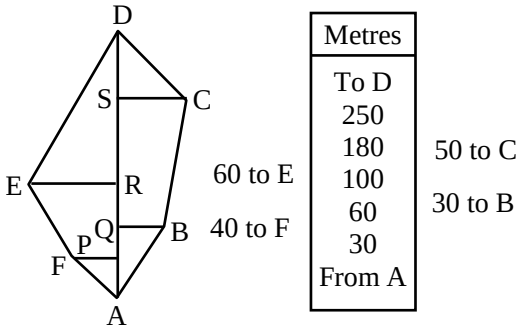
MENSURATION

AREA OF A POLYGON

AREA OF IRREGULAR RECTILINEAR FIGURES

For field ABCDEF, to find its area, we proceed as follows:

1. Select two farthest corners (A and D) such that the line joining them does not intersect any of the sides. Join the corners. The line joining them is called the base line. In this case the base line is AD.
2. From each corner draw perpendiculars FP, BQ, ER and CS to AD. These are called offsets.
3. Measure and record the following lengths: AP and PF, AQ and QB, AR and RE, AS and SC.
4. Record these measurements as shown.



Metres	
To D	
250	
180	50 to C
100	
60	30 to B
30	
From A	

The field has been divided into four right triangles and two trapezia. In the trapezia, the parallel sides are perpendicular to the base line.

The area of the field is the sum of the areas of the triangles and trapezia.

Area of $\Delta APF = \frac{1}{2} \times AP \times FP$

$= \frac{1}{2} \times 30 \times 40\ m^2$

$= 600\ m^2$

Area of $\Delta AQB = \frac{1}{2} \times AQ \times QB$

$= \frac{1}{2} \times 60 \times 30\ m^2 \quad = 900\ m^2$

Area of trapezium $PREF = \frac{1}{2} \times PR\ (PF + RE)$

$= ½ \times 70 \times 100\ m^2 = 3500\ m^2$

Area of trapezium BQSC $= ½ \times QS\ (BQ + SC)$

$= ½ \times 120 \times 80\ m^2 = 4800\ m^2$

Area of $\Delta SCD = ½ \times SD \times SC$

$= ½ \times 70 \times 50\ m^2 = 1750\ m^2$

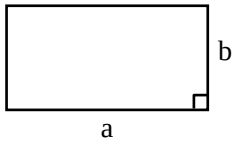
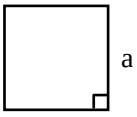
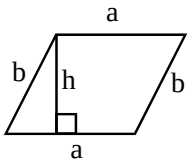
Area of $\Delta ERD = ½ \times RD \times ER$

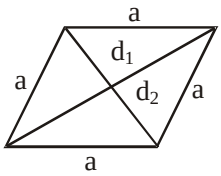
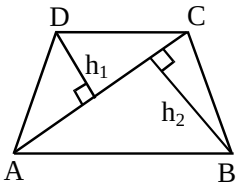
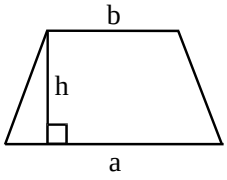
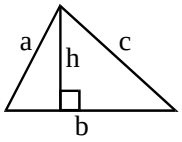
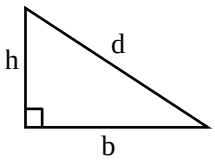
$= ½ \times 150 \times 60\ m^2 = 4500\ m^2$

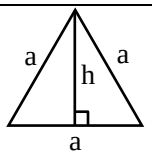
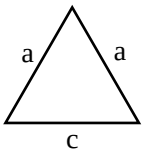
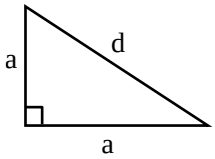
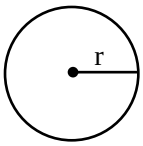
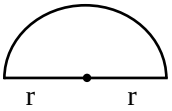
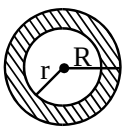
Total area $= (600 + 900 + 3500 + 4800 + 1750 + 4500)\ m^2$

