BROAD ROOT SCHOLARS ACADEMY

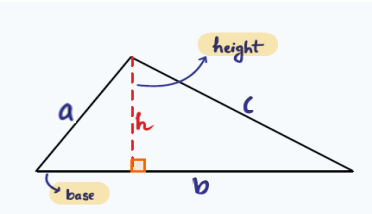
Perimeter & Area of 2D Shapes

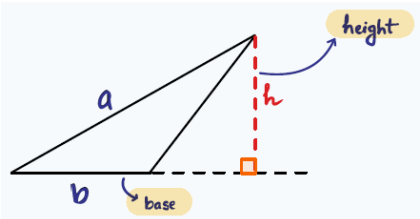
TRIANGLE

➢ SCALENE TRIANGLE:

If a, b & c are the sides of a triangle where h is the perpendicular height of a vertex from base (b) then:

- Perimeter $(P) = a + b + c$
- Area $(A) = \frac{1}{2} \times b \times h$

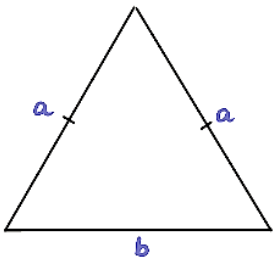




➢ ISOSCELES TRIANGLE:

If a is the length of the equal sides and b is the length of the third side of an isosceles triangle, then:

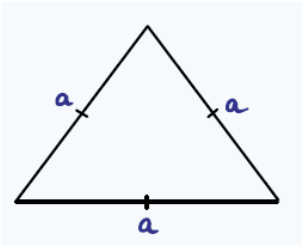
- Perimeter $(P) = 2a + b$
- Area $(A) = \frac{1}{4} \times b \times \sqrt{4a^2 - b^2}$



➢ EQUILATERAL TRIANGLE:

If a is the length of the equal sides of a equilateral triangle, then:

- Perimeter $(P) = 3a$
- Area $(A) = \frac{\sqrt{3}}{4}\sqrt{a^2}$

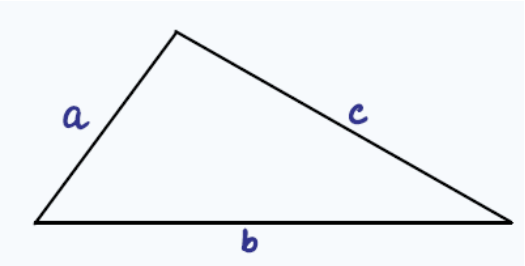


Area of triangle when specific measurements are given

➢ **When only 3 sides are known**, then area of a triangle can be found using **Heron's Formula**.

Here, $s = half\ of\ perimeter = \frac{a+b+c}{2}$

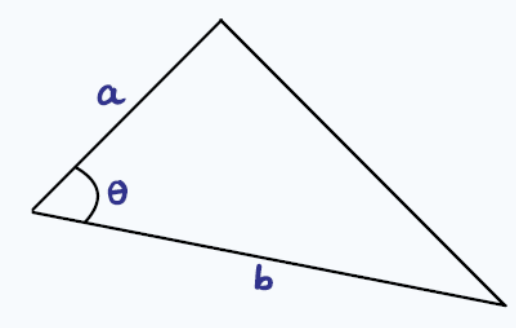
Hence, Area $(A) = \sqrt{s(s-a)(s-b)(s-c)}$



➢ **When two adjacent sides and included angle is given**, then area of a triangle can be found using **Trigonometry**.

If a and b are two adjacent sides of a triangle and θ be the included angle, then:

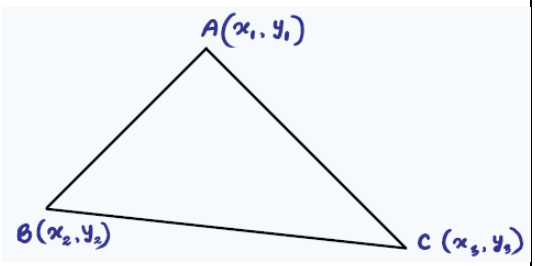
$$\text{Area } (A) = \frac{1}{2} \times a \times b \times \sin\theta$$



➢ **When the coordinates of the vertices of a triangle** is given, then area of a triangle can be found using **Coordinate Geometry**.

