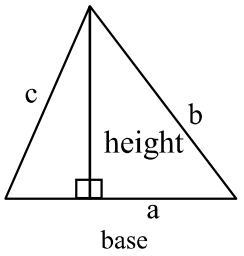
Mensuration

Chapter 15

AREA AND PERIMETER

1. **Triangle**

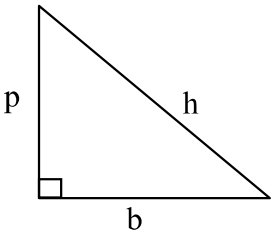


(a) Perimeter (2s) = a + b + c

(b) Area $= \sqrt{s(s-a)(s-b)(s-c)}$

(c) Area $= \frac{1}{2} \times base \times height$ where a, b, c are sides of the triangle and S is semi-perimeter, $S = \frac{a+b+c}{2}$

2. **Right-angled triangle**



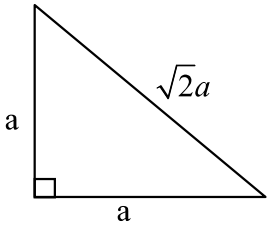
(a) Perimeter = b + p + h

(b) Area = $\frac{1}{2} \times b \times p$

(c) Hypotenuse (h) = $\sqrt{b^2 + p^2}$

where b = base, p = perpendicular, h = hypotenuse

3. **Right-angle Isosceles triangle**

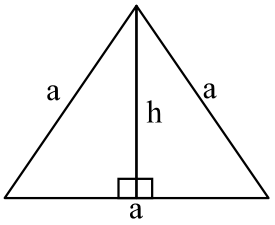


(a) Hypotenuse = $\sqrt{a^2 + a^2} = \sqrt{2}a$

(b) Perimeter = $2a + \sqrt{2}a$

(c) Area = $\frac{1}{2} \times base \times height = \frac{1}{2} \times a \times a = \frac{1}{2}a^2$

4. **Equilateral triangle**

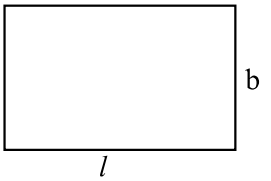


(a) Perimeter = 3a

(b) Height $= \frac{\sqrt{3}}{2}a$

(c) Area $= \frac{\sqrt{3}}{4}a^2$

5. **Rectangle**

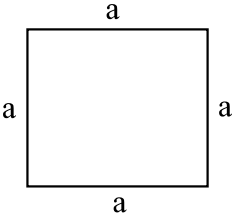


(a) Perimeter = 2 (l+ b)

(b) Diagonal = $\sqrt{l^2 + b^2}$

(c) Area = $l \times b$

6. **Square**

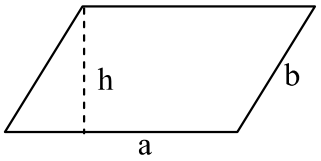


(a) Perimeter = 4a

(b) Diagonal (d) = $\sqrt{2}a$

(c) Area = $a^2 = \frac{1}{2}d^2$

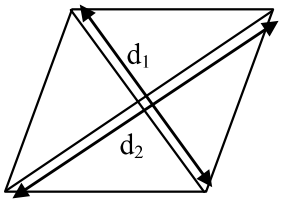
7. **Parallelogram**



(a) Perimeter = 2 (a + b)

