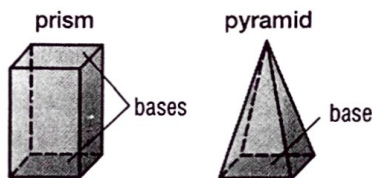


## QUICK Review

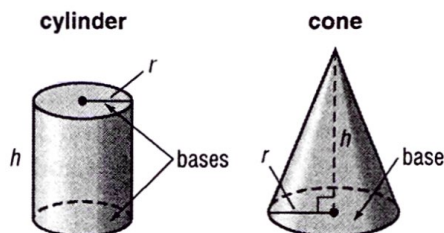
### Polygons

Sides	Name
5	pentagon
6	hexagon
7	heptagon
8	octagon
9	nonagon
10	decagon

A **prism** is a polyhedron with two parallel, congruent faces called **bases**. A **pyramid** is a polyhedron with one base that is a polygon and faces that are triangles. Prisms and pyramids are named by the shape of their bases.



There are also solids that are not polyhedrons. A **cylinder** is a three-dimensional figure with congruent, parallel bases that are circles connected with a curved side. A **cone** has one circular base and a vertex connected by a curved side.



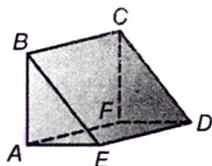
## Study Tip

**Common Error** In the drawing of a rectangular prism, the bases do not have to be on the top and bottom. Any two parallel rectangles are bases. In a triangular pyramid, any face is a base.

## EXAMPLES Identify Solids

Identify the figure. Then name the bases, faces, edges, and vertices.

1



The figure has two parallel congruent bases that are triangles, so it is a triangular prism.

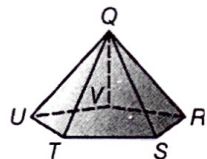
**bases**  $ABE$ ,  $FCD$

**faces**  $ABE$ ,  $FCD$ ,  $BCDE$ ,  $FAED$ ,  $ABCF$

**edges**  $\overline{AB}$ ,  $\overline{BE}$ ,  $\overline{EA}$ ,  $\overline{FC}$ ,  $\overline{CD}$ ,  $\overline{DF}$ ,  $\overline{BC}$ ,  $\overline{ED}$ ,  $\overline{AF}$

**vertices**  $A$ ,  $B$ ,  $C$ ,  $D$ ,  $E$ ,  $F$

2



The figure has one base that is a pentagon, so it is a pentagonal pyramid.

**base**  $RSTUV$

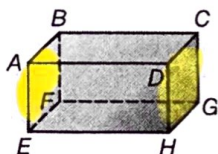
**faces**  $RSTUV$ ,  $QVR$ ,  $QRS$ ,  $QST$ ,  $QTU$ ,  $QUV$

**edges**  $\overline{QR}$ ,  $\overline{QS}$ ,  $\overline{QT}$ ,  $\overline{QU}$ ,  $\overline{QV}$ ,  $\overline{VR}$ ,  $\overline{RS}$ ,  $\overline{ST}$ ,  $\overline{TU}$ ,  $\overline{UV}$

**vertices**  $Q$ ,  $R$ ,  $S$ ,  $T$ ,  $U$ ,  $V$

## CHECK Your Progress

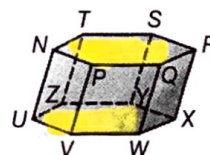
a.



b.



c.



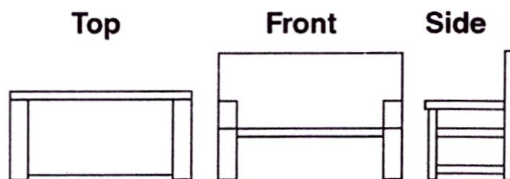
You can use three-dimensional drawings of objects to describe how different parts of the objects are related in space.



