

10-1 Solid Geometry

Warm Up

Classify each polygon.

1. a polygon with three congruent sides
equilateral triangle
2. a polygon with six congruent sides and six congruent angles
regular hexagon
3. a polygon with four sides and with opposite sides parallel and congruent
parallelogram

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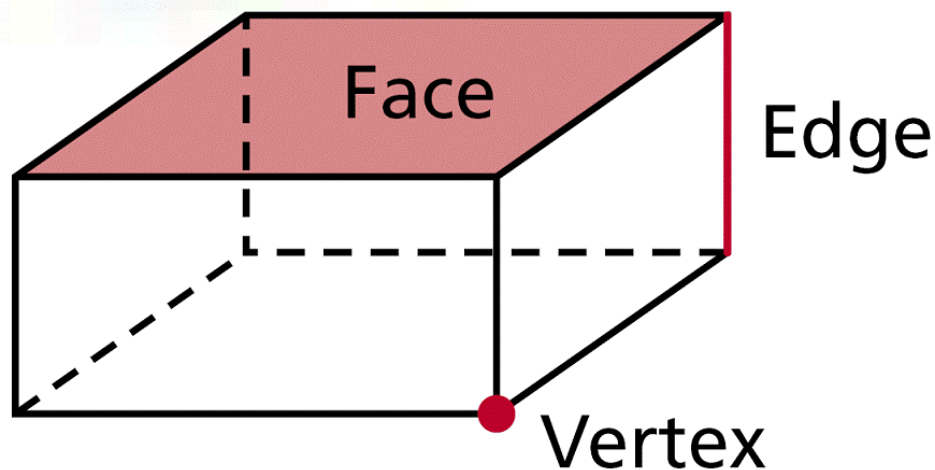
Objectives

Classify three-dimensional figures according to their properties.

Use nets and cross sections to analyze three-dimensional figures.

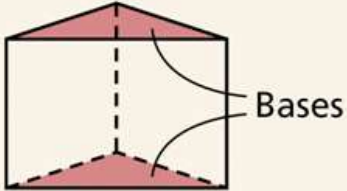
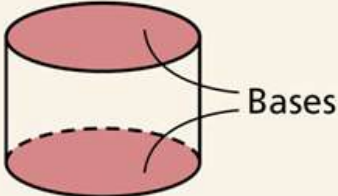
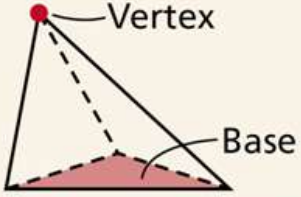
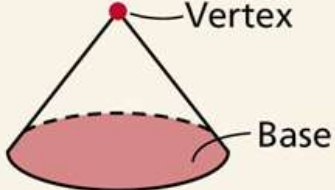
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Three-dimensional figures, or solids, can be made up of flat or curved surfaces. Each flat surface is called a **face**. An **edge** is the segment that is the intersection of two faces. A **vertex** is the point that is the intersection of three or more faces.



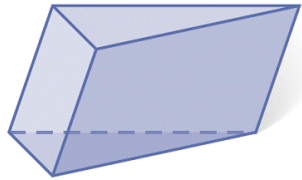
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Three-Dimensional Figures

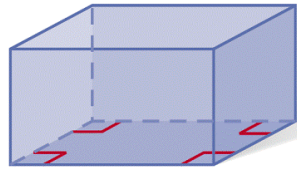
| TERM | EXAMPLE |
|---|--|
| <p>A prism is formed by two parallel congruent polygonal faces called <i>bases</i> connected by faces that are parallelograms.</p> |  <p>A diagram of a triangular prism. It shows two parallel triangular bases, one at the top and one at the bottom, connected by three vertical edges. Dashed lines indicate hidden edges. Two curved arrows point from the label 'Bases' to the top and bottom triangular faces.</p> |
| <p>A cylinder is formed by two parallel congruent circular bases and a curved surface that connects the bases.</p> |  <p>A diagram of a cylinder. It shows two parallel circular bases, one at the top and one at the bottom, connected by a curved surface. Dashed lines indicate the hidden back edge of the bottom base. Two curved arrows point from the label 'Bases' to the top and bottom circular faces.</p> |
| <p>A pyramid is formed by a polygonal base and triangular faces that meet at a common vertex.</p> |  <p>A diagram of a triangular pyramid. It shows a triangular base at the bottom and a single vertex at the top. Three edges connect the vertex to the corners of the base. Dashed lines indicate hidden edges. A red dot marks the vertex, and a label 'Vertex' points to it. A label 'Base' points to the bottom triangular face.</p> |
| <p>A cone is formed by a circular base and a curved surface that connects the base to a vertex.</p> |  <p>A diagram of a cone. It shows a circular base at the bottom and a single vertex at the top. A curved surface connects the base to the vertex. Dashed lines indicate the hidden back edge of the base. A red dot marks the vertex, and a label 'Vertex' points to it. A label 'Base' points to the bottom circular face.</p> |

