Name: ___________________________

Date: ___________________________

Period: _________________________

Geometry Lesson 49

Objective: TSW be introduced to solids.

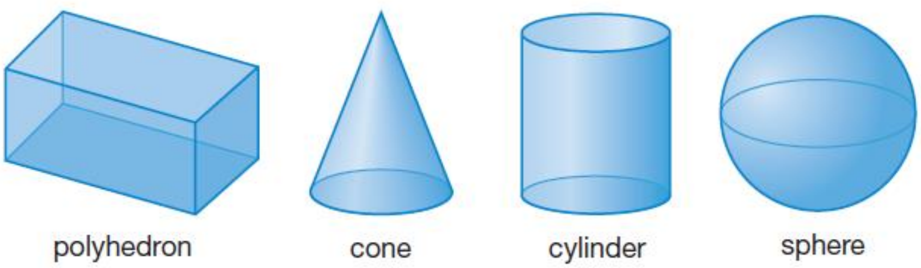
The figures discussed in previous lessons are two-dimensional figures. This lesson introduces three-dimensional figures called solids. Solids can have flat or curved surfaces.

__________________________ - Any closed three-dimensional figure formed by four or more polygons that intersect only at their edges.

__________________ - A three-dimensional figure with a circular base and a curved lateral surface that comes to a point.

_________________________ - A three-dimensional figure with two parallel circular bases and a curved lateral surface that connects the bases.

________________ - The set of points in space that are a fixed distance from a given point, called the center of the sphere.

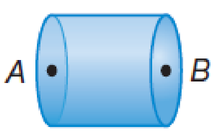


Math Reasoning

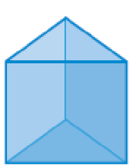
Write What are some common objects that are polyhedrons? Spheres?

Example 1 Classifying Solids

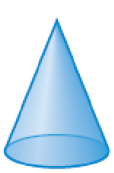
Classify each of the three-dimensional solids shown.

a. 

SOLUTION

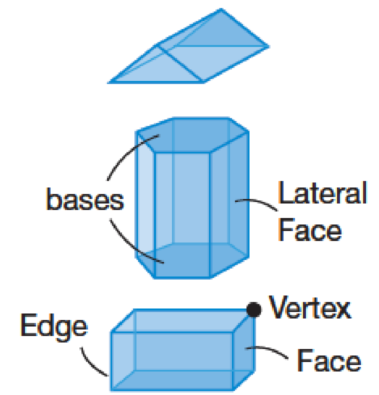
b. 

SOLUTION

c. 

SOLUTION

___________ of the Polyhedron - Each flat surface of a polyhedron.



_____________ - The segment that is the intersection of two faces of a solid.

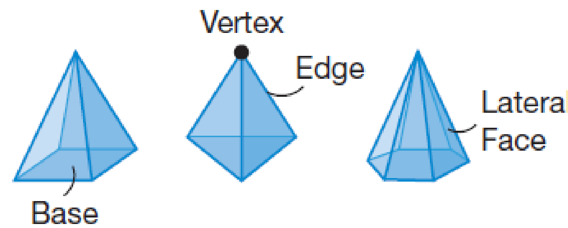
_______________ - The point of intersection of three or more faces of the figure.

______________ - A polyhedron formed by two parallel congruent polygonal bases connected by lateral faces that are parallelograms.

_________________ of a Prism - One of the two congruent parallel faces of the prism.

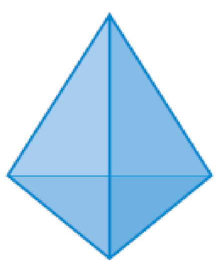
__________________ Face - Face of a prism that is not a base.

_______________________ - A polyhedron formed by a polygonal base and triangular lateral faces that meet at a common vertex. The faces of a pyramid all share a common vertex. The base is the side of the pyramid that does not share a single vertex with all of the other sides.



