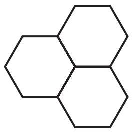
Properties of Platonic Solids				
Regular Polyhedron	**Vertices (V)**	**Edges (E)**	**Faces (F)**	$V - E + F$
tetrahedron	4	6	4	2
cube	8	12	6	2
octahedron	6	12	8	2
dodecahedron	20	30	12	2
icosahedron	12	30	20	2

Example 1 Hexagons and Platonic Solids

Why are none of the Platonic solids made with regular hexagons? Explain using angle measures.

SOLUTION

Each angle in a regular hexagon measures 120°. At least three hexagons would need to be placed at each vertex.



This means that each vertex would have a total measure of $120° \times 3 = 360°$.

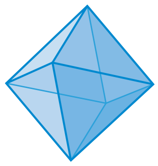
But, 360° is the angle of a point on a plane. If the angles added to 360°, the hexagons would make a tessellation, not a polyhedron.

Math Language

A **tessellation** is a repeating pattern of polygons that completely covers a plane with no gaps or overlaps.

Example 2 Angles of Platonic Solids

a. What is the sum of the measures of the angles at a vertex of a regular octahedron?



SOLUTION

Each vertex is the meeting point of four equilateral triangles. The measure of each angle in an equilateral triangle is 60°.

$60° \times 4 = 240°$

The sum of the angles is 240°.

b. What is the sum of the measure of the angles at a vertex of a cube?

SOLUTION

Each vertex is the meeting point of three squares. The measure of each angle in a square is 90°.

$90° \times 3 = 270°$

The sum of the angles is 270°.