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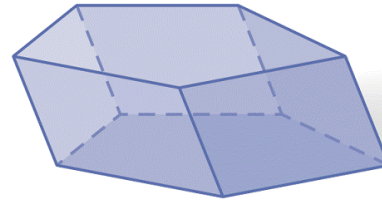
A **cube** is a prism with six square faces. Other prisms and pyramids are named for the shape of their bases.



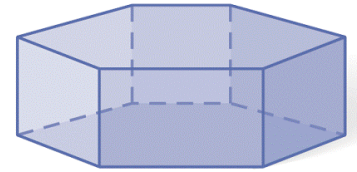
Triangular
prism



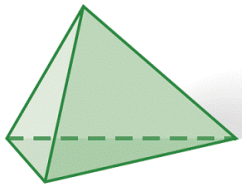
Rectangular
prism



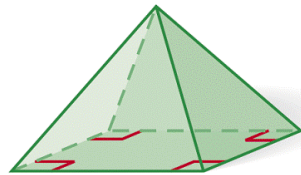
Pentagonal
prism



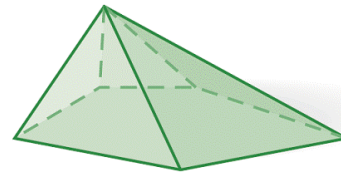
Hexagonal
prism



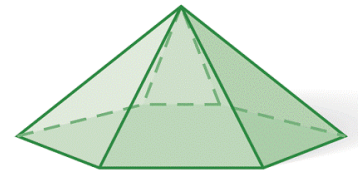
Triangular
pyramid



Rectangular
pyramid



Pentagonal
pyramid

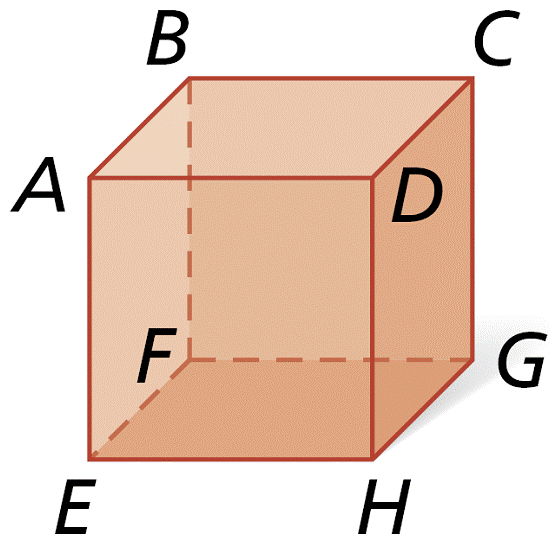


Hexagonal
pyramid

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Example 1A: Classifying Three-Dimensional Figures

Classify the figure. Name the vertices, edges, and bases.



cube

vertices: A, B, C, D, E, F, G, H

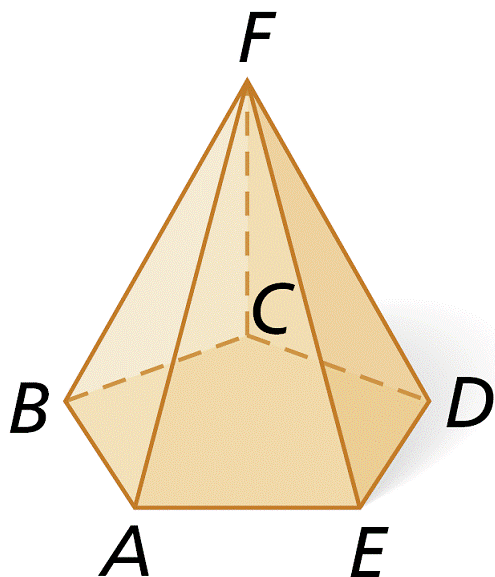
edges: $\overline{AB}, \overline{BC}, \overline{CD}, \overline{DA}, \overline{EF}, \overline{FG},$
 $\overline{GH}, \overline{HE}, \overline{AE}, \overline{BF}, \overline{CG}, \overline{DH}$

