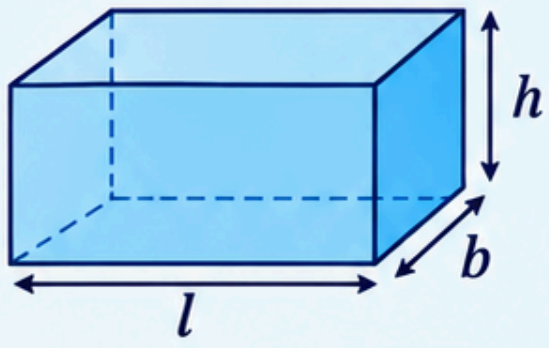
Class 9 Maths

Math of Space: Surface Area and Volume

Chapter 14 – Formula Sheet

Ganita Manjari

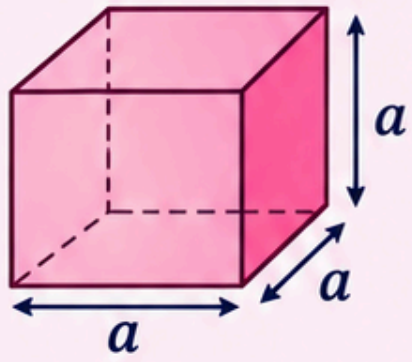
CUBOID



Total Surface Area (TSA)
$= 2(lb + bh + hl)$

Volume $= l \times b \times h$

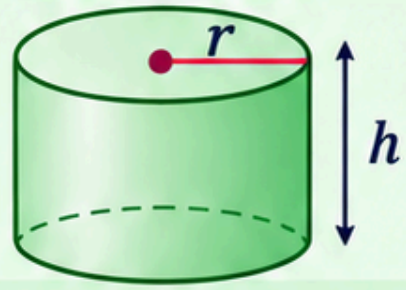
CUBE



Total Surface Area (TSA)
$= 6a^2$

Volume $= a^3$

CYLINDER



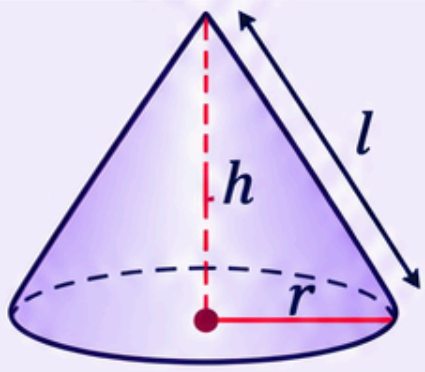
Curved Surface Area (CSA) $= 2\pi rh$

Total Surface Area (TSA)
(closed at both ends) $= 2\pi r(h + r)$

Surface area (closed at one end)
$= \pi r(2h + r)$

Volume $= \pi r^2 h$

CONE



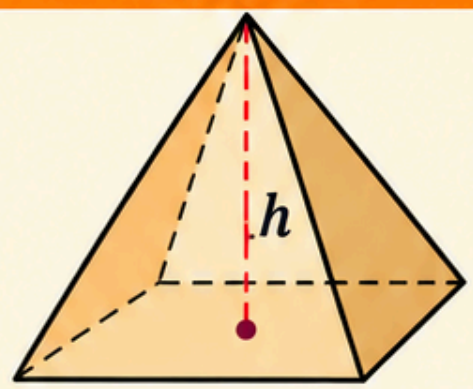
Slant height: $l = \sqrt{r^2 + h^2}$

Curved Surface Area (CSA) $= \pi rl$

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

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

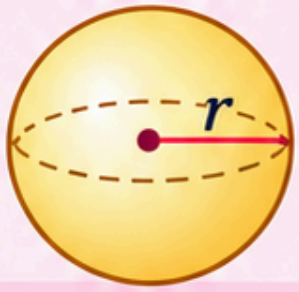
PYRAMID



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

Note:
There is no separate formula for the total surface area of a pyramid. Its surface area is obtained by adding the areas of its polygonal faces.

SPHERE



Surface Area $= 4\pi r^2$

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

HEMISPHERE

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

Total Surface Area (TSA) $= 3\pi r^2$

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

Symbols Used

l = length b = breadth
h = height (or depth)
r = radius a = side of a cube
l = slant height (of a cone)

Units

- Surface area is measured in square units (e.g., cm^2, m^2).
- Volume is measured in cubic units (e.g., cm^3, m^3).

Same Formulas, Bigger Possibilities!

Learn ♥ Practice ♥ Grow

Maths Makes Life Brighter!

