SOLIDS AND 3-D CUBE MODELS

There are lots of interesting three-dimensional (3-D) shapes to study in mathematics. These shapes are the fundamental shapes of many objects you find around you, both naturally and man-made. First we'll look at some 3-D shapes sometimes referred to as solids.

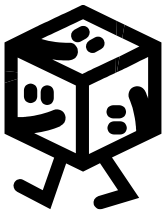
Prisms are one group of the solids. Prisms are named by the shape of their bases.

We can build 3-D models from cubes. Take a look at a model built out of candles found around the house. The candles could be used because they were cube-shaped.

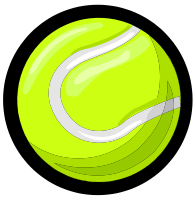
Solids

This man is holding a megaphone which is shaped like a cone. A **cone** has a curved surface, a circular base, and one vertex.

This juice can is shaped like a cylinder. A **cylinder** has two circular bases and a curved surface.

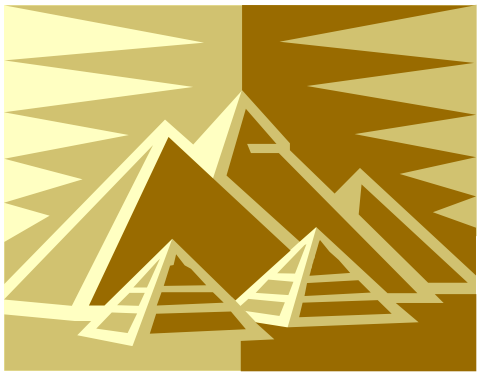


This comic figure is shaped like a cube. A **cube** is a rectangular prism where all sides are congruent.



This tennis ball is shaped like a sphere. A **sphere** is one continuous curved surface where all of its points are the same distance from a center point within the sphere.

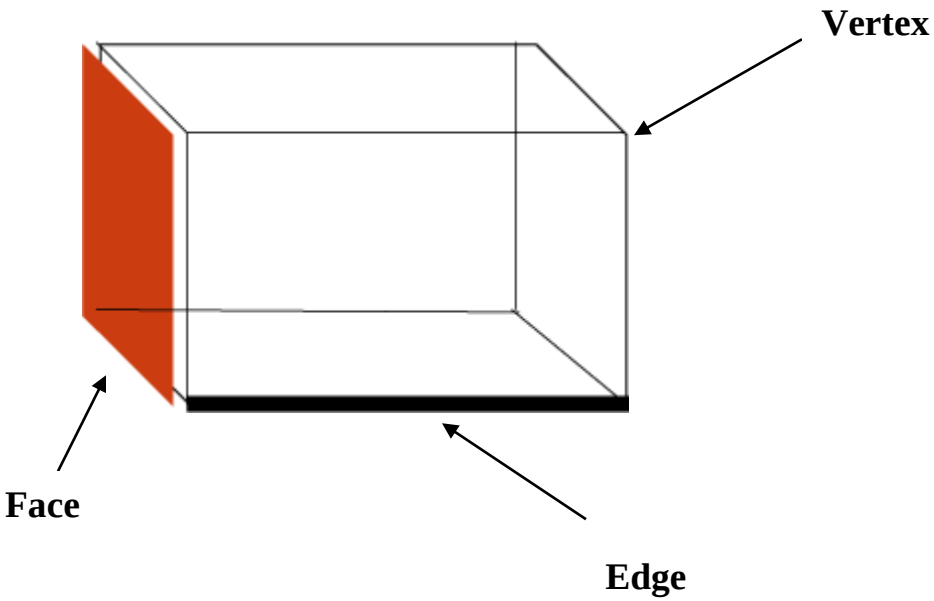
This box is shaped like a **rectangular prism**. A rectangular prism has six rectangular faces that meet at right angles.



This picture shows five pyramids. A **pyramid** has a polygon for its base and triangles for its sides which meet at one vertex. The ancient Egyptians built many pyramids.

Prisms

A rectangular prism has six faces, 12 edges, and 8 vertices.



Face – the flat surface of a three-dimensional figure

Vertex – the point where the edges of a three-dimensional figure intersect

Edge – the line segment formed where two faces intersect

3-D Cube Models

Here is a structure built out of candle cubes.

Do you see all 12 cubes? There are six cubes on the bottom layer, 4 cubes in the middle layer, and 2 cubes on the top layer.

