

SURFACE AREAS AND VOLUMES

Module 4 of 4

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INTRODUCTION

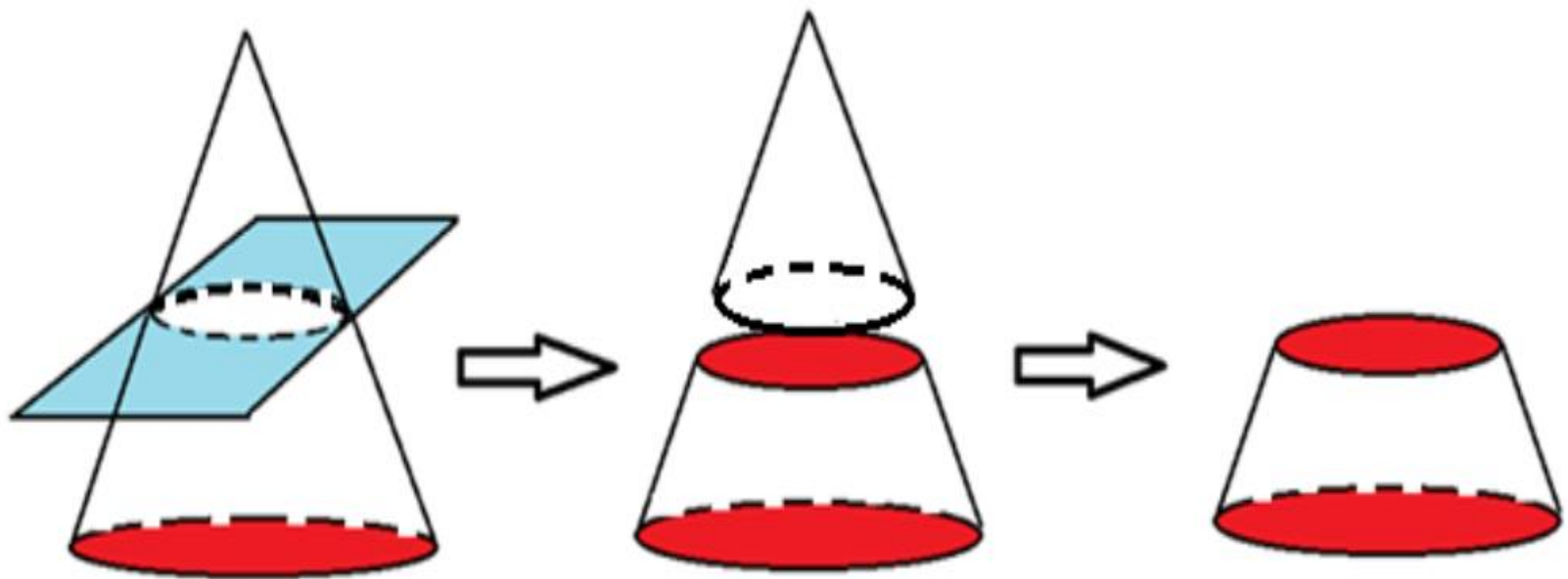
In previous module, we have discussed about the conversion of a solid from one shape to another. In this, two or more solids are melted to recast a new solid or a solid is recast into two or more solids.

In this section, we will learn about a solid which is formed when a part of the solid is removed from it and the shape of the solid formed is different from the solid taken and the part removed from it.

Now we will consider a cone and from its upper part it is removed by cutting it parallel to the base. We see that from a cone another smaller cone is removed and the solid left is different from a cone, this part of the cone is known as frustum of a cone.

In conversion of shapes, a solid is recast into two more solids. It may be the case when two or more solids are melted to give a new shape. But here, from a solid another solid is subtracted. The volume of the new shape so formed is the difference of the volumes.

Let us consider upper part of a cone is removed by cutting it parallel to the base.



Plane parallel to base cuts the cone

Cone as two separate parts

Frustum of a Cone

Let the radius and the height of the cone be r_2 and h_2 respectively. The radius and the height of the cone removed be r_1 and h_1 respectively.

$$\begin{aligned}\text{Volume of frustum of a cone} &= \frac{1}{3}\pi r_2^2 h_2 - \frac{1}{3}\pi r_1^2 h_1 \\ &= \frac{1}{3}\pi(r_2^2 h_2 - r_1^2 h_1)\end{aligned}$$

$$\text{Slant height, } l = \sqrt{h^2 + (r_2 - r_1)^2}$$

$$\text{CSA of frustum} = \pi(r_1 + r_2)l$$

$$\text{TSA of frustum} = \pi(r_1 + r_2)l + \pi(r_1^2 + r_2^2)$$

$$\text{Volume} = \frac{1}{3}\pi h(r_1^2 + r_2^2 + r_1r_2)$$



THANK YOU