bases: $ABCD, EFGH, ABFE,$
 $DCGH, ADHE, BCGF$

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Example 1B: Classifying Three-Dimensional Figures

Classify the figure. Name the vertices, edges, and bases.



pentagonal pyramid

vertices: A, B, C, D, E, F

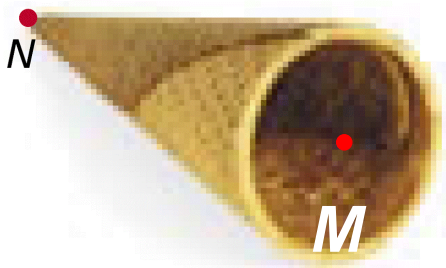
edges: $\overline{AB}, \overline{BC}, \overline{CD}, \overline{DE}, \overline{EA},$
 $\overline{AF}, \overline{BF}, \overline{CF}, \overline{DF}, \overline{EF}$

base: $ABCDE$

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Check It Out! Example 1a

Classify the figure. Name the vertices, edges, and bases.



cone

vertex: N

edges: none

base: $\bullet M$

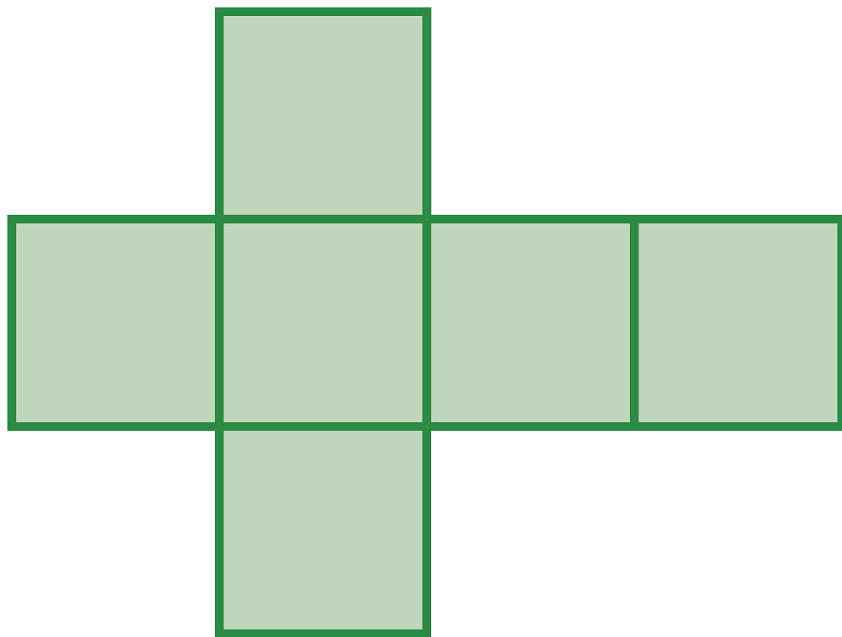
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A **net** is a diagram of the surfaces of a three-dimensional figure that can be folded to form the three-dimensional figure. To identify a three-dimensional figure from a net, look at the number of faces and the shape of each face.

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Example 2A: Identifying a Three-Dimensional Figure From a Net

Describe the three-dimensional figure that can be made from the given net.

