

Grade 7 - Cross-Sections of Three-Dimensional Figures - Lesson

Common Core 7.G.A.3 · maths-pdf.fr/en/

A cross-section is the two-dimensional shape formed when a plane slices a three-dimensional figure. A slice of a rectangular prism parallel to a face is a rectangle the same size as that face. A slice of a rectangular pyramid parallel to its base is a smaller rectangle, and a vertical slice through the apex is a triangle.

Grade 7 · Common Core State Standards: **7.G.A.3**

Key facts

- A cross-section is the flat shape where a plane meets a solid.
- Prism slice parallel to a face: a rectangle congruent to that face.
- Pyramid slice parallel to the base: a smaller rectangle similar to the base.
- Pyramid slice through the apex and perpendicular to the base: a triangle.
- A slanted plane can give a triangle, trapezoid, or other polygon.

What is a cross-section?

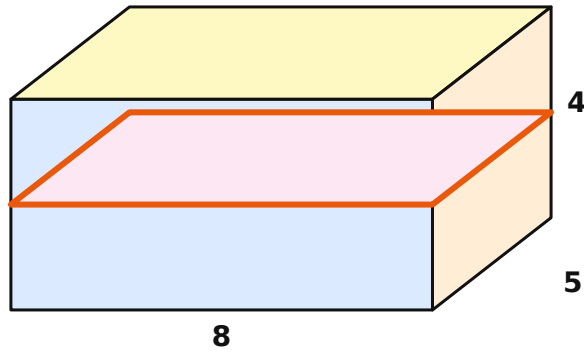
A **cross-section** is the two-dimensional shape you see when a plane slices through a three-dimensional figure. Imagine cutting a loaf of bread: the cut face is the cross-section.

Cross-section

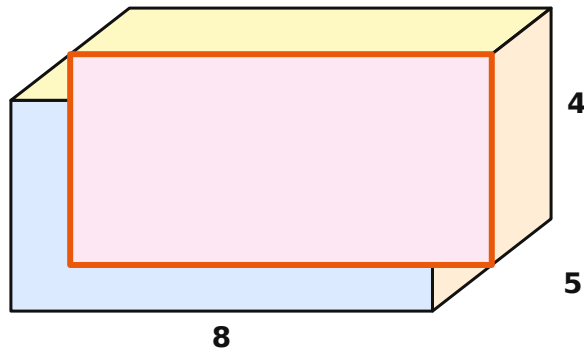
The cross-section of a solid is the **flat shape** where a plane meets the solid. Its shape depends on the solid and on how the plane is tilted.

What do slices of a rectangular prism look like?

A right rectangular prism has three pairs of rectangular faces. A plane parallel to any face makes a rectangle that is the same size as that face.



A cut parallel to the base gives a rectangle that is congruent to the base: 8 by 5.

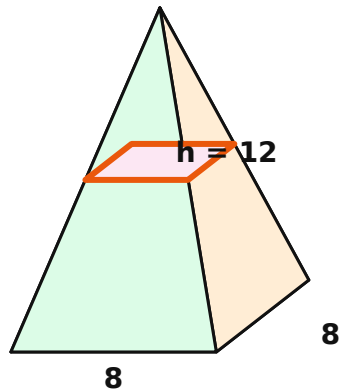


A vertical cut parallel to the front face gives a rectangle 8 by 4.

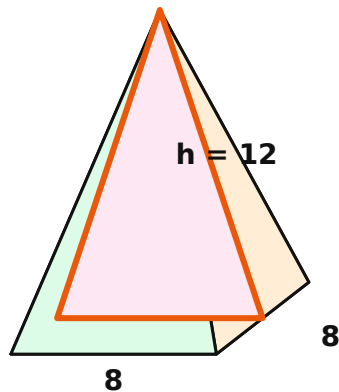
A slice parallel to the base is congruent to the base, so a prism that is 8 by 5 by 4 gives an 8-by-5 rectangle. A vertical slice parallel to the front face gives an 8-by-4 rectangle, and a vertical slice parallel to the side face gives a 5-by-4 rectangle.

What do slices of a rectangular pyramid look like?

A pyramid narrows toward its apex. A slice **parallel to the base** is a smaller rectangle with the same shape as the base. A vertical slice that passes through the **apex** is a triangle.



A cut parallel to the base of a pyramid gives a smaller, similar shape. Halfway up, the sides are half as long: 4 by 4.



A vertical cut through the apex gives a triangle with the same base and height as the pyramid.

For a pyramid of height 12 with a square base of side 8, a cut 6 above the base has $(12-6) \div 12 = \frac{1}{2}$ of the base side, so it is a 4-by-4 square with area 16, not 32.

What if the plane is tilted?

A slanted plane can give other shapes. A tilted cut across a cube can make a rectangle that is not a square, or a triangle if it cuts off a corner, or even a hexagon. To name a cross-section, picture where the plane meets each face: each face the plane crosses gives one side of the shape.

Solid	Plane position	Cross-section
Prism	Parallel to a face	Rectangle (same as the face)
Pyramid	Parallel to the base	Smaller similar rectangle
Pyramid	Vertical through the apex	Triangle

Solid	Plane position	Cross-section
Cube	Cuts off a corner	Triangle

Questions about cross-sections of three-dimensional figures

What is a cross-section?

It is the shape you get when a plane cuts through a solid. For a rectangular prism sliced parallel to the base, it is a rectangle.

What shape do you get when you slice a pyramid parallel to its base?

You get a smaller shape similar to the base. For a square pyramid it is a smaller square.

What shape results from a vertical cut through the apex of a pyramid?

It is a triangle. Its base is a base edge or a line across the base, and its height equals the height of the pyramid.

Can a cube have a triangular cross-section?

Yes. If the plane cuts off a corner by crossing the three edges that meet there, the cut face is a triangle.

How do I find the area of a cross-section?

Identify the shape, find its dimensions from the solid, and use the area formula. For a prism slice parallel to the base, the area equals the base area.