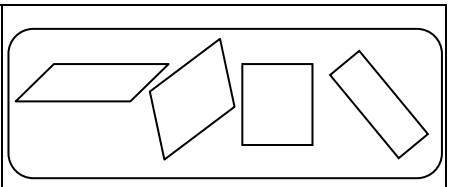
## MENSURATION

**Parallelogram**: Parallelogram is a quadrilateral whose opposite sides are parallel.

- *The diagonals of a parallelogram bisect each other*
- Opposite *sides of a parallelogram are equal, opposite angles are equal*
- If a quadrilateral has each pair of consecutive angles supplementary, then the quadrilateral is a parallelogram.
- If a quadrilateral has both pairs of opposite angles congruent, then the quadrilateral is a parallelogram.
- If each diagonal of a quadrilateral divides it into two congruent triangles, then the quadrilateral is a parallelogram.
- If a quadrilateral has diagonals that bisect each other, then the quadrilateral is a parallelogram.
- If a quadrilateral has one pair of opposite sides congruent and parallel, then the quadrilateral is a parallelogram.



2 adjacent sides are *a & b*.

**(i) Perimeter** = *2( a + b )*

**(ii) (ii) Area** = (*base) .*( *altitude)*

***RECTANGLE:*** *. RECTANGLE IS A PARALLELOGRAM WITH ALL RIGH ANGLES.*

- The diagonals of a rectangle are equal.
- If a parallelogram has at least one right angle, then the parallelogram is a rectangle.
- If a parallelogram has congruent diagonals, then the parallelogram is a rectangle.

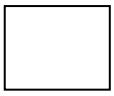
length = *l* breadth = *b*

**Perimeter** = *2( l + b )*

**Area** = *l b*

***SQUARE:*** *A RECTANGLE ALL WHOSE SIDES ARE EQUAL IS CALLEI SQUARE.*

- All angles of a square are right angles.
- Diagonals of a square are equal
- Diagonals of square are perpendicular to each other and are bisectors of angles of the square.
- If a quadrilateral is both a rectangle and a rhombus, then the quadrilateral is a square.



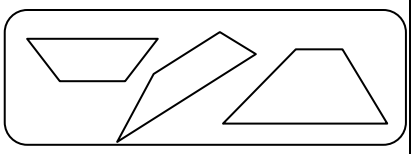
Side = *a*

**Perimeter** = *4a*

**Area** = $a^2$

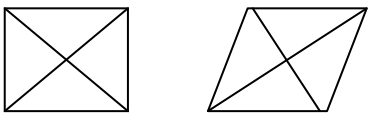
**Trapezoid.:.** A trapezoid is a quadrilateral two opposite sides of which are parallel.

- The median of a trapezoid is parallel to its base and its length is equal to half of the sum of the lengths of its upper and lower base lengths.



**Rhombus :** Rhombus is a parallelogram all whose sides are equal. Diagonals are perpendicular to each other. Rhombus' diagonal is a bisector of its angle.

- If a parallelogram has two adjacent sides congruent, then the parallelogram is a rhombus.
- If a quadrilateral has four congruent sides, then the quadrilateral is a rhombus.
- If a parallelogram has perpendicular diagonals, then the parallelogram is a rhombus.
- If one diagonal of a parallelogram bisects two opposite angles, then the parallelogram is a rhombus.



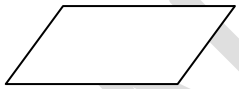
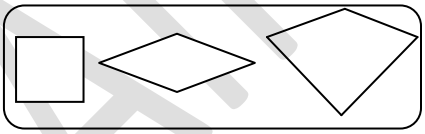
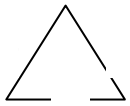
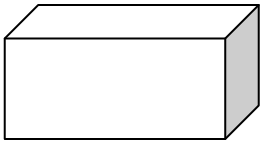
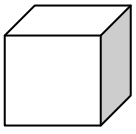
Side = *a* and 2 diagonals are $d_1$ & $d_2$