If $A(x_1, y_1), B(x_2, y_2)$ and $C(x_3, y_3)$ are the vertices of a triangle, then:

$$\text{Area } (A) = \frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$$

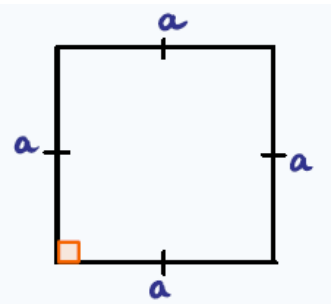


QUADRILATERALS

➢ **SQUARE:**

If a is the side of a square, then:

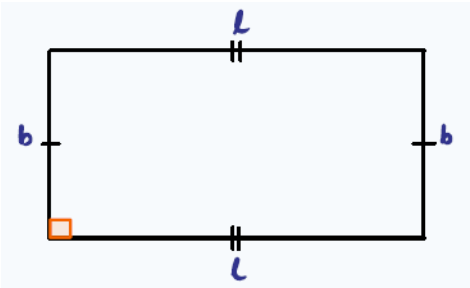
- Perimeter $(P) = 4a$
- Area $(A) = a^2$



➢ **RECTANGLE:**

If l and b are the length and breadth of a rectangle, then:

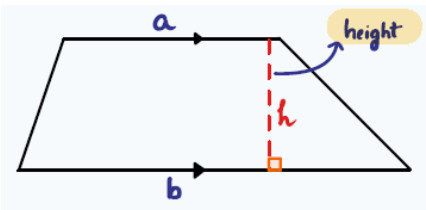
- Perimeter $(P) = 2(l + b)$
- Area $(A) = l \times b$

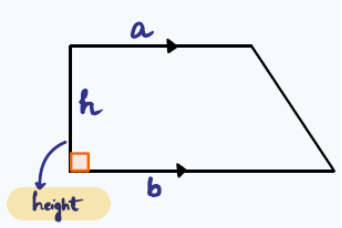


➢ **TRAPEZIUM:**

If a and b are the length of the parallel sides and h is the perpendicular distance between the parallel lines, then:

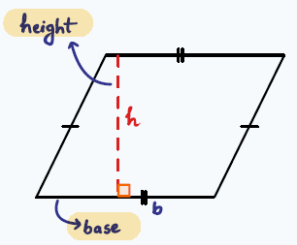
- Perimeter $(P) = sum\ of\ all\ sides$
- Area $(A) = \frac{1}{2} \times h \times (a + b)$





➢ PARALLELOGRAM:

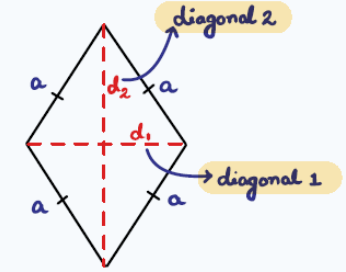
If l and b are the length and breadth of a parallelogram and h is the perpendicular distance between the parallel lines, then:



- Perimeter $(P) = 2(l + b)$
- Area $(A) = b \times h$

➢ RHOMBUS:

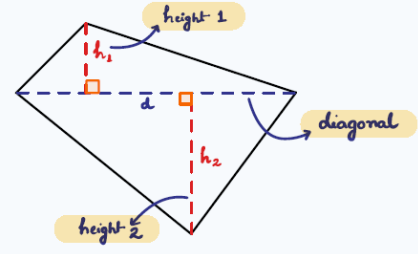
If a rhombus has sides $'a'$ and diagonals d_1 and d_2, then:



- Perimeter $(P) = 4a$
- Area $(A) = \frac{1}{2} \times d_1 \times d_2$

➢ QUADRILATERAL:

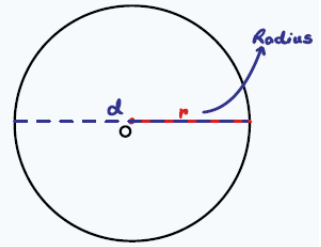
In any quadrilateral, if d is the diagonal and h_1 and h_2 are the heights of the opposite vertices, then:



- Perimeter $(P) = sum\ of\ all\ sides$
- Area $(A) = \frac{1}{2} \times d \times (h_1 + h_2)$

➢ CIRCLE:

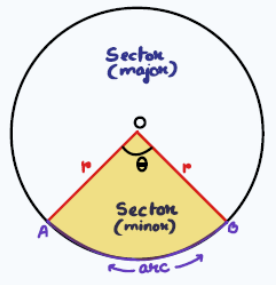
If a circle has radius $'r'$, then diameter is given by $d = 2r$. Hence:



- Perimeter $(P) = 2\pi r\ or\ \pi d$
- Area $(A) = \pi r^2$

➢ SECTOR AREA:

If a circle has radius $'r'$ and θ be the angle between 2 radii, then:

