Molly was playing with a stacking toy of wooden rings that looked similar to a cone when put together correctly. Delaney, her older sister, noticed the top and bottom of each ring was a circle just like the base of the cone. She wondered about slicing any solid parallel to its base. Would the flat surface created by the cut always be the same shape as the base of the original solid?

**EXPLORE!**

**Step 1:** Sketch a cone, a cylinder, a rectangular prism and a square pyramid.

**Step 2:** What shape is the base of each solid?

**Step 3:** Analyze each shape and determine what two-dimensional shape would be formed by a cut parallel to the base.

**Step 4:** Organize this information into the first two columns of a table like the one shown below. The last two columns will be filled in later.

<table>
<thead>
<tr>
<th>Name of Solid</th>
<th>Shape of Original Base</th>
<th>Shape of New Base after Parallel Cut</th>
<th>Shape of a Side of the Solid</th>
<th>Shape after Making a Perpendicular Cut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cone</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cylinder</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rectangular Prism</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Square Pyramid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Step 5:** Look at the table. What do you notice about each new base formed by a horizontal cut parallel to the original base?

**Step 6:** Fill in the column titled, “Shape of a Side of the Solid,” in the table. Write what shape each side of the solid is. If it does not have a shape, write “none.”

**Step 7:** Look at each solid and determine what two-dimensional shape would be formed if a cut is made perpendicular to the base. Write your answers in the last column of your table.

**Step 8:** What do you notice about the shape formed by:

a. making a perpendicular cut to the base in a cone and a pyramid?

b. making a perpendicular cut to the base in a rectangular prism and a cylinder?
To slice means to cut, making a piece separate from the original shape. In the Explore! you determined which two-dimensional shape was formed by different slices. Each slice was either perpendicular to the base or parallel to the base. The table below summarizes the slices made in the Explore!.

### SLICING SOLIDS

<table>
<thead>
<tr>
<th>Name of Solid</th>
<th>Two-dimensional shape formed by a slice parallel to the base</th>
<th>Two-dimensional shape formed by a slice perpendicular to the base</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prism</td>
<td>Shape congruent to its base</td>
<td>Rectangle</td>
</tr>
<tr>
<td>Cylinder</td>
<td>Congruent circle</td>
<td>Rectangle</td>
</tr>
<tr>
<td>Pyramid</td>
<td>Shape similar to its base</td>
<td>Triangle</td>
</tr>
<tr>
<td>Cone</td>
<td>Similar circle</td>
<td>Triangle</td>
</tr>
</tbody>
</table>

Delaney knew that when her mother would slice an orange in half the two-dimensional shape formed along the cut was a circle. She asked her father if any cut on a sphere would make a circle. They took an orange and made a variety of slices. What do you think they found?

### SLICING SPHERES

| Sphere | When a sphere is sliced, the slice will always be a circle. |

**EXAMPLE 1**

Determine the two-dimensional shape formed by each slice.

a. A perpendicular slice to the base of a cone.

b. A parallel slice to the base of a triangular prism.

**Solutions**

a. A **triangle** is formed by slicing a cone perpendicular to the base.

b. A **triangle** is formed by slicing a triangular prism parallel to its base.
**EXAMPLE 2**

A cut was made on each solid parallel to its base. Determine if the two-dimensional figure formed by the cut is similar or congruent to its base.

a. ![Image](Image1.png)

b. ![Image](Image2.png)

c. ![Image](Image3.png)

**SOLUTIONS**

a. **SIMILAR.** The cut formed will be a circle but it will be smaller than the base.

b. **CONGRUENT.** The cut formed will be a hexagon the same size as the base.

c. **CONGRUENT.** The cut formed will be a circle that is the same size as the base.

A solid can be sliced many ways. Each cut will not always be parallel or perpendicular to the solid's base. The diagram at the right shows the corner of a cube being sliced. The two-dimensional shape made by the cut is a triangle.

**EXERCISES**

Use the solids below. Read each description. Using the word bank, list the two-dimensional shape formed by each slice.

![Images of solids: Cylinder (A), Cube (B), Rectangular Prism (C), Cone (D), Square Pyramid (E)]

1. Figure B sliced perpendicular to the base
2. Figure D sliced parallel to the base
3. Figure A sliced parallel to the base
4. Figure A sliced perpendicular to the base
5. Figure E sliced perpendicular to the base
6. Figure D sliced perpendicular to the base
7. Figure C sliced perpendicular to the base
8. Figure B sliced diagonally from top left to bottom right
9. Figure C sliced parallel to the base
10. Figure E sliced parallel to the base
11. Pedro cut a cube parallel to its base.
   a. What shape is the base of the new solid?
   b. The two new solids that are formed are no longer cubes. What are the names of the two new solids?

12. Cheri cut a cube diagonally from the top right edge to the bottom left edge. What shape is formed by the cut? What other solid when cut diagonally will have the same shape as the diagonal cut of the cube?

13. A cylinder is 12 inches tall and has a diameter of 8 inches. The surface area of the cylinder is about 402 square inches. A cut is made perpendicular to the base of the cylinder and through the center of the cylinder. What is the surface area of each new solid?

Each solid is cut parallel to its base. Determine the name of the two-dimensional figure formed by the cut and if the figure is similar or congruent to its base.

14. 

15. 

16. 

17. 

18. 

19. 

20. Nathan sliced a solid once. The cut was parallel to the solid’s base. The figure formed was a pentagon congruent to the solid’s base. Name the original solid.

21. Sylvette made one slice on two different solids. She cut both solids perpendicular to their bases. The two-dimensional figure formed by each cut was a triangle. Name the two solids that Sylvette sliced.

22. Sketch a composite solid that when cut parallel to its base is sometimes congruent to its base and sometimes similar to its base.

Name the two-dimensional shape formed by each slice.

23. 

24. 

25. 

26. 