**Real-World Link . . . .**  
A well-landscaped lawn and garden can increase the value of a home up to 15%.

**REAL-WORLD EXAMPLE Analyze Drawings**

**3 FURNITURE** The photo shows a garden bench. Draw and label the top, front, and side views of the bench.



**CHECK Your Progress**

**d. TOOLBOX** Draw and label the top, front, and side views of the toolbox shown.



The intersection of a solid and a plane is called a **cross section** of the solid.

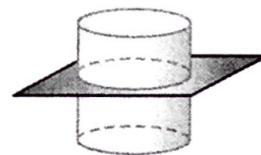
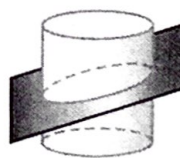
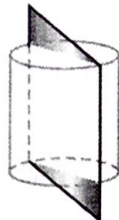
**EXAMPLE Identify Cross Sections**

**4** Describe the shape resulting from a vertical, angled, and horizontal cross section of a cylinder.

**Vertical Slice**

**Angled Slice**

**Horizontal Slice**



The cross section is a rectangle.

The cross section is an oval/ellipse

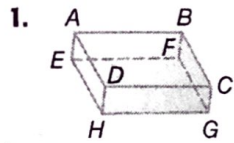
The cross section is a circle.

**CHECK Your Progress**

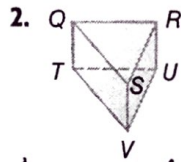
**e.** Describe the shape resulting from a vertical, angled, and horizontal cross section of a square pyramid.

## ✓ CHECK Your Understanding

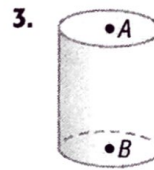
Examples 1 and 2 Identify each figure. Then name the bases, faces, edges, and vertices.



rectangular prism

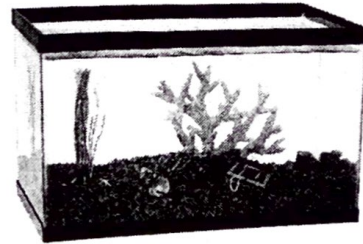


triangular prism

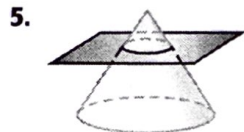


cylinder

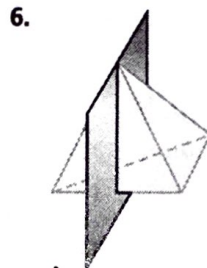
Example 3 4. **AQUARIUMS** Draw and label the top, front, and side views of the aquarium shown.



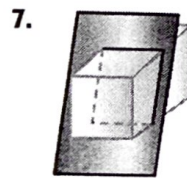
Example 4 Describe the shape resulting from each cross section.



circle



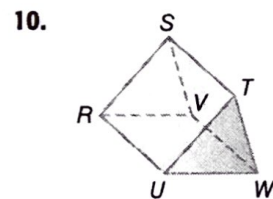
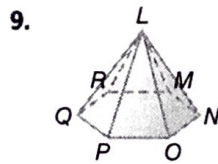
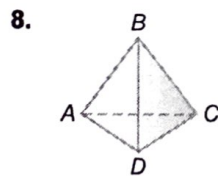
triangle



rectangle

## Practice and Problem Solving

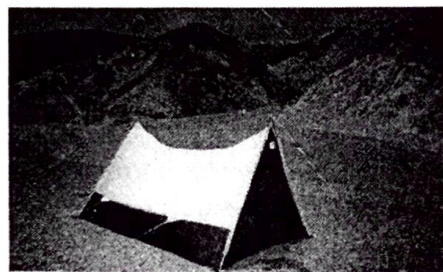
Examples 1 and 2 Identify each figure. Then name the bases, faces, edges and vertices.



Example 3 11. **BUILDINGS** Draw and label the top, front, and side views of the building.



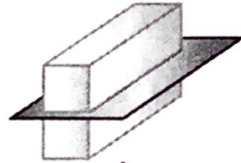
12. **TENT** Draw and label the top, front, and side views of the tent.



