



CONE AND FRUCT CONE: SECTIONS OF A CONE WITH A PLANE AND THE SURFACE OF A CONE

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ABSTRACT

A cone is a geometric body in space, consisting of a circular base and one vertex. All lines connected from the points at the base of the cone to the vertex form a cone. The radius of the base of the cone is r , and the height is h . The lateral surface, the full surface, the volume of the cone, and the geometric shapes formed when cut by various planes are widely studied in geometry.

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The center of the circle at the base of the cone is point O , and the vertex is point S . The height of the cone is the perpendicular from point S to the base plane, expressed in the form $h = SO$. The element generating the side is denoted by L . If the radius of the base is r , then the length of the side generator is expressed as follows:

$$L = \sqrt{r^2 + h^2}$$

The complete surface of a cone consists of two parts: the base surface and the lateral surface. Base surface:

$$S_a = \pi r^2$$

The lateral surface area of a cone is calculated using the following formula:

$$S_y = \pi r L$$

Therefore, the total total surface area of the cone is:

$$S_t = S_a + S_y = \pi r^2 + \pi r L$$

Volume of a cone

The volume of a cone is determined as follows:

$$V = (1/3)\pi r^2 h$$

This formula is valid for all types of cones (acute-angled cone, right cone, oblique cone).

A truncated cone is a part of a cone cut parallel to a plane from the vertex. If the radius of the larger base is R , the radius of the smaller base is r , and the height is

h , the volume of the truncated cone is found as follows:

$$V = (1/3)\pi h (R^2 + Rr + r^2)$$

The lateral surface area of a truncated cone is found by the following formula:

$$S_y = \pi(R + r)L$$

Here L is the side generator of the truncated cone:

$$L = \sqrt{((R - r)^2 + h^2)}$$

The complete surface area is the area of the bases, including the area of the base:

$$S_t = \pi(R^2 + r^2) + \pi(R + r)L$$

When a cone is cut by different planes, various geometric shapes are formed:

- 1) When cut by a horizontal plane, a circle is formed.
- 2) When cut by a plane parallel to the base, a smaller circle is formed.
- 3) When cut by a plane inclined to the side, not to the base, an ellipse is formed.
- 4) When cut along the axis of the cone, a triangle is formed.

If the plane is parallel to the side generator of the cone, a parabola is formed. If the plane passes through the side generator, a hyperbola is formed.

These sections are called conic sections.

The length of the surface of a cone and its importance in geometry

The lateral surface of a cone is represented as an arc. The length of the arc of the lateral surface is $2\pi r$, and when it is opened in the form of an arc, a sector of a circle with radius L is formed

The central angle of this sector is found as follows:

$$\alpha = (2\pi r / L) \text{ radian}$$

The opening of the conical surface is widely used in technology, architecture, engineering and construction. For example, the opening of the conical surface plays an important role in the manufacture of pipe joints, ventilation systems, metal structures.

Practical applications

The conical shape is very common in nature and technology:

- the front part of rockets and aircraft;
- ice cream cones;
- funnels;
- various mechanical details;
- light optics (for focusing).

The conical surface and its opening are used as the main geometric shapes in the creation of cloaks, hats, decorative elements, mechanical structures.

In conclusion, the cone and the truncated cone play an important role in geometry. Their surfaces, volumes and sections are used in many branches of mathematics. The sections of the cone with a plane form the basis of analytical geometry. In particular, the origin of the ellipse, parabola and hyperbola from conic sections is of great importance in mathematics.

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