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A Brief Description on Cube and its Dimensions

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Editorial

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EDITORIAL

A cube is a three-dimensional solid object having six square faces, facets, or sides, three of which meet at each vertex in geometry. The cube is one of the five Platonic solids and is the only regular hexahedron. It is made up of six faces, twelve edges, and eight vertices. A square parallelepiped, an equilateral cuboid, and a right rhombohedron are all examples of the cube. In three orientations, it's a standard square prism, and in four, it's a trigonal trapezohedron. The octahedron and the cube are twins. Its symmetry is cubical or octahedral. The only convex polyhedron with entirely square faces is the cube.

The cube has four specific orthogonal projections: one centered on a vertex, one on the edges, one on the face, and one on the normal to the vertex figure. The A_2 and B_2 coxeter planes are the first and third, respectively.

Spherical tiling

The cube can alternatively be represented as a spherical tiling that is stereographically projected onto the plane. Angles, but not areas or lengths, are preserved in this conformal projection. On the plane, straight lines on the sphere are projected as circular arcs.

Cartesian coordinates

The Cartesian coordinates of the vertices of a cube centred at the origin, with edges parallel to the axes and an edge length of 2 are (± 1, ± 1, and ± 1).

Equation in R^3

A cube's surface with centre (x_0, y_0, z_0) and edge length of 2a is the locus of all points (x, y, z) in analytic geometry, hence it may be regarded the limiting case of a 3D super ellipsoid as all three exponents approach infinity.

By analogy with squares and second powers, third powers are termed cubes because the volume of a cube is the third power of its sides a × a × a

A cube has the most volume out of all the cuboids (rectangular boxes) with the same surface area. In addition, among cuboids with the same total linear size (length+width+height), a cube has the biggest volume.

Doubling the cube

The Delian problem, or doubling the cube, was set by ancient Greek mathematicians and included starting with the length of the edge of a given cube and constructing the length of the edge of a cube with twice the volume of the original cube using just a compass and straightedge. They were unable to solve the issue, which was demonstrated to be unsolvable in 1837 by Pierre Wantzel because the cube root of 2 is not a constructible integer.

Geometric relations

A cube has eleven nets (one of which is depicted above), or eleven different ways to flatten a hollow cube by cutting seven edges. At least three colours are required to colour the cube so that no two neighbouring faces are the same colour.

The cube is the only three-dimensional Euclidean space cell with a regular tiling. It is also the only member of the Platonic solids group that has faces with an even number of sides, making it a zonohedron (every face has point symmetry).

Six identical square pyramids may be carved out of the cube. A rhombic dodecahedron is formed when these square pyramids are joined to the faces of a second cube (with pairs of coplanar triangles combined into rhombic faces).

Other dimensions

In four-dimensional euclidean space, the equivalent of a cube is known as a tesseract or hypercube. A tesseract is the order-4 hypercube, while a hypercube (or n-dimensional cube or simply n-cube) is the equivalent of the cube in n-dimensional Euclidean space. A measure polytope is another name for a hypercube.

In lower dimensions, there exist analogues of the cube: a point in dimension 0, a line segment in one dimension, and a square in two dimensions.