

Geometry

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Unit 12: Surface Area and Volume of Solids

Priority Standard: G-GMD: Use volume formulas for cylinders, pyramids, cones and spheres to solve problems

Unit 8 “I can” Statements:

1. I can identify solids
2. I can find the surface area of prisms and cylinders
3. I can find the surface area of pyramids and cones
4. I can find the volume of prisms and cylinders
5. I can find the volume of pyramids and cones
6. I can find the surface area and volume of spheres
7. I can use the properties of similar solids to find unknown ratios, corresponding lengths, areas or volumes

Chapter 12.1: Explore Solids

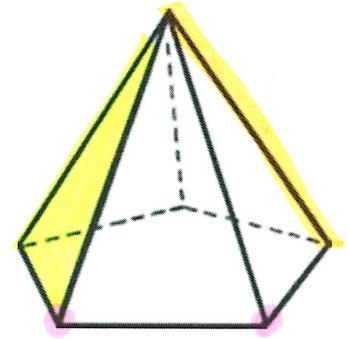
Polyhedron: solid bounded by polygons called faces that enclose a single region of space

* flat not rounded

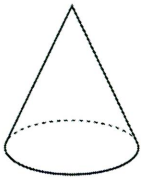
Face: flat side

Edge: is a line segment formed by the intersection of two faces

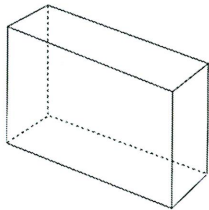
Vertex: point where 3 or more edges meet



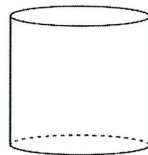
Types of Solids: Which solids are polyhedrons? *yes or no*



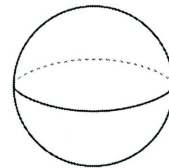
No



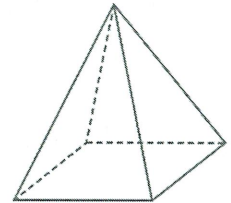
yes



No

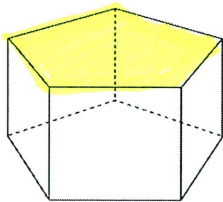


No



yes

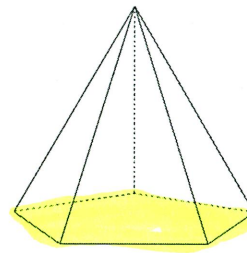
Classifying Solids: To name a prism or a pyramid, use the shape of the base.



Pentagonal prism

*2 bases
same shape*

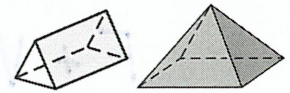
one base



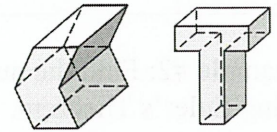
Pentagonal pyramid

Regular Polyhedrons: A polyhedron is regular if all of its faces are congruent regular polygons.

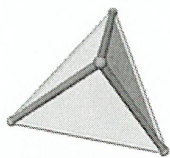
• A polyhedron is **convex**: if any two points on its surface can be connected by a segment that lies entirely inside or on the polyhedron.



• A polyhedron is **concave**: if two points on its surface is connected by a segment that goes outside the polyhedron.

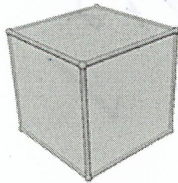


There are 5 regular polyhedra called platonic solids



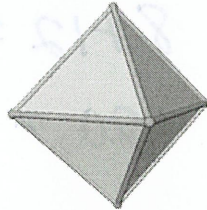
Tetrahedron

4 faces



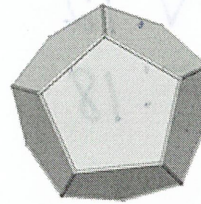
Cube

6 faces



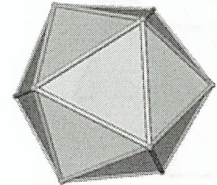
Octahedron

8 faces



Dodecahedron

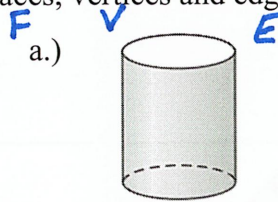
12 faces



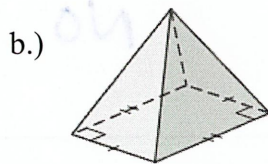
Icosahedron

20 faces

Example #1: Tell whether the solid is a polyhedron. If it is, name the polyhedron and find the number of faces, vertices and edges.



