# L-20 MENSURATION

## Conversion of Units

1 rupee = 100 paise
1 m = 100 cm
1 Km = 1000 m
1 L = 1000 mL
1 KL = 1000 L

1 Kg = 1000 g
1 g = 1000 mg
1 hour = 60 minutes
1 year = 365 days

**Perimeter** → The sum of the lengths of all sides of a plane figure is called the perimeter.

Perimeter of Rectangle = $2(l+b)$
Perimeter of Square = $4a$ (or) $4s$
Perimeter of a Triangle = $a+b+c$

**Area** → The measurement of the region enclosed by a plane figure is called area.

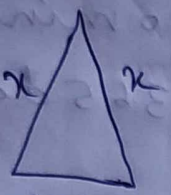
Area of Rectangle = Length × breadth
Area of a Square = $a^2$ (or) $s^2$
Area of right isosceles triangle = $\frac{1}{2}a^2$
Area of right angled triangle = $\frac{1}{2}(l \times b)$
Area of a Parallelogram = $b \times h$
= base × height

# EX 20.1

1) Perimeter of equilateral triangle

$P = 3 \times$ side $= 3 \times 16$ cm

$P = 48$ cm //

2) 


Unequal side of isosceles triangle is 10 cm

$P = 36$ cm.

Let the equal sides be $x$ each.

$P = x + x + 10$

$36 = x + x + 10$

$36 = 2x + 10$

$2x = 36 - 10$

$2x = 26$

$x = \frac{26}{2}$

$x = 13$ cm

So each equal side is 13 cm.

3) Perimeter of square $= 4l$

$P = 4l$

$36 = 4l$

$\frac{36}{4} = l$

$l = 9$ cm //

5) Length $= 83$m, Width $= 33$m.

Perimeter $= 2(l + b)$

$= 2(83 + 33)$

$= 2 \times 116$

$P = 232$ m

Distance to be covered = 812m

No of rounds required = $\frac{812}{232} \div 3.5$

6) Area of Square = S x S

= 3.4 x 3.4

A = 11.56 cm²

7) Area of rectangle = l x b

= 11.2 cm x 7.5 cm

A = 84 cm²

8) A = l x b

117 = ~~9~~ x l x 9

l = $\frac{117}{9}$ = 13 cm.

9) A = S x S

36 = S²

$\sqrt{36}$ = S

S = 6cm.

10) (i) 100 mm²

(ii) 10000 mm²

(iii) 400 mm²

(iv) 250000 cm²

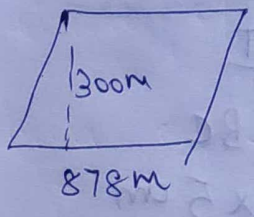
(v) 16 m²

15) Area of parallelogram = ~~486 cm²~~

base x height

= 878 x 300 m.

A = 263400 m²

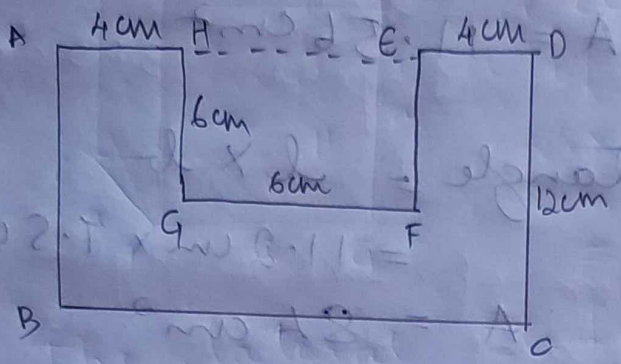


16) $A = \text{base} \times \text{height}$

$486\,cm^2 = 27\,cm \times \text{height}$

$\text{Height} = \frac{486}{27} = 18\,cm$

17) (i)




$AD = AH + HE + ED$

$= 4 + 6 + 4$

$= 14\,cm$

Area of rectangle ABCD $= AD \times DC$

$= 12 \times 12$

$= 168\,cm^2$

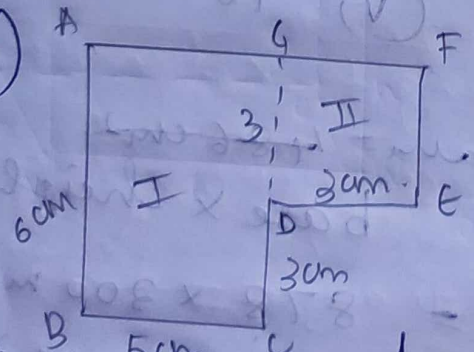
Area of HGFE $= 6\,cm \times 6\,cm$

$= 36\,cm^2$

Area of shaded part $= 168\,cm^2 - 36\,cm^2$

$= 132\,cm^2$

(ii)