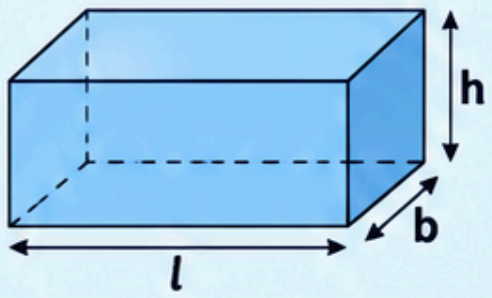
Class 9 Maths – Chapter 14

Surface Area & Volume

Formula Sheet

Quick Revision Easy Reference!

1. Cuboid

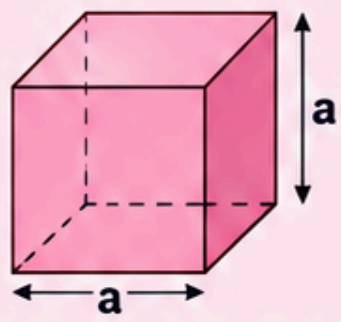


$$\text{TSA} = 2(lb + bh + hl)$$

$$\text{Volume} = l \times b \times h$$

l = length, b = breadth, h = height

2. Cube

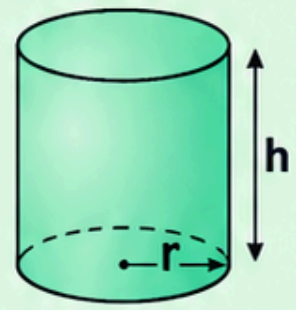


$$\text{TSA} = 6a^2$$

$$\text{Volume} = a^3$$

a = side

3. Right Circular Cylinder



$$\text{CSA} = 2\pi rh$$

$$\text{TSA} = 2\pi r(h + r)$$

$$\text{Volume} = \pi r^2 h$$

r = radius, h = height

4. Right Circular Cone

$$\text{CSA} = \pi rl$$

$$\text{TSA} = \pi r(l + r)$$

$$\text{Volume} = \frac{1}{3}\pi r^2 h$$

r = radius, h = height, l = slant height

5. Sphere

$$\text{Surface Area} = 4\pi r^2$$

$$\text{Volume} = \frac{4}{3}\pi r^3$$

r = radius

6. Hemisphere

$$\text{CSA} = 2\pi r^2$$

$$\text{TSA} = 3\pi r^2$$

$$\text{Volume} = \frac{2}{3}\pi r^3$$

r = radius

7. Pyramid (Right Pyramid)

$$\text{Volume} = \frac{1}{3}Bh$$

B = area of base
h = height

8. Important Unit Conversions

1 cm = 10 mm

1 m = 100 cm

1 m^2 = 10,000 cm^2

1 cm^2 = 100 mm^2

1 m^3 = 1,000,000 cm^3

1 L = 1,000 cm^3

9. Key Points to Remember

- Use the same units throughout.
- TSA = CSA + Area of base(s)
- $\pi \approx \frac{22}{7}$ or 3.14
- For a cube, all faces are squares of equal area.
- For a hemisphere, TSA includes curved surface + base area.
- Volume gives the space inside the solid (in cubic units).

Practice Formulas
Solve Problems
Build Confidence!

Nikita Digi Store

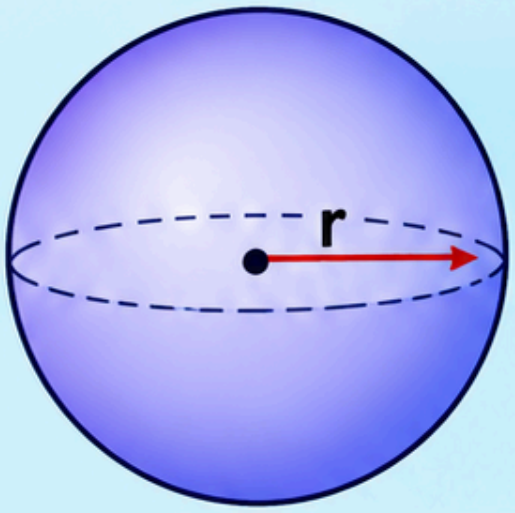
Learning Made Easier!

Class 9 Maths

Surface Area & Volume
Sphere, Hemisphere & Cone
Formula Sheet

Quick Revision Easy Reference!