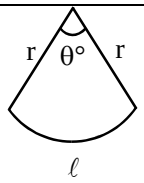
$= 16050\ m^2$

Formulae to calculate area of some geometrical figures:

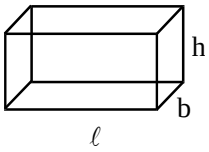
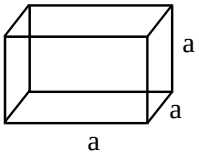
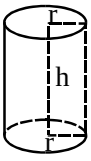
S. No.	Name	Figure	Perimeter in units of length	Area in square units
1.	Rectangle	 a = length, b = breadth	2(a + b)	ab
2.	Square	 a = side	4a	a^2 $\frac{1}{2}(\text{diagonal})^2$
3.	Parallelogram	 a = side b = side adjacent to a h = distance between the opp. parallel sides	2(a + b)	ah

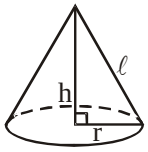
4.	Rhombus	 a = side of rhombus d_1d_2 are the two diagonals	4a	$\frac{1}{2}d_1d_2$
5.	Quadrilateral	 AC is one of its diagonals and h_1, h_2 are the altitudes on AC from D, B respectively.	Sum of its four sides	$\frac{1}{2}(AC)\ (h_1 + h_2)$
6.	Trapezium	 a, b, are parallel sides and h is the distance between parallel sides	Sum of its four sides	$\frac{1}{2}h\ (a + b)$
S. No.	**Name**	**Figure**	**Perimeter in units of length**	**Area in square units**
7.	Triangle	 b is the base and h is the altitude a, b, c are three sides of Δ.	$a + b + c = 2s$ where s is the semi perimeter	$\frac{1}{2}b \times h$ or $\sqrt{s(s-a)(s-b)(s-c)}$
8.	Right triangle	 d(hypotenuse) $= \sqrt{b^2+h^2}$	$b + h + d$	$\frac{1}{2}bh$

9.	Equilateral triangle	 a = side h = altitude = $\frac{\sqrt{3}}{2}$a	3a	(i) $\frac{1}{2}$ah (ii) $\frac{\sqrt{3}}{4}a^2$
10.	Isosceles triangle	 c = unequal side a = equal side	2a + c	$\frac{c\sqrt{4a^2-c^2}}{4}$
11.	Isosceles right triangle	 d(hypotenuse) = a $\sqrt{2}$, a = Each of equal sides, The angles are 90°, 45°, 45°.	2a + d	$\frac{1}{2}a^2$
12.	Circle	 r = radius of the circle $\pi = \frac{22}{7}$ or 3.1416	2πr	πr²
S. No.	**Name**	**Figure**	**Perimeter in units of length**	**Area in square units**
13.	Semicircle	 r = radius of the circle	πr + 2r	$\frac{1}{2}\pi r^2$
14.	Ring (shaded region)	 R = outer radius r = inner radius	……..	π(R² – r²)

15.	Sector of a circle	 θ° = central angle of The sector, r = radius of the sector λ = length of the arc	$\lambda + 2r$ where $\lambda = \frac{\theta}{360} \times 2\pi r$	$\frac{\theta}{360} \times \pi r^2$

Volume of some solid figures:

S. No.	Nature of the solid	Shape of the solid	Lateral/curved surface area	Total surface area	Volume	Abbreviations used
1.	Cuboid		$2h(\lambda + b)$	$2(\lambda b + bh + \lambda h)$	λbh	λ = length b = breadth h = height
2.	Cube		$4a^2$	$6a^2$	a^3	a = length of edge
3.	Right circular cylinder		$2\pi rh$	$2\pi r(r + h)$	$\pi r^2 h$	r = radius of base h = height of the cylinder

4.	Right circular cone		πr λ where $\lambda = \sqrt{r^2 + h^2}$	$\pi r(\lambda + r)$	$\frac{1}{3}\pi r^2 h$	h = height r = radius λ = slant height