(b) Area = Base × Height

8. **Rhombus**

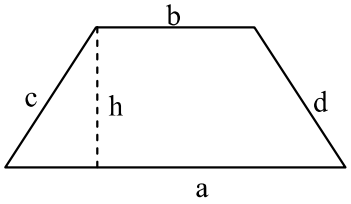


(a) Side = $\frac{1}{2}\sqrt{d_1^2 + d_2^2}$

(b) Perimeter = $2\sqrt{d_1^2 + d_2^2}$

(c) Area = $\frac{1}{2}d_1d_2$

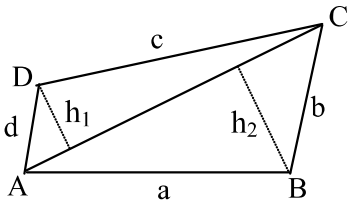
9. **Trapezium**



(a) Area = $\frac{1}{2}(a+b)\times h$

(b) Perimeter = a + b + c + d

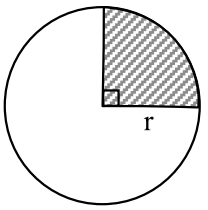
10. **Quadrilateral**



(a) Area = $\frac{1}{2}\times AC\times(h_1+h_2)$

(b) Perimeter = a + b + c + d

11. **Circle**



(a) Diameter (d) = 2r

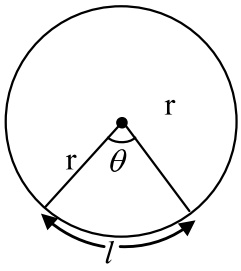
(b) Circumference $= 2\pi r = \pi d$

(c) Area = $\pi r^2 = \frac{\pi d^2}{4}$

(d) Area of semi-circle = $\frac{\pi r^2}{2}$

(e) Area of quadrant = $\frac{\pi r^2}{4}$

12. **Sector**



(a) Area of sector (A) = $\frac{\theta}{360}\times\pi r^2 = \frac{1}{2}lr$

(b) Length of arc (l) = $\frac{\theta}{360}\times 2\pi r$

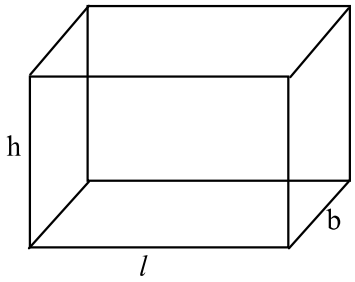
13. **Regular Polygon**

(a) Area = $\frac{1}{2}$ number of sides × radius of the inscribed circle

(b) Vertex angle of a regular polygon $(\theta) = \left(\frac{n-2}{n}\right)\times 180°$

14. **Volume and Surface Area**

(i) **Cuboid**



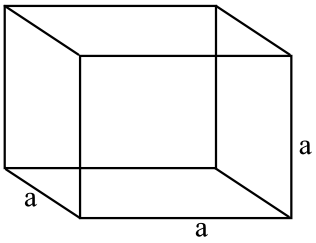
(a) Volume = $l \times b \times h$

(b) Surface Area = $2(lb + bh + hl)$

(c) Diagonal = $\sqrt{l^2 + b^2 + h^2}$

(d) Area of four walls = $2(l + b) \times h$

(ii) **Cube**

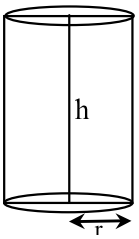


(a) Volume = a^3

(b) Surface Area = $6a^2$

(c) Diagonal = $\sqrt{3}a$

(iii) **Right Circular Cylinder**



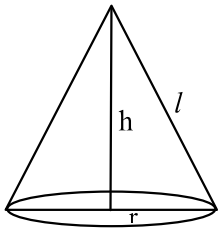
(a) Volume = $\pi r^2 h$

(b) Curved Surface Area $= 2\pi rh$

(c) Total Surface Area = $2\pi r(r + h)$

(d) Area of each end or base area = πr^2

(iv) **Right Circular Cone**



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

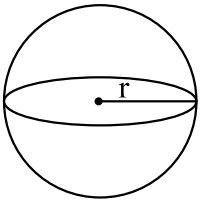
(b) Slant height = $\sqrt{r^2 + h^2}$

(c) Curved Surface Area = πrl

(d) Base Area = πr^2

(e) Total Surface Area = $\pi r(r + l)$

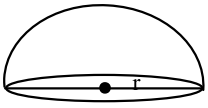
(v) **Sphere**



(a) Volume = $\frac{4}{3}\pi r^3$

(b) Total Surface Area = $4\pi r^2$

(vi) **Hemisphere**

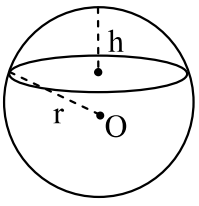


(a) Volume = $\frac{2}{3}\pi r^3$

(b) Total surface area = $3\pi r^2$

(c) Curved Surface Area = $2\pi r^2$

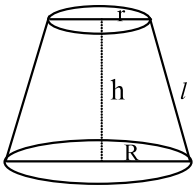
(d) **Spherical Gap of Radius '*r*' and Height '*h*'**



Volume = $1/3\pi h^2(3r - h)$

Surface area = $2\pi rh$

(vii) **Frustum of Cone**



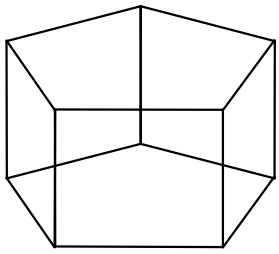
(a) Slant height (l) $= \sqrt{h^2 + (R-r)^2}$

(b) Volume (V) $= \frac{\pi h}{3}\left(R^2 + r^2 + Rr\right)$

(c) Curved Surface Area $= \pi(R+r)l$

(d) Total Surface Area $= \pi\left[\left(R^2 + r^2\right) + l(R+r)\right]$

(viii) **Prism and Pyramid**

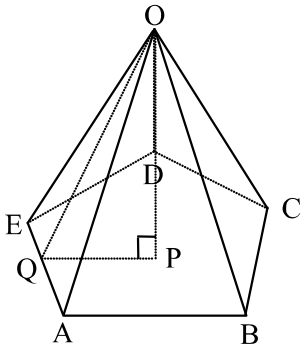


A. **Prism**

(a) Volume of a Right Prism = Area of the base × Height

(b) Lateral Surface Area = Perimeter of the Base × Height

B. **Pyramid**



(a) Volume of a Pyramid = $\frac{1}{3}\times$ Area of the base × height

(b) The whole surface area of a Pyramid is the sum of the areas of the base and the lateral surface areas.