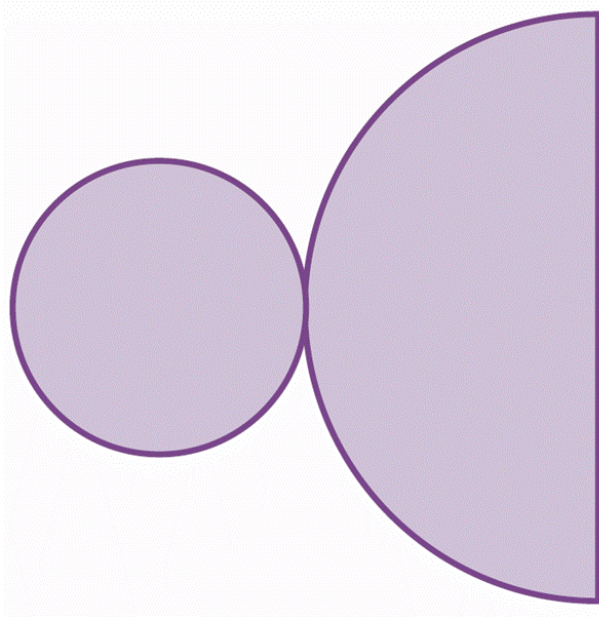


The net has six congruent square faces. So the net forms a cube.

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Example 2B: Identifying a Three-Dimensional Figure From a Net

Describe the three-dimensional figure that can be made from the given net.

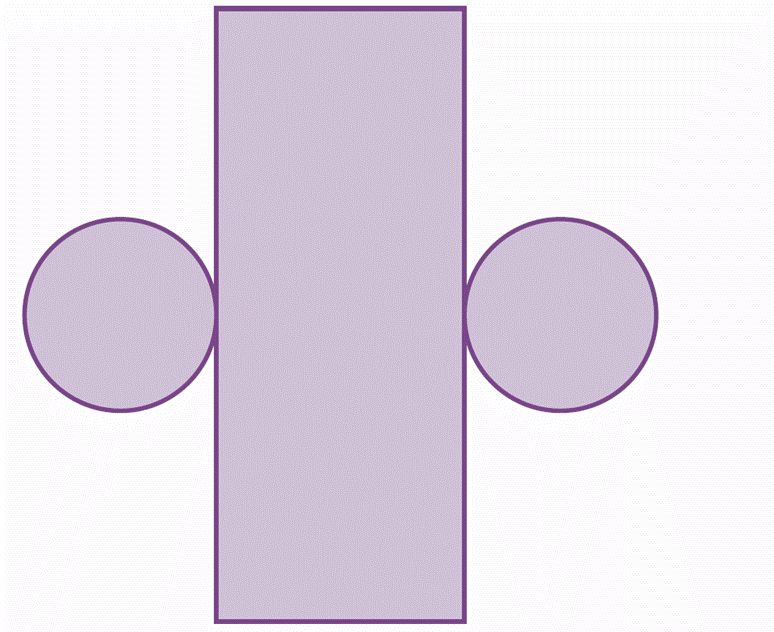


The net has one circular face and one semicircular face. These are the base and sloping face of a cone. So the net forms a cone.

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Check It Out! Example 2b

Describe the three-dimensional figure that can be made from the given net.



The net has two circular faces and one rectangular face. These are the bases and curved surface of a cylinder. So the net forms a cylinder.

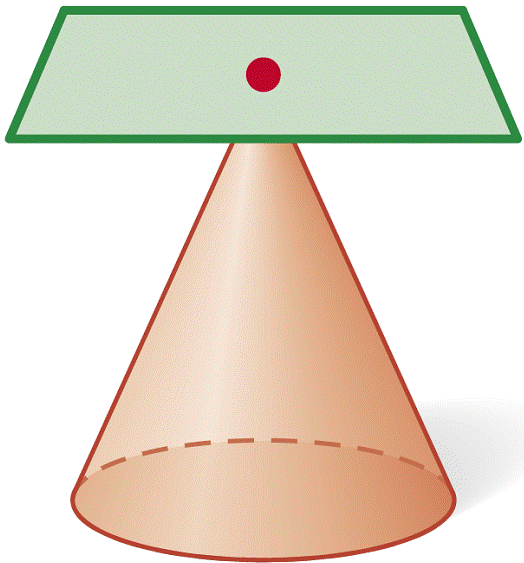
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A **cross section** is the intersection of a three-dimensional figure and a plane.

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Example 3A: Describing Cross Sections of Three-Dimensional Figures

Describe the cross section.

