**Activity 8.2.2 Moving to the Next Dimension**

Mathematicians conceive of 4th, 5th, and higher dimensions by extending ideas from lower dimensions as shown in this activity.



1. A point has no dimension. A segment can be thought of as the trail of a point moved into the next dimension by passing along a line. The original point has zero dimension. The segment has \_\_\_\_ dimension(s).

2. Imagine a segment moving in a plane to form a square. The trail of the moving segment is a square region or face. As they move, the original two endpoints create edges for the square.

a. Let’s count the vertices of the square. The original segment had \_\_ vertices and the final segment has \_\_\_ vertices. That gives a total of \_\_\_ vertices.

b. Let’s count the edges of the square. The original segment is one edge and the final segment is another edge. Each endpoint of the original segment moves to form a new edge of the square. How many edges are there altogether? \_\_\_\_\_

c. The segment has moved through the plane from its original position to its final position. This creates the interior of the square, or one face. In summary the square has \_\_\_ vertices, \_\_\_ edges, and \_\_\_\_ face.



3. Now imagine a square moving in space to form a cube. The trail of the square is the space within the cube.

1. 4 vertices from the original square move to create \_\_ new vertices and \_\_\_ new edges.
2. 4 edges from the original square move to create \_\_ new edges and \_\_\_ new faces
3. The original square is a face. It moves to create \_\_\_ new face and the space filling the cube.
4. To summarize the cube has \_\_\_\_ vertices, \_\_\_\_ edges, \_\_\_\_\_ faces, and \_\_\_\_ space.

4. Complete this table based on what you have observed.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Figure | Dimensions | # of vertices | # of edges | # of faces | # of spaces |
| point |  |  | --- | --- | --- |
| segment |  |  |  | --- | --- |
| square |  |  |  |  | --- |
| cube |  |  |  |  |  |