# Quantitative Aptitude

## Mensuration (Square, Rhombus, Triangle, Rectangle)

| Shape | Area Formula | Perimeter Formula | Parameters |
|---|---|---|---|
| **Square** | $A = a^2$ | $P = 4a$ | a = side |
| **Rectangle** | $A = l \times b$ | $P = 2(l + b)$ | l = length, b = breadth |
| **Scalene Triangle** | $A = \sqrt{[s(s-a)(s-b)(s-c)]}$, $s = (a+b+c)/2$ | $P = a + b + c$ | a, b, c = sides |
| **Isosceles Triangle** | $A = (b/4) \times \sqrt{(4a^2 - b^2)}$ | $P = 2a + b$ | a = equal sides, b = base |
| **Equilateral Triangle** | $A = (\sqrt{3}/4)\, a^2$ | $P = 3a$ | a = side |
| **Rhombus** | $A = (1/2) \times d_1 \times d_2$ | $P = 4a$ | a = side, $d_1$, $d_2$ = diagonals |

## Mensuration (Circle, Parallelogram, Trapezium)

| Figure | Area Formula | Perimeter / Circumference Formula |
|---|---|---|
| **Circle**<br>**Circle Segment or Sector:** | $A = \pi r^2$<br>(where r is radius)<br>• Sector Area = $(\theta/360) \times \pi r^2$<br>• Arc Length = $(\theta/360) \times 2\pi r$ | $C = 2\pi r$ or $C = \pi d$ (where $d = 2r$) |
| **Parallelogram** | A = Base × Height<br>$A = b \times h$ | $P = 2(a + b)$<br>(where a and b are adjacent sides) |
| **Trapezium** | $A = ½(a + b)h$<br>(where a and b are parallel sides, h is height) | $P = a + b + c + d$<br>(sum of all four sides) |

## Mensuration (Cube, Cuboid, Sphere, Cone, Cylinder)

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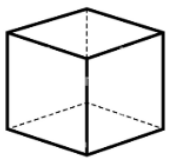
| **CUBE** |  | **All sides are equal. It has six faces and 12 edges.** | ○ **Volume = $a^3$**<br>○ **Total surface area = $6a^2$**<br>○ **Diagonal = $a\sqrt{3}$**<br>○ **Sum of all edges = 12a** |

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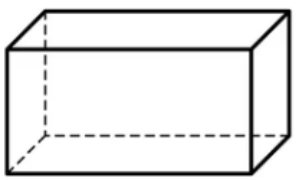
| **CUBOID** |  | A rectangular body having 3D rectangular shape, is called a cuboid. | ○ Volume = $l \times b \times h$<br>○ Total surface area = $2(lb + bh + lh)$<br>○ Diagonal = $\sqrt{l^2 + b^2 + h^2}$<br>○ Total Area of walls = $2(l + b) \times h$ |

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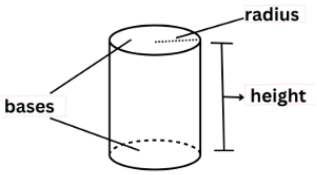
| **CYLINDER** |  | ○ Volume of cylinder = area of base × height = $\pi r^2 h$<br>○ Curved surface area = Perimeter of base × height = $2\pi rh$<br>○ Total surface Area = curved surface area + area of both the circles | ○ When the rectangular sheet is folded along its length, then the length becomes the circumference of the base of the cylinder and breadth becomes the height of the cylinder. |

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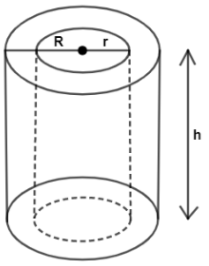
| **HOLLOW CYLINDER** |  | ○ Volume of hollow cylinder = $\pi(R^2 - r^2)h$<br>○ Curved surface area = $2\pi\ (R + r)\ h$<br>○ Total surface area = $2\pi\ (R + r)h + 2\pi\ (R^2 - r^2)$<br>$= 2\ \pi(\ R + r\ )\ \{\ h + R - r\ \}$<br>Where, R = External radius of cylinder, r = internal radius of cylinder, h = height |

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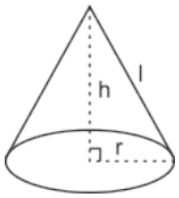
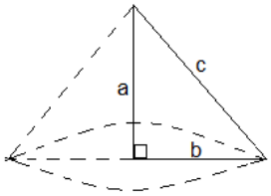
| **CONE** |  | ○ Volume = $\frac{1}{3}$ × $base\ area$ × height = $\frac{1}{3}\pi r^2 h$<br>○ Slant height ($l$) = $\sqrt{r^2 + h^2}$<br>○ Curved surface area = $\pi\ rl$<br>○ Total surface area = $\pi\ rl\ +\ \pi\ r^2 = \pi\ r\ (\ l + r\ )$ |

○ Cone formed by rotating right angled triangle about its height:




○ Volume of cone so formed = $\frac{1}{3}\pi\ b^2 a$

○ Similarly, Cone formed by rotating right angled triangle about its base:

Volume of cone so formed = $\frac{1}{3}\pi\ a^2 b$

○ Similarly, Cone formed by rotating right angled triangle about its hypotenuse :

Volume of cone so formed = $\frac{1}{3}\pi r^2 c$

(where r is the altitude on hypotenuse and r = $\frac{a \times b}{c}$)

Note: If the base is not round, it will be called a pyramid. A pyramid can have various shapes of the base example: square, rectangular, triangular etc.