$DG = AB - DC$

$= 6 - 3$

$= 3\,cm.$

Area of shaded part I

$= AB \times BC$

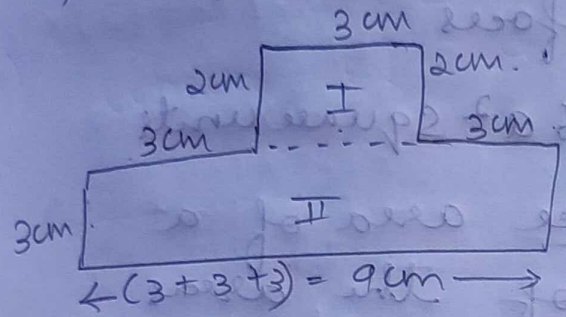
$= 6\,cm \times 5\,cm$

$= 30\,cm^2$

Area of shaded part II = GD × DE
= 3 cm × 3 cm
= 9 cm²

Total area = 30 cm² + 9 cm²
= 39 cm²

(iii)

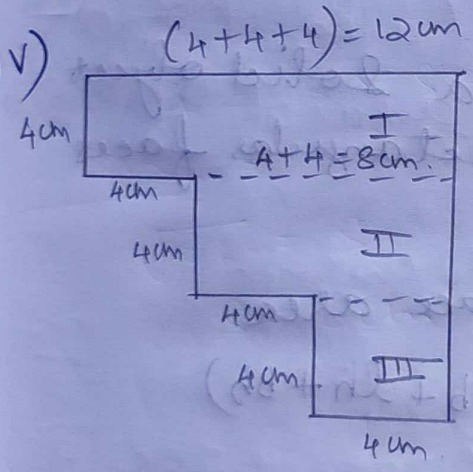



Area of part I
= 3 × 2
= 6 cm²

Area of part II
= 9 × 3
= 27 cm²

Total Area = 6 cm² × 27 cm²
A = 33 cm²

iv)




Area of part I
= 12 cm × 4 cm
= 48 cm²

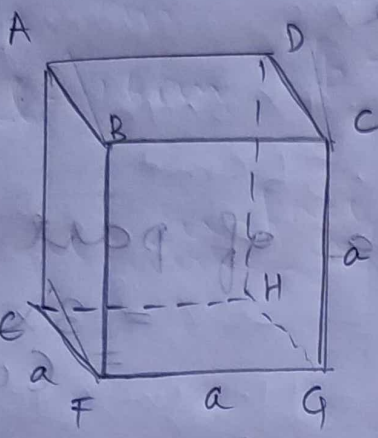
Area of part II = 8 × 4
= 32 cm²

Area of part III = 4 × 4
= 16 cm²

Total Area = 48 + 32 + 16
= 96 cm²

# Surface Area

**Cube** → A cube is a solid object with 6 equal square faces.




The surface area of a cube is the sum of the areas of its six faces.

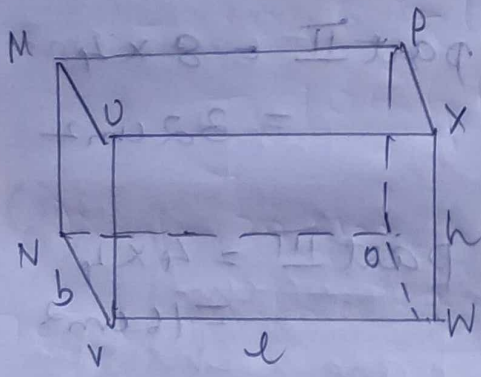
$= 6a^2$ square units

The lateral surface area of a cube is the sum of the areas of the four squares meeting the base