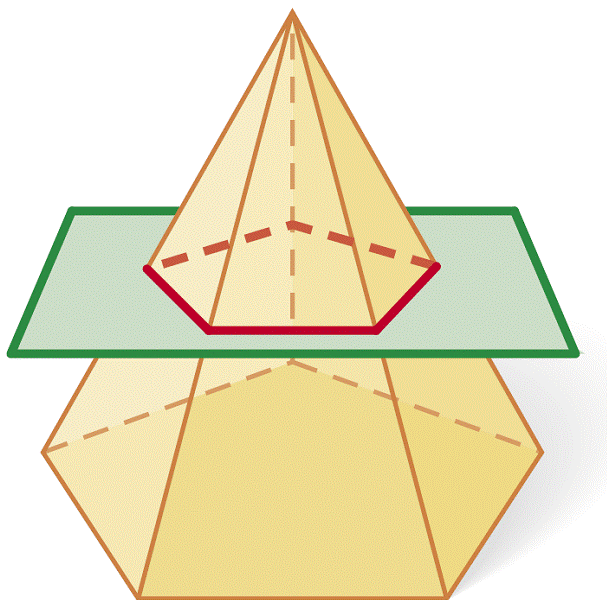


The cross section is a point.

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Example 3B: Describing Cross Sections of Three-Dimensional Figures

Describe the cross section.

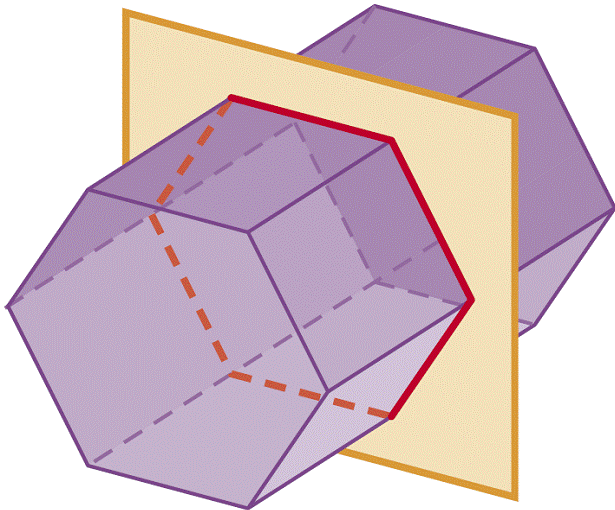


The cross section is a pentagon.

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Check It Out! Example 3a

Describe the cross section.

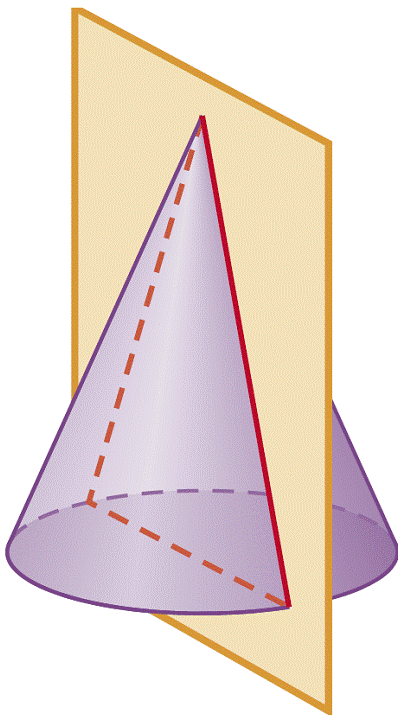


The cross section is a hexagon.

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Check It Out! Example 3b

Describe the cross section.

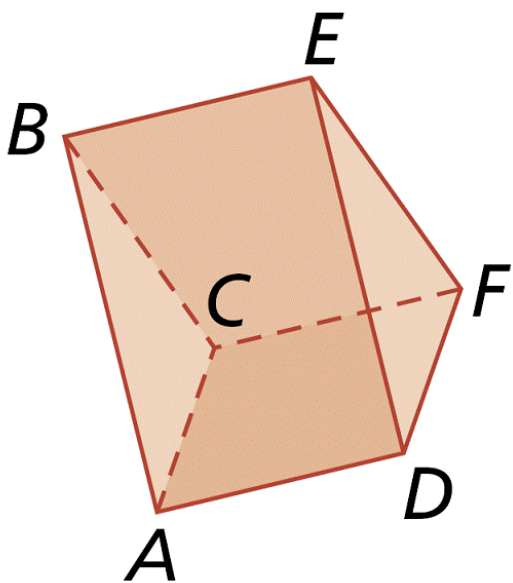


The cross section is a triangle.