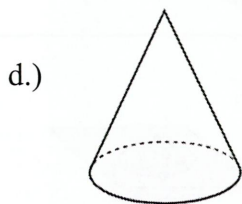
No



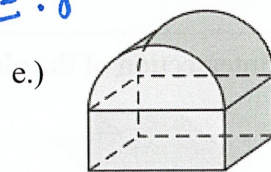
Yes, rectangular pyramid
F: 5
V: 5
E: 8



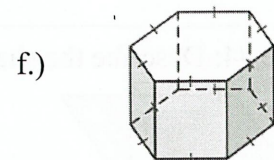
Yes F: 5
triangular V: 6
prism E: 9



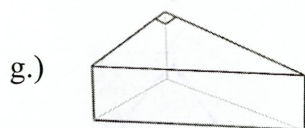
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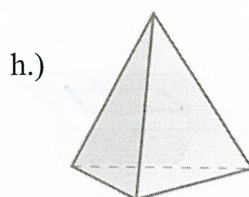
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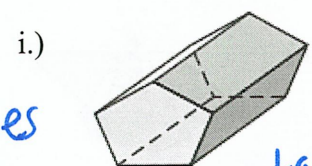
Yes F: 8
hexagonal V: 12
prism E: 18



Yes F: 5
V: 6
E: 9
triangular prism



Yes F: 4
V: 4
E: 6
triangular pyramid



Yes F: 7
V: 10
E: 15
pentagonal prism

Euler's Theorem (Theorem 12.1):

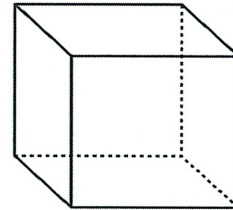
The number of faces (F), vertices (V) and edges (E) of a Polyhedron are related by the formula...

$$F + V = E + 2$$

$$F = 6$$

$$V = 8$$

$$E = 12$$

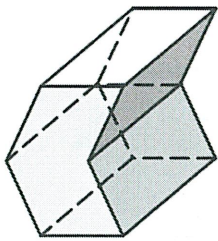


$$F + V = E + 2$$

$$6 + 8 = 12 + 2$$

$$14 = 14 \checkmark$$

Example #2: Find the number of faces, vertices and edges of the polyhedron shown. Check your answers using Euler's Theorem.



$$F: 8$$

$$V: 12$$

$$E: 18$$

$$F + V = E + 2$$

$$8 + 12 = 18 + 2$$

$$20 = 20 \checkmark$$

Example #3: Is it possible for a polyhedron to have 16 faces, 34 vertices and 50 edges?

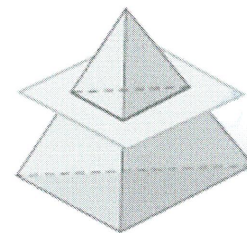
$$F + V = E + 2$$

$$16 + 34 = 50 + 2$$

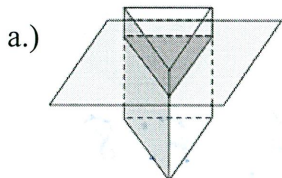
$$50 \neq 52$$

NO

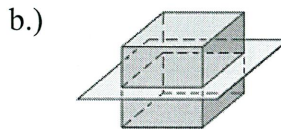
Cross Section: the intersection of a plane and a solid.



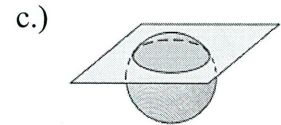
Example #4: Describe the shape formed by the intersection of the plane and the solid.



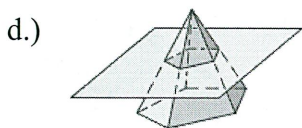
triangle



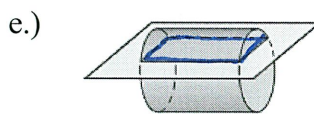
square



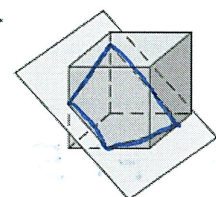
circle



pentagon



rectangle



trapezoid