$= 4a^2$ square units

~~Total~~ surface

**Cuboid** → A cuboid is a solid object with 6 rectangular faces




Total Surface area

$= 2(lb + lh + bh)$

Lateral Surface area

$= 2h(l + b)$ Square units

# Ex 20.3

1) (i) 6 cm

Total Surface area of cube $= 6a^2$

$= 6 \times 6^2$

$= 6 \times 36$

$= 216 \text{ cm}^2$

(ii) 3 cm

$= 6a^2$

$= 6 \times 3^2$

$= 6 \times 9 = 54 \text{ cm}^2$

(iii) 1.5 m

$= 6a^2$

$= 6 \times 1.5^2$

$= 6 \times 4.5$

$= 13.5 \text{ m}^2$

(iv) 4.5 cm

$= 6a^2$

$= 6 \times 4.5^2$

$= 121.5 \text{ cm}^2$

2) (i) $l = 4\text{m}$, $b = 3\text{m}$, $h = 2\text{m}$

Total Surface area of cuboid $= 2(lb + lh + bh)$

$= 2(4 \times 3 + 4 \times 2 + 3 \times 2)$

$= 2(12 + 8 + 6)$

$= 2(26) = 52 \text{ m}^2$

(iii) $l = 40\text{cm}$, $b = 25\text{cm}$, $h = 15\text{cm}$

Total Surface area of cuboid $= 2(lb + lh + bh)$

$= 2(40 \times 25 + 40 \times 15 + 25 \times 15)$

$= 2(1000 + 600 + 375)$

$= 3950 \text{ cm}^2$

3) Lateral surface area of cube $= 4a^2$

$= 4 \times (4.5)^2$

$= 4 \times 20.25$

$= 81.00 \text{ cm}^2$

4) $l = 16\text{cm}$, $b = 12\text{cm}$, $h = 10\text{cm}$

Lateral surface area of cuboid $= 2(l+b) \times h$

$= 2(16+12) \times 10$

$= 2 \times 28 \times 10$

$= 560 \text{ cm}^2$.

5) Total surface area of cuboid $= 1046 \text{ cm}^2$

Area of base $= 187 \text{ cm}^2$ = area of top

Lateral surface area of cuboid =

Total surface area $-$ (area of top + area of the base)

$= 1046 - (187 + 187)$

$= 1046 - 374 = 672 \text{ cm}^2$.

6) $l = 30\text{cm}$, $b = 20\text{cm}$, $h = 20\text{cm}$

Total surface area of box $= 2(30 \times 20 + 20 \times 20 + 20 \times 30) \text{ cm}^2$

$= 2(600 + 400 + 600) \text{ cm}^2$

$= 2 \times 1600 \text{ cm}^2$

$= 3200 \text{ cm}^2$

**Volume** → The capacity or the space occupied by a solid figure is known as its Volume.

Volume is expressed in cubic units.

Volume of a cube = $l \times l \times l$

$= l^3$ cubic units

Volume of a cuboid = $l \times b \times h$

or.

Volume = area of base × height

Ex 20.4

2)(i) Volume of cube = $8 \times 8 \times 8$
$= 512 \text{ cm}^3$

(ii) 10 cm
Volume of a cube $= 10 \times 10 \times 10$
$= 1000 \text{ cm}^3$

(iii) Volume of a cube $= 12 \times 12 \times 12$
$= 1728 \text{ cm}^3$

(iv) Volume of a cube $= 1.5 \times 1.5 \times 1.5$
$= 3.375 \text{ m}^3$

3) (i) Volume of cuboid $= l \times b \times h$
$= 20 \times 20 \times 10$
$= 4000 \text{ cm}^3$

(ii) Volume of cuboid $= l \times b \times h$
$= 12 \times 8 \times 6$
$= 576 \text{ cm}^3$

(iii) Volume of cuboid $= l \times b \times h$
$= 8 \times 7 \times 6$
$= 336 \text{ m}^3$

(iv) Volume of cuboid $= l \times b \times h$
$= 2.5 \times 2 \times 1.4$
$= 7 \text{ m}^3$

4) Volume of a cube is $27 m^3$

$V = l \times l \times l$

$27 = l^3$

$\sqrt[3]{27} = 3m.$

T.S.A of cube $= 6 \times (side)^2 = 6 \times 3^2 = 54 m^2$

L.S.A of cube $= 4 \times (side)^2 = 4 \times 3^2 = 36 m^2.$

5) Volume of a room $= 140 m^3 = l \times b \times h.$

Area of floor $= l \times b.$

$35 m^2 = l \times b.$

$$\text{Height} = \frac{\text{Volume of room}}{\text{Area of floor}} = \frac{140}{35} = 4m.$$

6) Area of floor $= 54.4 sq m.$

Height of a room $= 5.2 m.$

Volume of the room $= (l \times b) \times h$

$= 54.4 \times 5.2.$

$= 282.88 m^3$

7) Length of cubical tin $= 30 cm$

Volume of the tin $= (30)^3$

$= 27000 cm^3.$

$= 27$ litres