1. Sphere



Surface Area

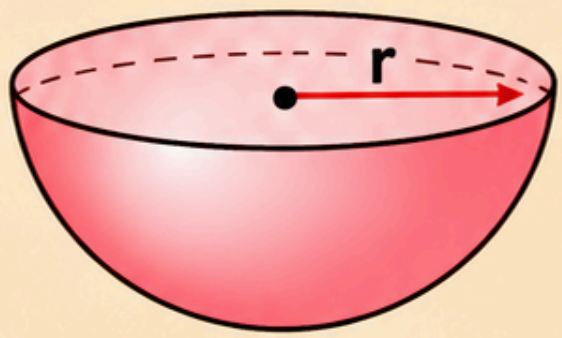
$$S = 4\pi r^2$$

Volume

$$V = \frac{4}{3}\pi r^3$$

r = radius

2. Hemisphere



Curved Surface Area (CSA)

$$CSA = 2\pi r^2$$

Total Surface Area (TSA)

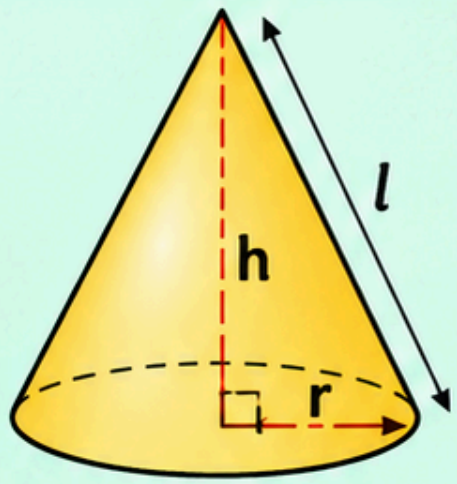
$$TSA = 3\pi r^2$$

Volume

$$V = \frac{2}{3}\pi r^3$$

r = radius

3. Right Circular Cone



Curved Surface Area (CSA)

$$CSA = \pi r l$$

Total Surface Area (TSA)

$$TSA = \pi r(l + r)$$

Volume

$$V = \frac{1}{3}\pi r^2 h$$

r = radius, h = height, l = slant height

Key Points to Remember

- $\pi \approx \frac{22}{7}$ or 3.14
- TSA = CSA + area of base(s)
- A hemisphere has one curved surface and one circular base.
- A cone has one curved surface and one circular base.
- Volume gives the space inside the solid (in cubic units).

Relationships

- A hemisphere is half of a sphere.
  - Surface area of hemisphere = $\frac{1}{2}$ × surface area of sphere
  - Volume of hemisphere = $\frac{1}{2}$ × volume of sphere
- In a cone, $l^2 = r^2 + h^2$ (by Pythagoras theorem).

Units

Surface Area → square units (e.g., cm^2, m^2)

Volume → cubic units (e.g., cm^3, m^3)

Practice Formulas Solve Problems Build Confidence!

Learn
Practise
Succeed

Maths Made Simple!

Nikita Digi Store
Your Learning Partner

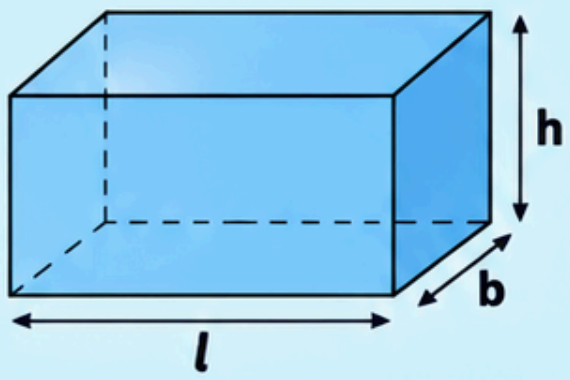
Class 9 Maths

Cuboid, Cube & Cylinder

Formula Sheet

Quick Revision Easy Reference!

1. Cuboid



Total Surface Area (TSA)

$$TSA = 2(lb + bh + hl)$$

Lateral Surface Area (LSA)

$$LSA = 2h(l + b)$$

Volume

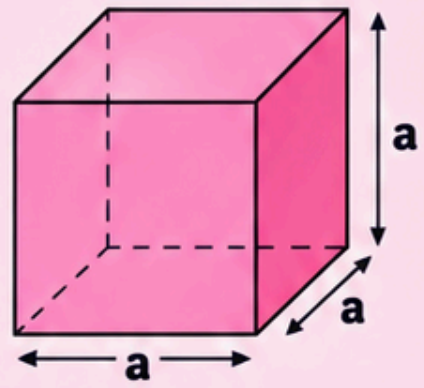
$$V = l \times b \times h$$

l = length
b = breadth
h = height

Key Points

- A cuboid has 6 rectangular faces.
- Opposite faces are equal.
- All angles are right angles (90°).

