Grade 8

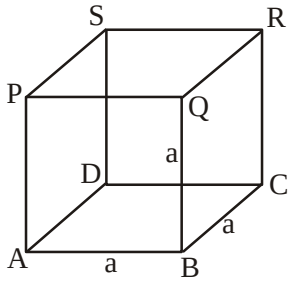
Chapter 6: Area of 3D Figures

Surface area of Cube

If ‘a’ is the length of each sides of a cube, then

surface area = Area of ABCD + Area of BCRQ + Area of PQRS + Area of ADSP + Area of DCRS + Area of ABQP

$= a^2 + a^2 + a^2 + a^2 + a^2 + a^2 = 6a^2$ sq. unit.



Examples

1. If lengths of each sides of a cubical box is 12 inch then find a surface area of the box.

Solution

lengths of each side of the box = 12 inch

i.e a = 12

surface area = (6×12^2) sq .inch

= 864 sq. inch

Lateral area of a cube

Lateral area of a cube means the surface area of the cube without the area of the top and bottom square faces. The unit used to measure the lateral area of a cube is square units.

If a is the length of each side of a cube,

lateral area = 4(area of square) sq. unit

$= 4a^2$ sq.unit.

Example

1. Find the lateral area of cube with side length 4 m

Solution

The lateral area of a cube = $4a^2$

Now a = 4

So, the lateral area of the given cube = $4 \times 4^2 = 4 \times 4 \times 4 = 64$

The lateral of the given cube is 64 m^2

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Volume of Cube

Let each edge of a cube be of length a.
Then the volume of the cube is a^3 cubic unit.

Important Note: If each edge of a cube be of length a then the length of diagonal
$= \sqrt{3}$ a unit

Examples

1. What is the volume of a cube (in cube cm) whose diagonal measures $4\sqrt{3}$ cm?

Solution

Let the length of an edge of the cube = x cm.
Then diagonal of the cube = $x\sqrt{3}$
According to problem
$x\sqrt{3} = 4\sqrt{3}$
$\Rightarrow x = 4$
$\therefore$ Volume of the cube = $(4)^3$ cm^3 = 64 cm^3.

2. What is the percentage increase in the volume of a cube if the length of each edge is increased by 50% ?

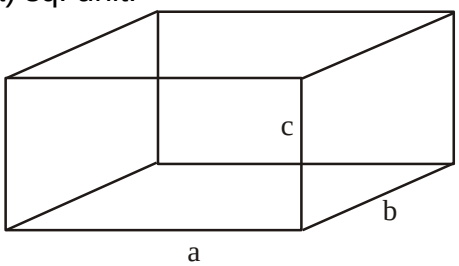
Solution

Let each edge of the cube = x cm
Then, volume of the cube = x^3 cm^3
Length of edge after increase = $\frac{150}{100}$ x cm $= 1.5x$ cm
$\therefore$ Increased volume = $(1.5x)^3$ cm^3 = $3.375x^3$ cm^3
$\therefore$ % increase = $\frac{(3.375x^3 - x^3)}{x^3} \times 100\% = (2.375 \times 100)\% = 237.5\%$.

Cuboid

Surface area of cuboid

The total surface area of a cuboid = sum of the areas of its 6 faces = 2(ab + bc + ca) sq. unit.



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Example

1. The length, width and height of a cuboid are 10 cm, 8 cm and 7 cm respectively. Find the total surface area of the cuboid.

Solution

Total surface area = 2(ab + bc + ca)
= 2(10 × 8 + 8 × 7 + 7 × 10) cm^2
= 2(80 + 56 + 70) cm^2
= 412 cm^2

2. Find the surface are of a cuboid of dimensions 4.8 c,. ¾ cm and 7.2 cm.

Solution

Area of face 1 = (4.8 × 7.2) cm^2 = 34.56 cm^2
Area of face 2 = (3.4 × 7.2) cm^2 = 24.48 cm^2
Area of face 3 = (4.8 × 3.4) cm^2 = 16.32 cm^2

Total surface area = 2(34.56 + 24.48 + 16.32) cm^2 = (2 × 75.36) cm^2= 150.72 cm^2.

Volume of Cuboid

Let length = l unit, breadth = b unit and height = h unit of a cuboid.
Then the volume of the cuboid = (l × b × h) cubic unit.

Important note: Let length = l unit, breadth = b unit and height = h unit of a cuboid.
Then the length of diagonal = $\sqrt{l^2 + b^2 + h^2}$ unit

Example

1. The breadth of a cuboid is twice its height and half its length. If the volume of the cuboid is 512 m^3, then what is the length of the cuboid?

Solution

Let the breadth of the cuboid be x (cm).
Then

Height of the cuboid = $\frac{x}{2}$;

Length of the cuboid = 2x

$\therefore$ Volume of the cuboid = $x \times \frac{x}{2} \times 2x = x^3$

From the problem

$x^3 = 512$

$\Rightarrow x = \sqrt[3]{512} = 8$

$\therefore$ Length of the cuboid = (2 × 8) cm = 16 cm.

2. The dimensions of a rectangular box are in the ratio 1 : 2 : 4 and the difference between the costs of covering it with the cloth and sheet at the rate of $ 20 and $ 20.50 per square metres respectively is $ 126. Find the dimensions of the box?

Solution

Let length = x, breadth = 2x and height = 4x.

Then

Area of the box $2(lb+bh+lh)=2\left(2x^2+8x^2+4x^2\right)=28x^2$

According to the problem

$20.5\times 28x^2-20\times 28x^2=126$

$\Rightarrow 28x^2\times 0.5=126$

$\Rightarrow x^2=9$

$\Rightarrow x=3$

$\therefore$ The dimensions are 3 cm, 6 cm and 12 cm.

Cone