POLYHEDRON DISCOVERIES

Objective: Discover the number of faces, edges and vertices of polyhedra.

Materials: Polyhedra Discoveries Chart Transparency
Polyhedra Discoveries Chart Answer Sheet
Two sets of geometric solids

Procedures:
1. Place the geometric solids on the tables with the rectangular prism, the triangular prism, the cube, and the hexagonal prism grouped together, the square pyramid in a group by itself; and the sphere, cone, and cylinders together.

2. Say something like: "These are all geometric solids. The solids in the first group are prisms. A prism is a solid which has two parallel bases that are congruent polygons and all other faces that are parallelograms. Remember that rectangles, and therefore squares, are also parallelograms. A prism is named by it bases." Hold up the triangular prism, and ask what its name would be. Hold up the hexagonal prism, and ask its name. Hold up the rectangular prism and explain that although its bases are square it is called a rectangular prism more often than a square prism. With any rectangular or square prism, any pair of opposite faces can be the bases. The square prism is given a special name, the "cube".

3. Hold up the square pyramid. Say something like: "This is a pyramid. A pyramid has a polygon for a base, and all of its other faces are triangles which have a common vertex, or point. It is usually easy for students to identify a pyramid, because it looks like the Egyptian pyramids. Pyramids are also named by their bases, so what is this one called?" (Square pyramid). "There are also other types of pyramids, like the pyramid with a triangular base, as well as all of its other sides being triangular, therefore, it has four triangular faces."

4. Prisms and pyramids are polyhedra. Polyhedra are solids which have flat faces which are polygons. This last group of solids are not polyhedra, are they? Why? Because their faces are not polygons.

5. 'Let's consider only the polyhedra for a moment, and fill in a chart that will allow you to discover an interesting pattern about polyhedra." Place the polyhedron chart on the overhead, and place the geometric solids

(only the polyhedra) at random on the participant's tables. Ask who has the triangular prism, then ask how many faces it has. Record this on the overhead chart, then ask how many vertices it has, then how many edges it has. Next, ask who has the square pyramid, and ask how many faces, vertices, and edges it has as you fill in the chart. Note the filled-in chart that is supplied, and verify their answers. Continue this procedure until you have filled in the chart with all of the information that is on the pre-filled-in chart. Challenge the participants to find a pattern that would hold true for all of the shapes. You may need to give them hints like: "Well, we only have four operations, multiplication, addition, subtraction, and division. Can you use these to find a common pattern between the number of faces, vertices, and edges of each shape?" The pattern is Faces + Vertices - 2 = Edges ($F + V - 2 = E$). Or, the participants may give it to you as Faces + Vertices = Edges + 2 ($F + V = E + 2$).

6. Discuss the fact that there are many patterns in mathematics. This pattern, or formula, may not be the most important one, but discovering it is a good problem solving exercise for students, and at the same time they are exposed to the proper terminology of defining polyhedra: faces, edges, vertices (or vertexes).

7. Pass out the filled-in charts to each participant.

POLYHEDRA DISCOVERIES CHART

POLYHEDRON	Number of FACES	Number of VERTICES	Number of EDGES
TRIANGULAR PRISM			
SQUARE PYRAMID			
RECTANGULAR PRISM			
CUBE			
HEXAGONAL PRISM			

POLYHEDRA DISCOVERIES CHART
ANSWER SHEET

POLYHEDRON	Number of FACES	Number of VERTICES	Number of EDGES
TRIANGULAR PRISM	5	6	9
SQUARE PYRAMID	5	5	8
RECTANGULAR PRISM	6	8	12
CUBE	6	8	12
HEXAGONAL PRISM	8	12	18