2. Cube



Total Surface Area (TSA)

$$TSA = 6a^2$$

Lateral Surface Area (LSA)

$$LSA = 4a^2$$

Volume

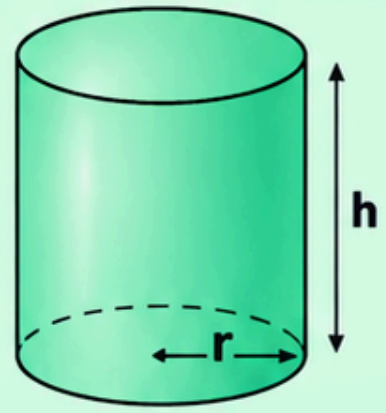
$$V = a^3$$

a = side (edge) of cube

Key Points

- A cube has 6 square faces.
- All faces are equal.
- All edges are equal.
- All angles are right angles (90°).

3. Right Circular Cylinder



Curved Surface Area (CSA)

$$CSA = 2\pi rh$$

Total Surface Area (TSA)

$$TSA = 2\pi r(h + r)$$

Volume

$$V = \pi r^2 h$$

r = radius of base h = height

Key Points

- A cylinder has two circular bases and one curved surface.
- Its height is the perpendicular distance between the bases.
- The bases are equal and parallel.

Useful Unit Conversions

- 1 cm = 10 mm
- 1 m = 100 cm
- 1 m^2 = 10,000 cm^2
- 1 cm^2 = 100 mm^2
- 1 m^3 = 1,000,000 cm^3
- 1 L = 1,000 cm^3

Remember

- Surface area is measured in square units (e.g., cm^2, m^2).
- Volume is measured in cubic units (e.g., cm^3, m^3).
- Use the same units throughout.
- $\pi \approx \frac{22}{7}$ or 3.14

Quick Tips

- Identify the correct formula based on what is asked (TSA, LSA, CSA or Volume).
- Write the units in your final answer.
- Draw a neat diagram and label dimensions.
- Practice questions to build speed and accuracy.

Practice Formulas
Solve Problems
Build Confidence!

Nikita Digi Store
Learning Made Easier!

Class 9 Maths
Ganita Manjari

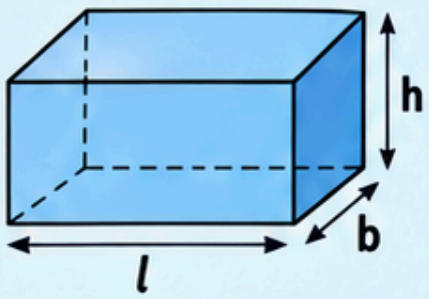
Chapter 14 – Math of Space

Important Volume & Surface Area Results

Quick Revision • Key Formulas • Important Results

Learn
Practise
Revise
Succeed!

1. Cuboid



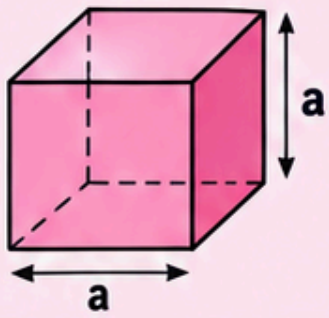
Volume: $V = lbh$

Total Surface Area (TSA):

$$TSA = 2(lb + bh + hl)$$

l = length, b = breadth, h = height

2. Cube



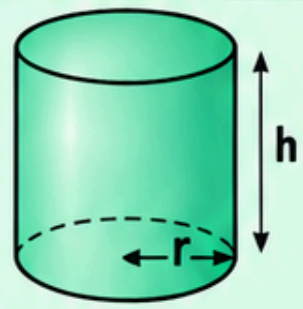
Volume: $V = a^3$

Total Surface Area (TSA):

$$TSA = 6a^2$$

a = side of cube

3. Right Circular Cylinder



Curved Surface Area (CSA):

$$CSA = 2\pi rh$$

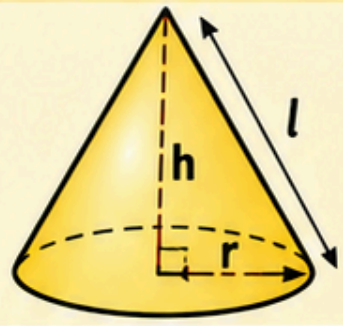
Total Surface Area (TSA):