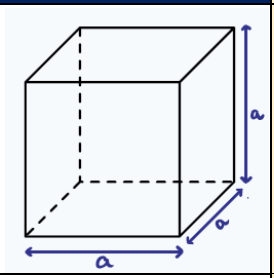
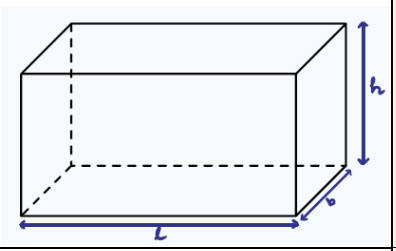
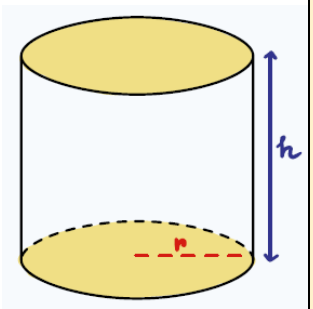
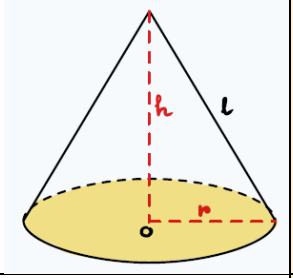
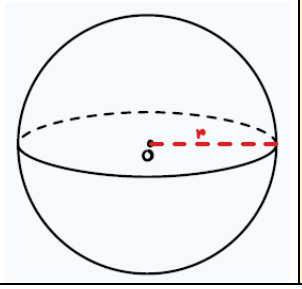


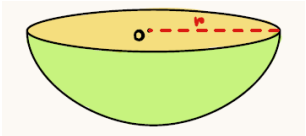
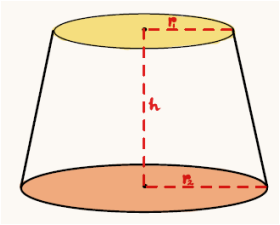
- Minor Sector Area: $\frac{\theta}{360^0} \times \pi r^2$
- Major Sector Area: $\frac{360^0 - \theta}{360^0} \times \pi r^2$
- Length of arc: $\frac{\theta}{360^0} \times 2\pi r$

Surface Area & Volume of 3D Shapes

Things To Know:

- **Total Surface Area (TSA)** is the total area of all the surfaces present in a 3D shape.
- **Lateral Surface Area (LSA)** or **Curved Surface Area (CSA)** is the total area of all the surfaces except for the top and the bottom i.e. total area of only walls.
- **Volume** is the total space occupied.

Shape	TSA	LSA	Volume
Cube 	$6a^2$	$4a^2$	a^3
Cuboid 	$2(lb + bh + hl)$	$2(bh + hl)$	$l \times b \times h$
Cylinder 	$2\pi rh + 2\pi r^2$	$2\pi rh$	$\pi r^2 h$
Cone 	$\pi rl + \pi r^2$ *where* l *= slant height and* $l = \sqrt{h^2 + r^2}$	πrl	$\frac{1}{3}\pi r^2 h$
Sphere 	$4\pi r^2$	*Same as TSA as a sphere has only 1 surface*	$\frac{4}{3}\pi r^3$

Hemisphere 	$3\pi r^2$	$2\pi r^2$	$\frac{2}{3}\pi r^3$
Frustrum of Cone 	$\pi r_1^2 + \pi r_2^2 + \pi L(r_1 + r_2)$ *where* $L = slant\ height$ *and* $L = \sqrt{h^2 + (r_2 - r_1)^2}$	$\pi L(r_1 + r_2)$	$\frac{1}{3}\pi h(r_1^2 + r_2^2 + r_1 r_2)$

BROAD ROOT SCHOLARS ACADEMY

FROM BASICS TO ADVANCE.....

COMPLETE GUIDANCE FOR BOARD + NEET/JEE

[OLYMPIAD | CUET-UG | IPMAT | JIPMAT | IISC | IISER | NISER | NDA]

FOUNDATION PROGRAME
[Class VIII-X]

- GENERAL MATHEMATICS
- ADVANCED MATHEMATICS
- GENERAL SCIENCE
- Extended/Core MATHEMATICS [Cambridge IGCSE]

INTEGRATED PROGRAME
[Class XI-XII]

- PHYSICS
- CHEMISTRY
- MATHEMATICS [Core/Applied]
- BIOLOGY

HOW LEARNING HAPPENS HERE

- CONCEPT CLARITY FIRST
- REGULAR TESTS + FEEDBACK
- DOUBT CLEARING SESSIONS
- PERSONAL ATTENTION TO EVERY STUDENT
- NO ROTE LEARNING METHODS

RESULTS ARE A BY-PRODUCT OF THE PROCESS

IS THIS COACHING CENTRE RIGHT FOR YOUR CHILD?

DOES YOUR CHILD

- STRUGGLE WITH CONCEPT?
- NEED PERSONAL ATTENTION?
- AFRAID OF MATHS & SCIENCE?
- WANT STRONG FUNDAMENTALS?
- HATE ROTE LEARNING?

IF YES, THEN YOU'RE IN THE RIGHT PLACE.

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