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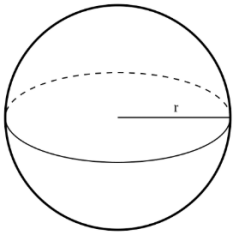
| **SPHERE** |  | ○ Volume of sphere = $\frac{4}{3}\pi r^3$<br>○ Curved Surface area<br>= Total surface area = $4\pi\ r^2$ |

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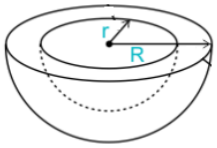
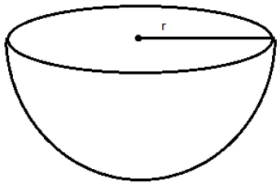
| **HOLLOW SPHERE OR SPHERICAL SHELL:** |  | ○ Volume of hollow sphere = $\frac{4}{3}\pi(R^3 - r^3)$<br>○ Internal surface area = $4\pi r^2$<br>○ External surface area = $4\pi R^2$<br>Here R = external radius and r = internal radius |
| **HEMISPHERE** |  | ○ Volume of the hemisphere = $\frac{2}{3}\pi r^3$<br>○ Total surface area = $3\pi r^2$<br>○ Curved surface area = $2\pi r^2$<br>Where, r = radius |

## Mensuration (Prism, Pyramid, Tetrahedron, Frustum)

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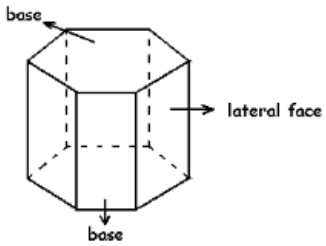
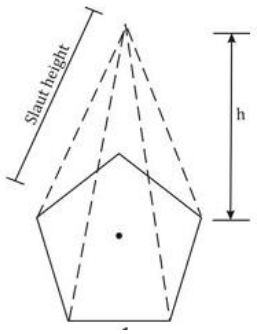
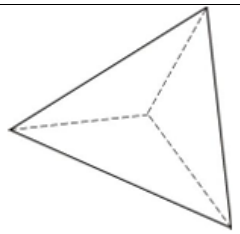
| **PRISM** |  | ○ Volume of prism = area of base × height<br>○ Lateral surface area = Perimeter of base × height<br>○ Total surface Area = Lateral surface area + area of base and top surface |
| **PYRAMID** |  | ○ Pyramid means a structure with regular polygon as its base and sloping sides that meet in a point at the top.<br>○ In Pyramid, with n sided regular polygon at its base, total number of vertices = n + 1<br>○ Volume = $\frac{1}{3}$ × base area × height<br>○ Slant height (l) = $\sqrt{r^2 + h^2}$<br>○ Lateral surface area = $\frac{Perimeter \times slant\ height}{2}$<br>○ Total Surface area = Lateral surface area + Area of base |
| **TETRAHEDRON** |  | It is a 3D figure made by joining four equilateral triangles.<br>○ Volume (V)= $\frac{1}{3} \times base\ area \times height$<br>$\Rightarrow V = \frac{1}{3} \times \frac{\sqrt{3}}{4} a^2 \times \left(\frac{\sqrt{6}}{12} a + \frac{\sqrt{6}}{4} a\right)$<br>$\Rightarrow V = \frac{\sqrt{2}}{12} a^3$ (Remember this formula)<br>○ Lateral surface area = $3 \times \frac{\sqrt{3}}{4} a^2$<br>○ Total surface area = $4 \times \frac{\sqrt{3}}{4} a^2$<br>○ Height of Tetrahedron = $\frac{\sqrt{6}}{3} a$ |

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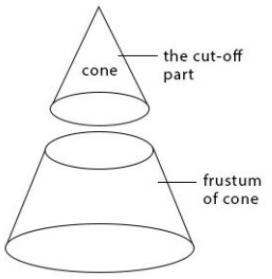
| **FRUSTUM OF CONE** |  | ○ Slant height (l)<br>$= \sqrt{h^2 + (R - r)^2}$<br>○ Curved Surface Area<br>$= \pi (R + r)\, l$<br>○ Total surface area<br>$= \pi (R + r)l + \pi R^2 + \pi r^2$<br>$= \pi \{ (R + r)\, l + R^2 + r^2 \}$<br>○ Volume = $\frac{1}{3}\pi h( r^2 + R^2 + rR )$ |

**IMP. UNIT CONVERSION:**

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| ○ **1$m^3$ = 1000 litres** |
| ○ **1 liter = 1000 $cm^3$** |
| ○ **1 meter = 10 decimeter = 100 cm = 1000 millimeter** |
| ○ **1 meter = $10^{-1}$decameter = $10^{-2}$ hectometer = $10^{-3}$ kilometer** |

## Mensuration (Other Important Formulas)

**Euler's Theorem (Polyhedra)**

F+V−E=2

Where: F = Number of faces, V = Number of vertices (corners), E = Number of edges

[For more study material and quizzes check out SSC CGL Target 150+ Success Series]