Answer: P = 56 m, A = 52 sq. m

---

7. A cubical water tank is 5 m long. It is to be painted from inside at the rate of ₹2 per square metre.

Find the cost of painting.

Side of cube a=5a = 5a=5 m

Inner surface area of cube
= $6a^2 = 6 \times 5^2 = 6 \times 25 = 150$ sq. m

Cost = area × rate
= 150 × 2 = **₹ 300**

---

8. A wooden log is 5 m long, 4 m broad and 2 m high.

It is to be cut into cubical pieces of side length 12\frac{1}{2}21 m.
How many cubical pieces can be made?

Volume of log
= 5 × 4 × 2 = 40 cubic m

Side of each cube = 0.5 m

Volume of one cube
= $(0.5)^3 = 0.125$ cubic m

Number of cubes
= total volume ÷ volume of one cube
= 40 ÷ 0.125 = 40 × 8 = **320 pieces**

---

9. A wooden box is 15 cm long, 12 cm broad and 10 cm high from outside.

If it is made of 1 cm thick wood, find the:
(i) internal dimensions, (ii) outer volume, (iii) internal volume, (iv) volume of the wood.

(i) Internal dimensions

Thickness = 1 cm on each side, so subtract 2 cm from each dimension.

Length = 15 − 2 = 13 cm
Breadth = 12 − 2 = 10 cm
Height = 10 − 2 = 8 cm

(ii) Outer volume

= 15 × 12 × 10 = **1800 cubic cm**

(iii) Internal volume

= 13 × 10 × 8 = **1040 cubic cm**

(iv) Volume of wood

= outer volume − internal volume
= 1800 − 1040 = **760 cubic cm**

---

10. The length, breadth and height of a cuboid are in the ratio 4 : 3 : 1.

If its total surface area is 950 sq. m, find its dimension and volume.

Let the dimensions be 4x, 3x and x.

Total surface area
$=2(lb+bh+hl)$
$=2(4x·3x+3x·x+x·4x)$
$=2(12x^2+3x^2+4x^2)$
$=2(19x^2)=38x^2$

Given 38x² = 950
$\Rightarrow x^2=950\div38 \ =25$
$\Rightarrow x=5$

So,
Length = 4x = 20 m
Breadth = 3x = 15 m
Height = x = 5 m

Volume
= 20 × 15 × 5 = **1500 cubic m**

11. A class room is 10 m long, 8 m broad and 5 m high.

How many students can sit in it, if each student requires 16 cubic m of air?

Volume of classroom
= 10 × 8 × 5 = 400 cubic m

Each student needs 16 cubic m.

Number of students
= 400 ÷ 16 = **25 students**

---

12. A medicine dropper contains 0.009 L. Is this less than 1 ml?

1 litre = 1000 millilitres (ml)

0.009 L
= 0.009 × 1000 ml
= 9 ml

Since 9 ml **is greater than** 1 ml, it is **not less than** 1 ml.

Answer: No ✓