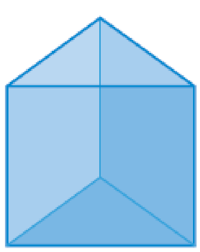
Prisms and pyramids are named by the shape of their bases. For example, a prism with a triangle for a base is called a triangular prism. A pyramid with a hexagon for a base would be called a hexagonal pyramid. A cube is the special name for a prism with six square faces.

Example 2 Classifying Polyhedra
Classify each polyhedron.



a.

SOLUTION



b.

SOLUTION

Regular Polyhedron - All of its faces are _________________________________, regular polygons.

Regular Pyramid - Its base is a regular polygon and its lateral faces are congruent __________________________ triangles.

Regular Prism - Its base is regular and its faces are __________________________.

A cube is both a regular ___________________________ and a regular rectangular _______________________.

A triangular prism with equilateral bases is a regular prism but is not a regular polyhedron, since its faces are not congruent to its bases.

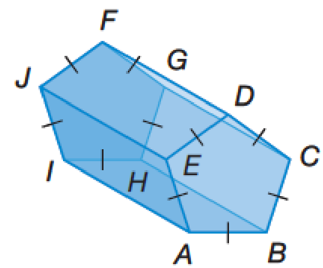
Math Reasoning

Generalize A pentagonal pyramid does not have a diagonal. Is this true of all pyramids? Explain.

_______________________ of a Polyhedron - A segment whose endpoints are the vertices of two different faces of a polyhedron.

Example 3 Describing Characteristics of Solids
Classify the polyhedron in the diagram, assuming all the angles of each pentagon are congruent. Is it a regular polyhedron? How many edges, vertices, and faces does it have? Name one diagonal segment of the polyhedron.

SOLUTION



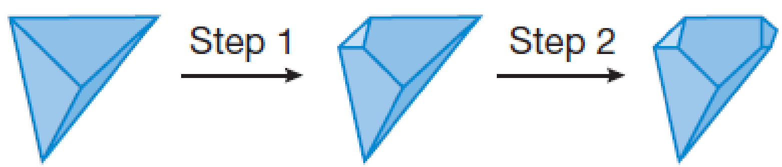
A unique relationship exists among the number of faces, vertices, and edges of any polyhedron.

Euler's Formula - For any polyhedron with V vertices, E edges and F faces,

Example 4 Using Euler's Formula
How many faces does a polyhedron with 12 vertices and 18 edges have?

SOLUTION

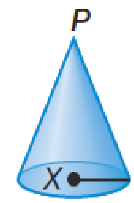
Example 5 Application: Diamond Cutting
Diamonds are cut to change them from a rough stone into a gemstone. The figure below shows two steps in cutting a particular diamond. If each of the other vertices is cut in the next steps, what is the number of faces, vertices, and edges of the diamond in Step 4? Verify your answer.



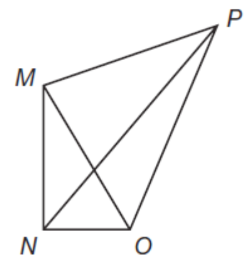
SOLUTION

You Try!!!!!!!

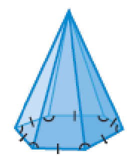
a.Classify the solid. Name its vertices, edges, and bases.



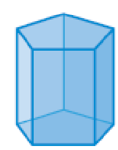
b.Classify the solid. How many vertices, edges, and bases does it have?



c.Classify the polyhedron. Determine whether it is a regular polyhedron.



d.Classify the polyhedron. Determine whether it is a regular polyhedron.



e.How many edges does a polyhedron with 14 vertices and 9 faces have?

f.Gemstones A gemstone is cut in the shape of a cube. Each vertex of the cube is then cut so that there is a triangular facet at each vertex. What is the number of faces, vertices and edges when the first four vertices of the cube are removed? Verify the results with Euler's Formula.