Example 4 Describe the shape resulting from each cross section.

P.11

13.



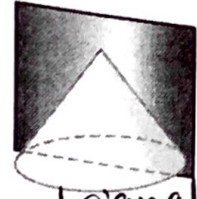
rectangle

14.



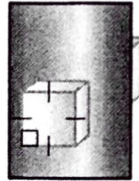
triangle

15.



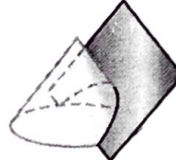
triangle

16.



square

17.



arc  
semicircle

18.



triangle

19. State whether the following conjecture is *true* or *false*. If *false*, provide a counterexample.

*Two planes in three-dimensional space can intersect at one point.*

20. **SPORTS** A standard basketball is shaped like a *sphere*.

a. Draw a basketball with a vertical, angled, and horizontal slice.

b. Describe the cross section made by each slice.

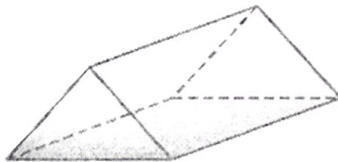
all circles



### H.O.T. Problems

21. **OPEN ENDED** Draw the cross sections of a polyhedron, cylinder, or cone. Exchange papers with another student. Identify the three-dimensional figures represented by the cross sections.

22. **FIND THE ERROR** Brian is identifying the figure below. Find his mistake and correct it.



The figure has a triangular base. It is a triangular pyramid.



**CHALLENGE** Determine whether each statement is *always*, *sometimes*, or *never* true. Explain your reasoning.

23. A prism has 2 bases and 4 faces.      24. A pyramid has parallel faces.

25. **WRITE MATH** Explain whether a top-front-side view diagram *always* provides enough information to draw a figure. If not, provide a counterexample.

# 12-1 Study Guide and Intervention *(continued)*

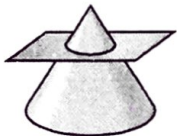
## Representations of Three-Dimensional Figures

**Cross Sections** The intersection of a solid and a plane is called a **cross section** of the solid. The shape of a cross section depends upon the angle of the plane.

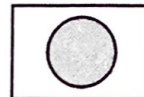
### Example

There are several interesting shapes that are cross sections of a cone. Determine the shape resulting from each cross section of the cone.

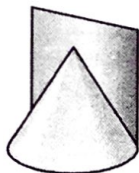
a.



If the plane is parallel to the base of the cone, then the resulting cross section will be a circle.



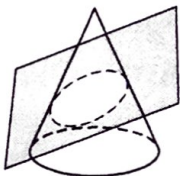
b.



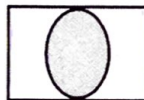
If the plane cuts through the cone perpendicular to the base and through the center of the cone, then the resulting cross section will be a triangle.



c.



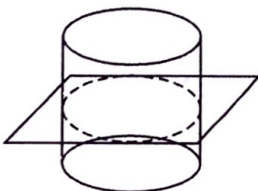
If the plane cuts across the entire cone, then the resulting cross section will be an ellipse.



### Exercises

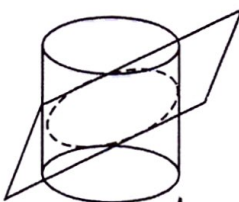
Describe each cross section.

1.



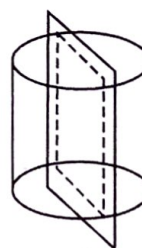
Circle

2.



oval / ellipse

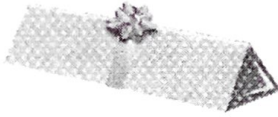
3.



rectangle

**✓ Test Practice**

26. Benita received the gift box shown.



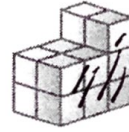
Which drawing **best** represents the top view of the gift box?

- A.
- B.
- C.
- D.

\* 27. Which of the following is NOT an example of a polyhedron?

