



Box Design Challenge

Grades 5-10

Aligns to Ohio Common Core

Mathematics Standards for grades 6 and 7

What you need:

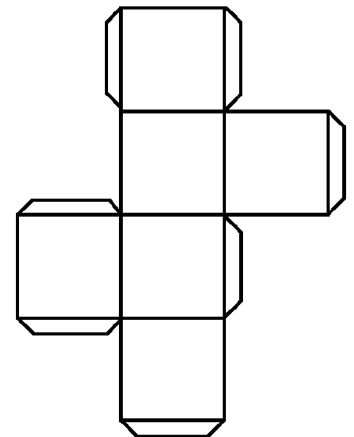
- Examples of different shaped boxes such as Toblerone bars, Chinese food cartons, cereal boxes, unusual shaped juice cartons
- Blank sheets of construction paper or card stock
- Paper for experimenting with nets
- Protractors
- Rulers
- Pencils
- Markers
- Snack foods (enough to experiment with filling 3D boxes)

Objective:

Draw and construct representations of two- and three-dimensional geometric objects using a variety of tools.

What to do:

1. Discuss the phrase *net of a solid* with your students. A net of a geometric solid is a two-dimensional (planar) figure that can be folded into a geometric solid, like a cardboard box prior to assembly. For example, we know that a cube has six sides. Each side of a cube is a square. So if we arrange six squares into a figure that can be folded into a cube, we have a net for a cube.
2. Ask students to name some types of products that come in three-dimensional cardboard box packaging.
3. Divide students into groups of 3 or 4 and give them several boxes to take apart and examine to determine their net. Ask them to (a) observe how the box was folded, (b) observe how many sides it takes to make a 3D object as opposed to a 2D drawing, and (c) notice how the size of the final folded object compares to the original size of its net.



Investigate:

1. Explain to students that they will be acting as packaging design engineers. Each group's task is to design a net of a solid and subsequently a container for a new 4 oz. snack food. The shape of their package should be a triangular tetrahedron.
2. Groups will investigate tetrahedrons and decide how many faces, vertices, corners, and edges there will be.
3. Each group must decide the size of the container they will need to contain and serve 4 ounces of snack food. Then, groups will design and construct the box with tabs and folds and test its ability to hold and serve a dry snack food such as pretzels or trail mix.
4. Each group will give their new product a name, draw graphics for the outside of their package, and provide a product slogan and description.

Conclusion:

Each group will give a short presentation to the class on the creation of their 2D net and their final 3D product package.

Learn:

The Platonic Solids belong to the group of geometric figures called polyhedra. A polyhedron is a solid figure bounded by plane polygons. The polygon's surfaces are called faces; where two faces intersect is called an edge; and the points where three or more edges intersect are called vertices. Only five regular solids are possible: cube, tetrahedron, octahedron, icosahedron, and dodecahedron. These figures are commonly referred to as *The Platonic Solids* because they featured prominently in the philosophy of Plato for whom they are named. Plato wrote about them in the dialogue *Timaeus* c.360 B.C. The philosopher speculated that these five solids were the shapes of the fundamental components of the physical universe (earth, air, water, and fire). Earth was associated with the cube, air with the octahedron, water with the icosahedron, and fire with the tetrahedron.