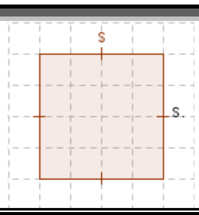
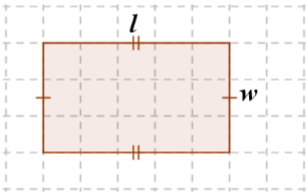
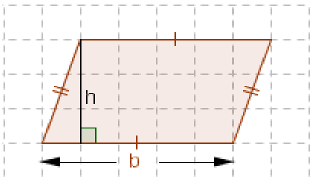
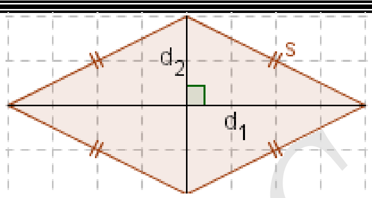
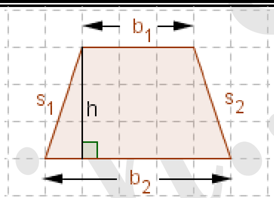
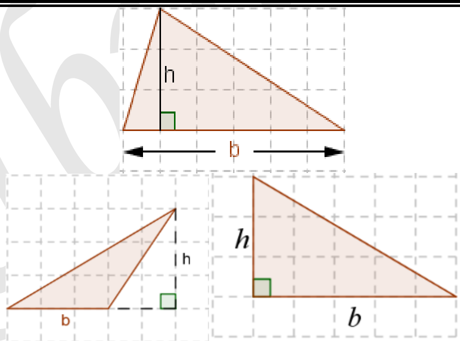
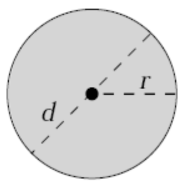
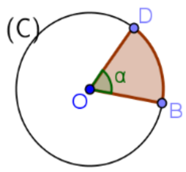
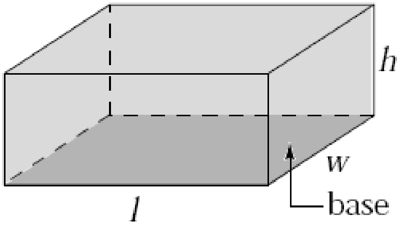
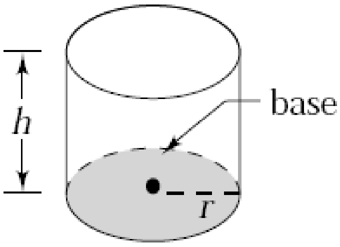
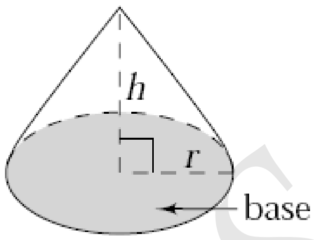
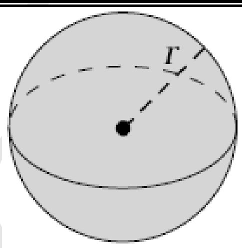
Areas, Perimeters of Plane figures

Square		Area is: $A = s \times s = s^2$. Perimeter is: $P = 4s$.
Rectangle		Area is: $A = l \times w$. Perimeter is: $P = sum\ of\ all\ sides.$ $P = 2l + 2w = 2(l + w)$.
Parallelogram		Area is: $A = b \times h$. Perimeter is: $P = sum\ of\ all\ sides.$
Rhombus		Area is: $A = \frac{d_1 \times d_2}{2}$. Perimeter is: $P = 4s$.
Trapezoid		Area is: $A = \frac{h}{2}(b_1 + b_2)$. Perimeter is: $P = (s_1 + s_2) + (b_1 + b_2)$
Triangle		Area is: $A = \frac{1}{2}(b \times h)$ or $A = \frac{leg_1 \times leg_2}{2}$ $(if\ \Delta\ is\ right)$ Perimeter is: $P = sum\ of\ all\ sides.$
Circle		Area is: $A = \pi \times r^2$ OR $A = \pi \times \frac{d^2}{4}$ Perimeter is: $C = 2\pi \times r$ OR $C = \pi \times d$.
Circular sector		Area of sector BOD is: $A = \frac{\pi r^2 \times \alpha}{360^\circ}$. Length of the arc BD is; $\frac{2\pi r \times \alpha}{360^\circ}$.

Volume and Surface area of Solid figures

Rectangular prism		*Volume is:*	$V = l \times w \times h$ Or $V = A_{Base} \times h.$
		Surface area is:	$S = 2(A_{rect_1} + A_{rect_2})$
Cylinder		*Volume is:*	$V = B \times h.$ $V = h \times \pi r^2$
		Surface area is:	$S = 2\pi r.h$
Right circular Cone		*Volume is:*	$V = \frac{1}{3} B \times h.$ $V = \frac{h}{3}\left(\pi r^2\right)$
		Surface area is:	$S = 4\pi r.s$
Sphere		*Volume is:*	$V = \frac{4}{3}\pi r^3$
		Surface area is:	$S = 4\pi r^2$

Note that:

P is perimeter

A is area

l is length

w is width

s is side

d is the diagonal

12.2 Area of a Triangle — by Heron's Formula

Heron was born in about 10AD possibly in Alexandria in Egypt. He worked in applied mathematics. His works on mathematical and physical subjects are so numerous and varied that he is considered to be an encyclopedic writer in these fields. His geometrical works deal largely with problems on mensuration written in three books. Book I deals with the area of squares, rectangles, triangles, trapezoids (trapezia), various other specialised quadrilaterals, the regular polygons, circles, surfaces of cylinders, cones, spheres etc. In this book, Heron has derived the famous formula for the area of a triangle in terms of its three sides.

Heron (10AD – 75 AD)

Fig. 12.4

The formula given by Heron about the area of a triangle, is also known as *Hero's formula*. It is stated as:

$$\textbf{Area of a triangle} = \sqrt{s(s-a)(s-b)(s-c)} \quad \text{(II)}$$

where a, b and c are the sides of the triangle, and s = semi-perimeter i.e. half the perimeter of the triangle $= \frac{a+b+c}{2}$,

This formula is helpful where it is not possible to find the height of the triangle easily. Let us apply it to calculate the area of the triangular park ABC, mentioned above (see Fig. 12.5).

Let us take $a = 40$ m, $b = 24$ m, $c = 32$ m,

so that we have $s = \frac{40 + 24 + 32}{2}$ m $= 48$ m.