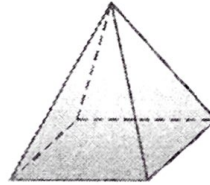
- F. cylinder
- G. rectangular prism
- H. octagonal pyramid
- I. triangular prism

28. Which of the following represents a side view of the figure below?



- A. *top*
- B. *top*
- C. *front*
- D. *front*

29. The figure below is a square pyramid.



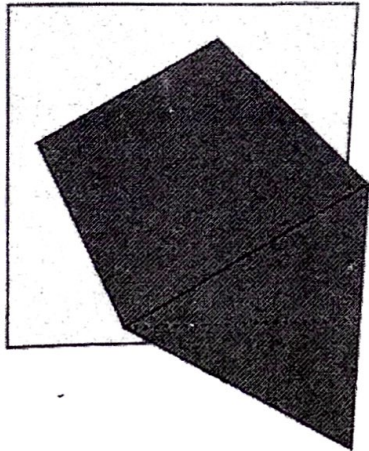
Which of the following is NOT a cross section from the square pyramid?

- F.
- H.
- G.
- I.

①

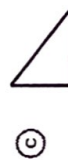
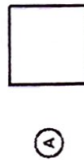
### Cross sections of 3D objects (basic)

You're out on a camping trip, and you're thinking about the geometry of your triangular prism.



Which shape does the intersection of the vertical plane with the tent look

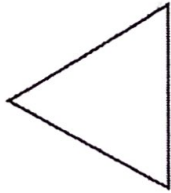
Choose 1 answer:



②

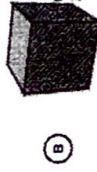
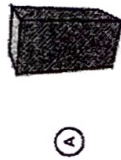
### Cross sections of 3D objects (basic)

A vertical slice through a three-dimensional solid produces a two-dimensional



Which one of the following solids can produce this two-dimensional shape

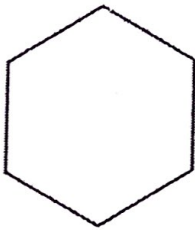
Choose 1 answer:



## Cross sections of 3D objects (basic)

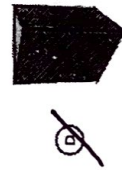
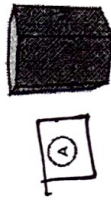
3

A horizontal slice through a three-dimensional solid produces a two-dimer



Which one of the following solids produces this two-dimensional shape v

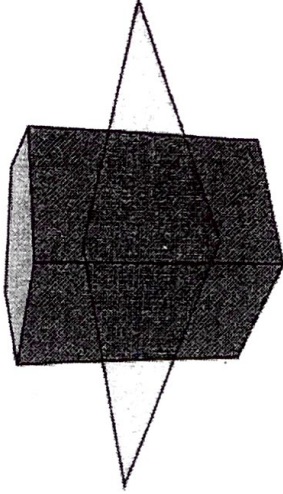
Choose 1 answer:



## Cross sections of 3D objects (basic)

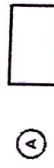
4

The figure below shows a right regular prism whose base is a pentagon.



Which shape does the intersection of the horizontal plane with the prism

Choose 1 answer:

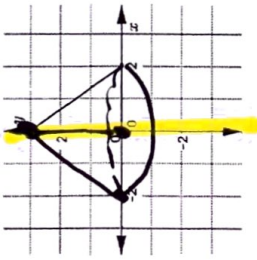


4 of 4



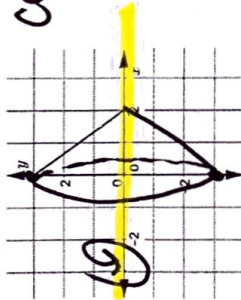
Name \_\_\_\_\_ Date \_\_\_\_\_

1. Describe in detail the solid formed by rotating a right triangle with vertices at  $(0, 0)$ ,  $(2, 0)$ , and  $(0, 3)$  about the vertical axis. Include the dimensions (height, length, width, radius, etc) of the solid in your description.