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Lesson Quiz: Part I

1. Classify the figure. Name the vertices, edges, and bases.



triangular prism;

vertices: A, B, C, D, E, F ;

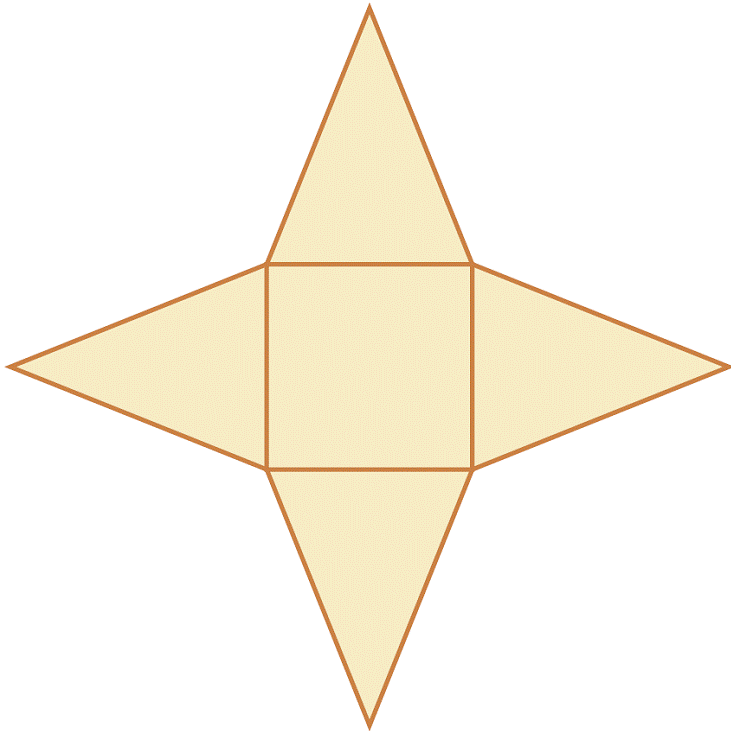
edges: $\overline{AD}, \overline{CF}, \overline{BE}, \overline{FD}, \overline{EF},$
 $\overline{AC}, \overline{DE}, \overline{AB}, \overline{BC}$

bases: $\triangle ABC$ and $\triangle DEF$

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Lesson Quiz: Part II

2. Describe the three-dimensional figure that can be made from this net.

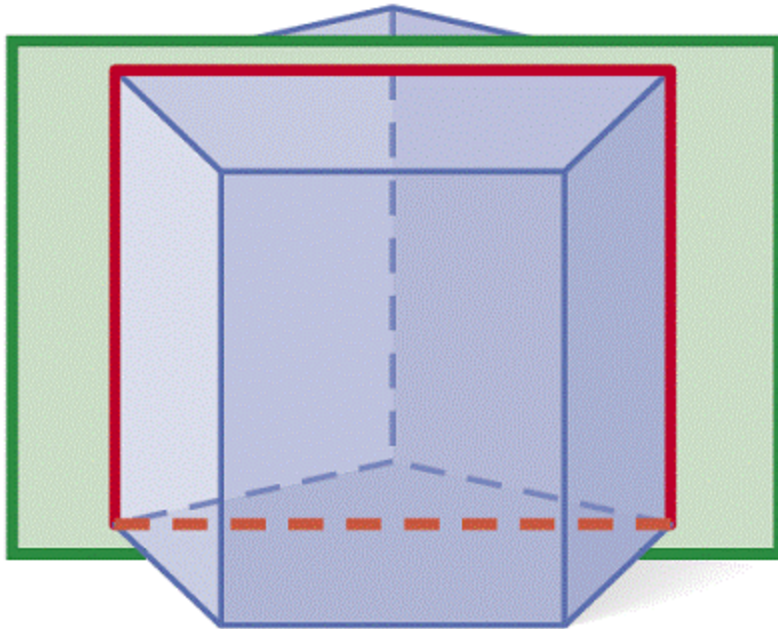


square pyramid

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Lesson Quiz: Part III

3. Describe the cross section.



a rectangle