Slicing Solids

Let's analyze cross-sections by slicing three-dimensional solids.

2.1 Slice This

Imagine slicing a cylinder with a straight cut. The flat surface you sliced along is called a **cross-section**. Try to sketch all the possible kinds of cross-sections of a cylinder.

2.2 Slice That

Your teacher will give your group a three-dimensional solid to analyze.

1. Sketch predictions of all the kinds of cross-sections that could be created from your solid.

2. Slice your solid to confirm your predictions. After slicing the solid, sketch any new cross-sections that you found.

2.3 Stack 'Em Up

Each question shows several parallel cross-sectional slabs of the same three-dimensional solid. Name each solid.

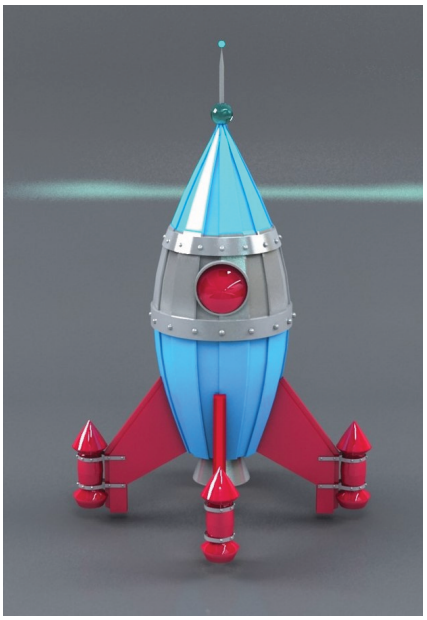
1. 

2. 

3. 

Are you ready for more?

3D-printers stack layers of material to make a three-dimensional shape. Computer software slices a digital model of an object into layers, and the printer stacks those layers one on top of another to replicate the digital model in the real world.



1. Draw 3 different horizontal cross-sections from the object in the image.

2. The layers can be printed in different thicknesses. How would the thickness of the layers affect the final appearance of the object?

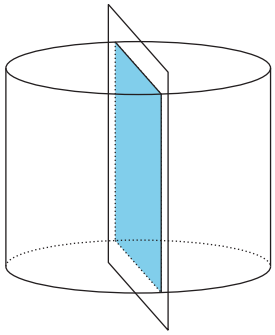
3. Suppose we printed a rectangular prism. How would the thickness of the layers affect the final appearance of the prism?

Lesson 2 Summary

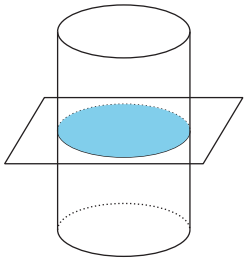
Here are some three-dimensional solids that may be familiar:

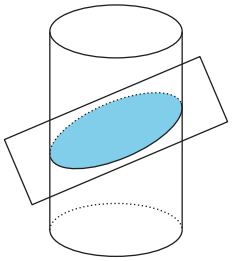
- A sphere is the set of points, in three-dimensional space, all of which are the same distance from some center.
- A prism has two congruent faces (or sides) that are called bases. The bases are connected by parallelograms.
- A cylinder is like a prism except the bases are circles.
- A pyramid has one base. The remaining faces are triangles that all meet at a single vertex.
- A cone is like a pyramid except the base is a circle.

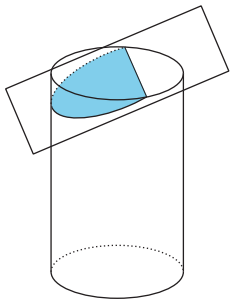
A **cross-section** is the intersection of a solid with a *plane*, which is a two-dimensional figure that extends forever in all directions. For example, some cheese is sold in cylindrical blocks. If the cheese is placed on one end and sliced vertically, the slice will reveal a rectangle, as shown. This rectangle is a cross-section of the cylinder.



Here are 3 more examples of cross-sections created by intersecting a plane and a cylinder.







These pieces of cheese are thin cylinders. They are like cross-sections, but they are three-dimensional. All the cuts were made parallel to one another. By looking at the slices, or by stacking them up, we can figure out that the original shape of the cheese was a cylinder.

What if another cheese plate contained slices whose radii got bigger to a maximum size and then got smaller again? The cheese was probably in the shape of a sphere. A sphere has circular cross-sections. The size of the circular cross-sections increases as they get closer to the center of the sphere, and then decreases past the center.