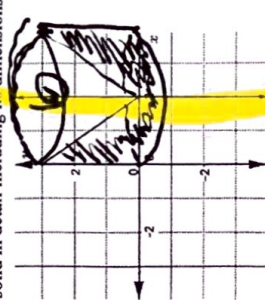
cone pointing up  
 $h = 3$  units  
 radius = 2 units

2. Describe in detail the solid formed by rotating a right triangle with vertices at  $(0, 0)$ ,  $(2, 0)$ , and  $(0, 3)$  about the horizontal axis. Include the dimensions (height, length, width, radius, etc) of the solid in your description.



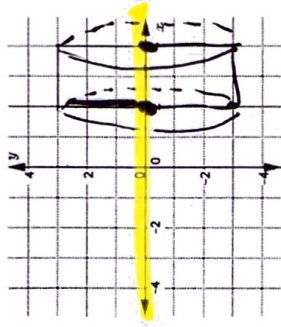
cone pointing right  
 $h = 2$  units  
 $r = 3$  units

3. Imagine the solid formed by rotating the same right triangle about the line  $x = 2$ . Describe this solid in detail including its dimensions.



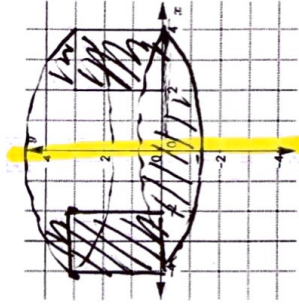
cylinder with cone removed  
 $h = 3$  units  
 $r = 2$  units

4. Describe in detail the solid formed by rotating a  $2 \times 3$  rectangle with vertices  $(2, 0)$ ,  $(4, 0)$ ,  $(2, 3)$  and  $(4, 3)$  about the x-axis. Include the dimensions (height, length, width, radius, etc) of the solid in your description.



cylinder  
 $h = 2$  units  
 $r = 3$  units

5. Describe in detail the solid formed by rotating a  $2 \times 3$  rectangle with vertices  $(2, 0)$ ,  $(4, 0)$ ,  $(2, 3)$ , and  $(4, 3)$  about the y-axis. Include the dimensions (height, length, width, radius, etc) of the solid in your description.



big cylinder with small cyl. removed  
 $h = 3$   
 over  $r = 4$



Go to the following website: CK-12 SLT3 Identify the solid created by rotating a two-dimensional figure

<https://www.ck12.org/geometry/cross-sections-and-basic-solids-of-revolution/lesson/user:ZGVib3JhaF9hX2hpbHRuZXJAbWNwc2lkLm9yZw../SLT-3-Identify-the-solid-created-by-rotating-a-two-dimensional-figure/>

Click on the link under "Watch this"

<https://learnzillion.com/lessons/3488-predict-3d-results-of-rotating-simple-figures>

You should be at Predict 3D results of rotating simple figures. Under Direction Instruction, watch the video.

1. What is a rotation? Circular movement around a center of rotation

2. What is the axis of rotation? Imaginary line of rotation for 3D objects

First Triangle:

3. a) What did the edges perpendicular to the axis draw? flat surfaces

b) What did the edges parallel to the axis draw? curved surfaces

c) What 3D shape was created from rotating the triangle? cone

First rectangle:

4. a) What did the edges perpendicular to the axis draw? flat surfaces

b) What did the edges parallel to the axis draw? curved surfaces

c) What 3D shape resulted from rotating the rectangle? cylinder

Second rectangle: diagonal

5. a) What did the edges perpendicular to the axis draw? flat faces

b) What did the edges parallel to the axis draw? curved surfaces



c) What 3D shape resulted from rotating the rectangle? cylinder

Third rectangle:

6. What 3D shape resulted from rotating the rectangle this time? diamond on top of diamond

First circle:

7. a) What did the curved edges draw? curved surfaces

b) What 3D shape resulted from rotating the rectangle? sphere

Once you are done with this video, you have completed this task!