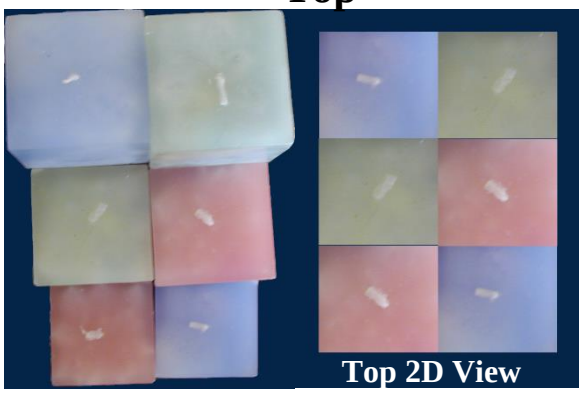
A 3-D (dimensional) structure has six 2-D views.

The six sides are top, bottom, two sides, front, and back.

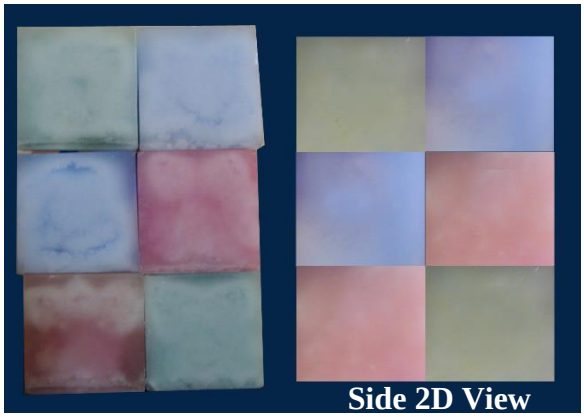
When you stand far enough back and are viewing one face of the structure, that face appears to be two dimensional.

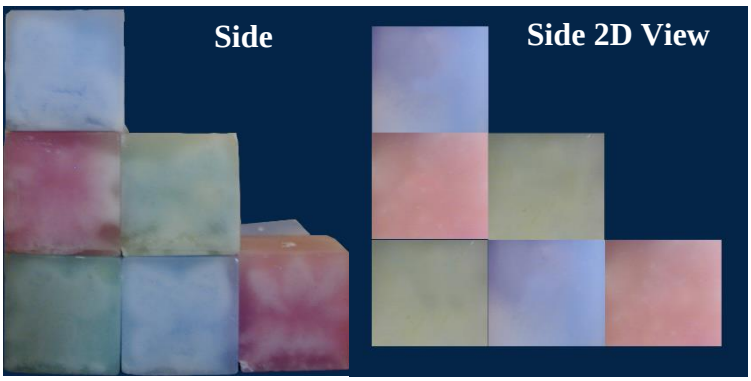
Below are three of the six views of the structure including an actual picture of the face, then the 2-D view of the face.

Top



Back





Side

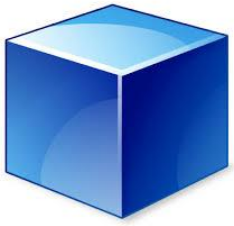
Finding The Surface Area of Nets

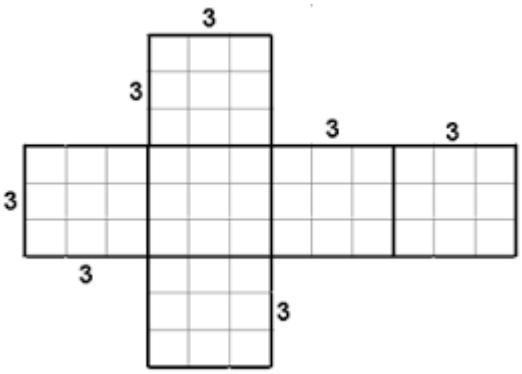
The surface area of the 3-D figures is the amount of area the surface of that figure takes up.

A **net** is the shape that is formed by unfolding a 3-D figure.

We can find the surface area of a 3-D figure by **finding the area of the individual shapes of the net, then adding them all together.**

This is a net of a cube. A cube is composed of 6 squares. The formula for the area of a square is length times width.





3 × 3 = 9 square units

Since there are 6 squares all having the same area we can add the following…

9 + 9 + 9 + 9 + 9 + 9 = **54 square units**

The units for surface area are always squared

You can also count the total number of squares to get the surface area.

Here are the area formulas for other shapes you may see in a net.

Shape	Area Formula
Square or Rectangle	$A = lw$
Triangle	$A = \frac{1}{2}bh$
Circle	$A = \pi r^2$

In the next section you will learn how to find the surface area of an object using formulas.