$$TSA = 2\pi r(h + r)$$

Volume: $V = \pi r^2 h$

r = radius, h = height

4. Right Circular Cone



Slant height: $l^2 = h^2 + r^2$

Curved Surface Area (CSA):

$$CSA = \pi rl$$

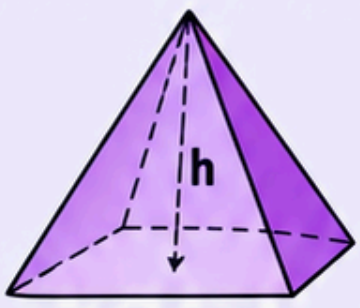
Total Surface Area (TSA):

$$TSA = \pi r(l + r)$$

Volume: $V = \frac{1}{3}\pi r^2 h$

r = radius, h = height, l = slant height

5. Pyramid



Base (polygon)

Volume:

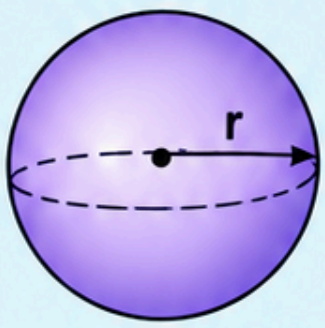
$V = \frac{1}{3} \times$ (area of base) $\times h$

Surface Area:

Sum of the areas of all polygonal faces.

h = height

6. Sphere



Surface Area:

$$S = 4\pi r^2$$

Volume:

$$V = \frac{4}{3}\pi r^3$$

r = radius

7. Hemisphere

Curved Surface Area (CSA):

$$CSA = 2\pi r^2$$

Total Surface Area (TSA):

$$TSA = 3\pi r^2$$

Volume:

$$V = \frac{2}{3}\pi r^3$$

r = radius

8. Key Relationships & Results

1. A hemisphere is half of a sphere.
2. The volume of a cone is one-third the volume of a cylinder with the same base radius and height.

$$V_{cone} = \frac{1}{3}V_{cylinder}$$

3. The volume of a sphere is two-thirds the volume of the smallest enclosing cylinder (with the same radius and height).

$$V_{sphere} = \frac{2}{3}V_{cylinder}$$

Units & Important Values

- Surface area is measured in square units (e.g., cm^2, m^2).
- Volume is measured in cubic units (e.g., cm^3, m^3).
- Use the same units throughout.
- $\pi \approx \frac{22}{7}$ or 3.14 (as used in this chapter).

Quick Tips

- Identify the given shape and dimensions.
- Use the correct formula (TSA, CSA or Volume).
- Draw a neat diagram if needed.
- Always write the units in your final answer.
- Check whether the surface is open, closed or covered at one end.
- Be careful with radius, height and slant height.

Practice Formulas
Solve Problems
Build Confidence!

Nikita Digi Store
Learning Made Easier!

Small Steps
Big Progress!

MATHS TODAY
BRIGHTER TOMORROW

Class 9 Maths

Chapter 14 – Math of Space

Important Tips & Unit Conversions

Quick Revision Better Results!

Unit Conversions

$1\ cm = 10\ mm$

$1\ m = 100\ cm$

$1\ m^2 = 10{,}000\ cm^2$

$1\ cm^2 = 100\ mm^2$

$1\ m^3 = 1{,}000{,}000\ cm^3$

$1\ L = 1{,}000\ cm^3$

$\pi \approx \frac{22}{7}$ or 3.14

Important Tips

1. Surface area is measured in square units (e.g., cm^2, m^2).
2. Volume is measured in cubic units (e.g., cm^3, m^3).
3. Use the same units throughout a calculation.
4. Choose the correct formula based on what is asked (TSA, LSA, CSA or Volume).
5. Write the units in your final answer.
6. Check whether the surface is open, closed, or covered at one end.
7. For a hemisphere, TSA includes curved surface + circular base.

Quick Tips

- Read the question carefully.
- Identify the shape and given dimensions.
- Think about what is asked (area or volume).
- Use the correct formula.
- Keep the units consistent.
- Draw a neat diagram if needed.
- Check your answer for reasonableness.

Remember

- Surface area → square units (cm^2, m^2)
- Volume → cubic units (cm^3, m^3)
- Use the same units throughout.
- Always write units in the final answer.
- Identify whether the surface is open, closed or covered at one end.
- For a hemisphere, TSA includes curved surface + circular base.

Practice Well Revise Smart Score High!

Nikita Digi Store

Learning Made Easier!