**Perimeter** = *4a*

**Area** = (*base) .( altitude)* OR

**Area** = $\frac{1}{2} d_1 d_2$

## MENSURATION

| | |
|---|---|
| • If both diagonals of a quadrilateral bisect the vertex angles, then the quadrilateral is a rhombus. | |
| **TRAPEZIUM:** Trapezia have one set of parallel sides; isosceles trapezia have two pairs of adjacent angles equal<br>Two parallel sides are: *a & b.,* Distance between parallel sides = *h*<br>**Area** = $\frac{1}{2}(a+b)\,.\,h$ |  |
| **KITES:** Kites have two pairs of equal adjacent sides and are convex.<br>Kites. |  |
| **TRIANGLE:** Three sides are *a, b & c.*<br>**Perimeter** = *a + b + c* , **Semi perimeter** *(s)* = $\frac{a+b+c}{2}$<br>, **Area** = $\frac{1}{2}$ *(base). ( altitude)***)**<br>**Heron's formula: Area** = $\sqrt{s(s-a)(s-b)(s-c)}$ |  |
| **EQUILATERAL TRIANGLE:** Whose all sides are equal **,** Side = *a*<br>**i)Perimeter** = *3a* **(ii) Area** = $\frac{\sqrt{3}}{4}a^2$ |  |
| **CIRCLE:** Radius = r , **(i) Circumference** = $2\pi r$ **(ii) Area** = $\pi r^2$ | |
| **CUBOID:** Length = *l* breadth = *b* height = *h*<br>**(i) Lateral Surface Area** (or **Area of 4 walls**) = *2h ( l + b )*<br>**(ii) Total Surface Area** = *2( l b + b h + l h )*<br>**(iii) Volume** = *l b h*<br>**(iv) Longest Diagonal** = $\sqrt{l^2+b^2+h^2}$ |  |
| **CUBE:** Edge = *a*<br>**(i) Lateral Surface Area** (or **Area of 4 walls**) = $4a^2$<br>**(ii) Total Surface Area** = $6a^2$, **(iii) Volume** = $a^3$<br>**(iv) Longest Diagonal** = $a\sqrt{3}$ |  |

## MENSURATION

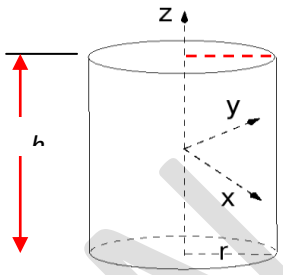
**CYLINDER:** Radius = $r$ height = $h$

**(i) Surface Area** = The **surface area of this open cylinder** is the area of its curved surface given by the product of the distance round the rim and the height. $(2\pi r)h = 2\pi r h$

(ii) If the **top** and **bottom** of the cylinder are covered, we will have a **closed cylinder**. The formula for **volume of prism or cylinder** is given by

$V$ = Volume = (Area of Base)(Height) $V = \pi r^2 h$

**(iii) Total Surface Area** = $2\pi r h + 2\pi r^2 = 2\pi r (r + h)$




### Volume of a Right Circular Cylinder

Volume = (Area of Base)(Height)

$$V = \pi r^2 h$$

**SPHERE:** Radius = r , **Total Surface Area** = $4\pi r^2$

Volume of the Sphere $= \frac{2}{3}$ the Volume of Cylinder

Volume of the Sphere $= \frac{2}{3}\,\frac{2}{3}\left(2\pi r^3\right) = \frac{4}{3}\pi r^3$

**Hemi SPHERE:** Radius = r ,**(i) Curved Surface Area** = $2\pi r^2$,

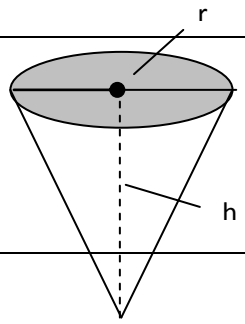
**(ii) Total Surface Area** = $3\pi r^2$ ,**(iii) Volume** = $\frac{2}{3}\pi r^3$

**CONE:** Radius = $r$ height = $h$ slant height = $l$

**(i)** **Total Surface Area** = $\pi r l + \pi r^2 = \pi r (r + l)$

**(ii)** **Volume** = $\frac{1}{3}\pi r^2 h$

**(iii)** **Area of Curved Surface=** $\pi r l = \pi r\sqrt{h^2 + r^2}$




**FRUSTUM:** Radii of Two circular ends are $r_1$ & $r_2$. height = $h$ slant height = $l$

**(i) Curved Surface Area** = $\pi (r_1 + r_2) l$

**(ii) Total Surface Area** = $\pi (r_1 + r_2) l + \pi r_1^2 + \pi r_2^2$

**(iii) Volume** = $\frac{1}{3}\pi h (r_1^2 + r_2^2 + r_1 r_2)$

(iv) Slant height: $l = \sqrt{h^2 + (r_1 - r_2)^2}$