

ESSENTIAL QUESTION: When is a solid a polyhedron?

QUESTIONS:

**VOCABULARY:**

**Polyhedron (convex) (3-D)**  
 A solid that is bounded by polygons

**Regular polyhedron**  
 A convex polyhedron with all faces  $\cong$  and regular polygons (only 5)

**Face**  
 The flat surface of a polyhedron  
 \* Always a polygon

**Edge**  
 A line segment where 2 faces intersect

**Vertex**  
 A point where 3 or more edges meet

**Solid's base**  
 used to name a prism or pyramid  
 "sits on"



**Platonic solid** \* A regular polyhedra

- Tetrahedron
- Icosahedron
- cube
- octahedron
- dodecahedron

**Cross section**  
 The intersection of a plane and a solid  
 - newly exposed surface after slice



- 4 triangles →
- 20 triangles →
- 6 squares →
- 8 triangles →
- 12 pentagons →

**A1. Sketch the following.**

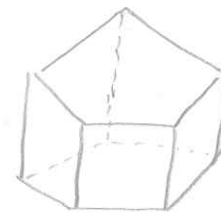
a. triangular pyramid

Base →  $\Delta$



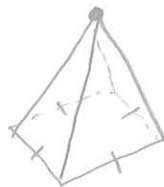
b. pentagonal prism

2 Bases each  $\cong$  pentagons



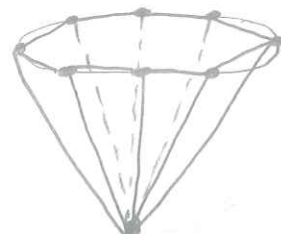
c. square pyramid

Base → 4  $\cong$  sides



d. octagonal pyramid

Base → 8 sides



Draw upside-down



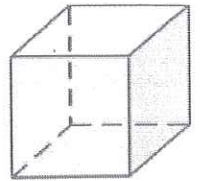
\*Want the ice cream to stay in!

SUMMARY:

QUESTIONS:

**Theorem 12.1: Euler's Theorem**

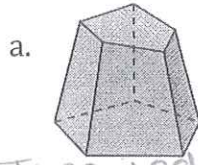
The number of faces (F), vertices (V), and edges (E) of a polyhedron are related by the formula  $F + V = E + 2$ .



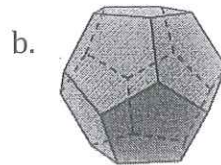
Cube:  $F=6$   $V=8$   $E=12$   $6+8=12+2$   
 $14=14 \checkmark$

A2. Tell whether the solid is a polyhedron. If it is, name the polyhedron and find the number of faces, vertices, and edges AND check your answers using Euler's Theorem.

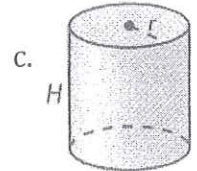
Top cut off



Truncated Pentagonal Pyramid  
 $F=7$   $V=10$   $E=15$   
 $7+10=15+2$   
 $17=17 \checkmark$

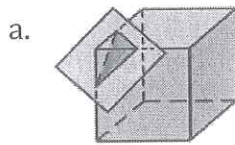


$F=12$   $V=20$   $E=30$   
 $12+20=30+2$   
 $32=32$   
 Dodecahedron

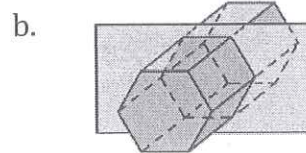


Cylinder  
 (Not a Polyhedron)

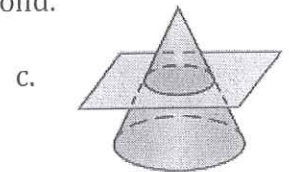
A3. Describe the shape of the cross section of each solid.



Triangle



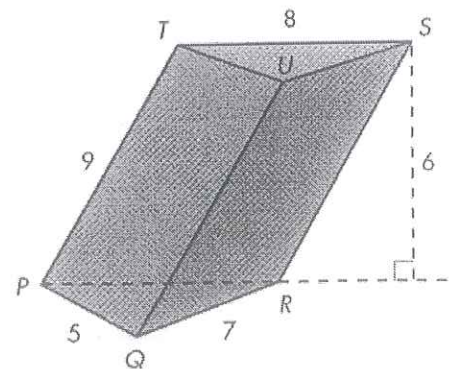
Hexagon



Circle

A4. Use the figure to respond to the following questions.

- Name the bases  
 $\triangle PQR$  and  $\triangle STU$
- Name the lateral edges  
 $\overline{PT}$ ,  $\overline{QU}$ ,  $\overline{RS}$
- Name the lateral faces  
 $PQUT$ ,  $QRSU$ ,  $PRST$
- What is the height?  
 6 in
- Specifically classify the solid.



lateral edges not  $\perp$   $\rightarrow$  oblique triangular prism