Volume and Surface Area of Rectangular prisms and Cubes

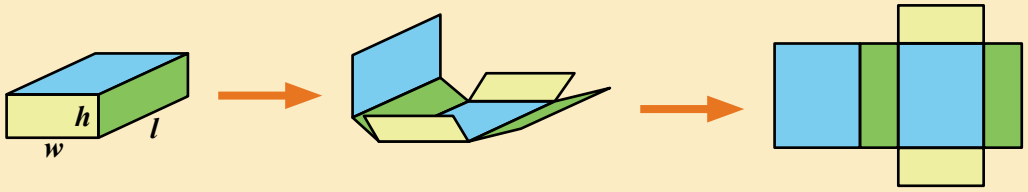
In geometry, a cuboid is a solid figure bounded by six faces. If all angles are right angles, and opposite faces of a cuboid are equal and ***rectangular***, it is a rectangular prism. Additionally, if all angles are right angles and opposite faces of a cuboid are equal and ***square***, it is a cube.

● The surface area of the rectangular prism or cube

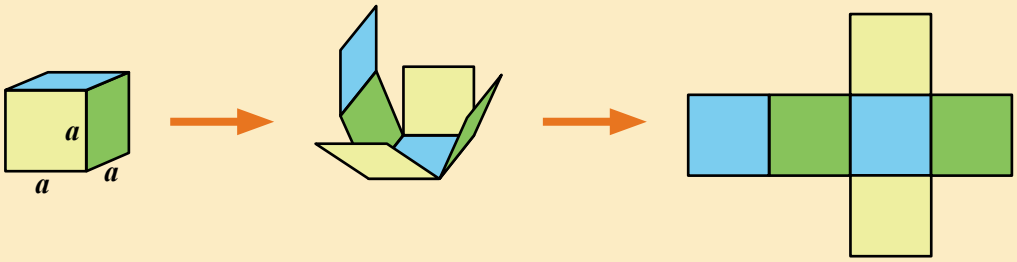
The surface area of a rectangular prism or cube is the sum of all 6 areas of the shapes that cover the surface of the object.

The surface area of a rectangular prism or a cube is equal to the area of its net.

Rectangular prism:



Cube:



Rectangular prism:

- Rectangular prism has six sides and each side is a rectangle.
- Front view and back view are equal.
- Left side view and right side view are equal.
- Top view and bottom view are equal.

Therefore, the surface area is length × width × 2 + length × height × 2 + width × height × 2.

Cube:

- Cube has six sides and each side is a square.

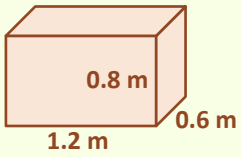
Therefore, the surface area is edge length × edge length × 6.

Surface area of rectangular prism	Surface area of cube
$(S) = 2 \times (lw + lh + wh)$	$(S) = 6a^2$
l = length, w = width, h = height	a = edge length of cube

Example 1

What is the surface area of the rectangular prism?

Explanation



$S = 2 \times (lw + lh + wh)$

$= 2 \times (1.2 \times 0.6 + 1.2 \times 0.8 + 0.6 \times 0.8)$

$= 2 \times 2.16$

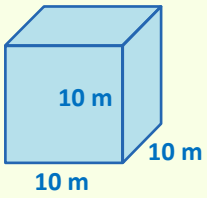
$= 4.32 \text{ m}^2$

Therefore, the surface area of the rectangular prism is 4.32 m^2.

Example 2

What is the surface area of the cube?

Explanation



Using the formula of the surface area of cube:

$S = 6a^2 = 6 \times 10^2 = 6 \times 100 = 600 \text{ m}^2$

Therefore, the surface area of the cube is 600 m^2.

● The volume of the rectangular prism or cube.

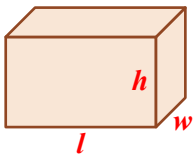
The volume of a rectangular prism or a cube is the amount of space inside of it.

Volume of a rectangular prism is length × width × height.

Volume of rectangular prism:

$(V) = lwh$

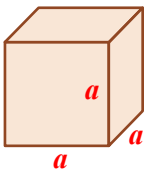
l = length, w = width, h = height



Volume of cube:

$(V) = a^3$

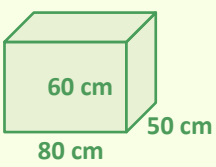
a = edge length of cube



Example 3

What is the Volume of the rectangular prism?

Explanation



The length, width and height of the rectangular prism has been given. Therefore, using the formula of volume of rectangular prism:

$V = lwh$ = 80 × 50 × 60 = 240000 cm^3

Therefore, the volume of the rectangular prism is 240000 cm^3.

Example 4

How much water can a cubic fish jar that has an edge length of 0.6 m can hold?

Explanation

The question is asking for the volume of the fish jar.

Using the formula of volume of cube:

$V = a^3$ = 0.6 × 0.6 × 0.6 = 0.216 m^3

Therefore, the cube fish jar can hold 0.216 m^3 of water.