

Chapter Review



Frequently Asked Questions

Q: What is a Platonic solid?

A: A Platonic solid is a polyhedron with faces that are all congruent regular polygons. The same number of faces meet at all the vertices in a Platonic solid. The five Platonic solids are shown below.

tetrahedron



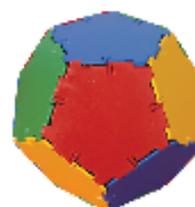
cube



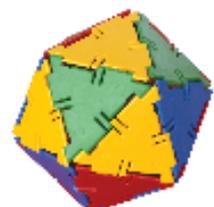
octahedron



dodecahedron



icosahedron



Q: Why are there only five Platonic solids?

A: The total of the interior angles that meet at each vertex of a Platonic solid must be less than 360° . At least three faces must meet at each vertex.

Regular polygons with more than five sides have angles that measure at least 120° . When you build a polyhedron, at least three faces have to meet at each vertex to make the polyhedron 3-D. If you tried to use the faces of polygons with more than five sides as the faces of a polyhedron, the sum of the angles that meet at each vertex would be at least 360° . This is not possible.

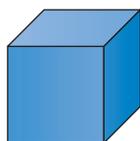
Q: How are the number of edges, vertices, and faces of a polyhedron related?

A: The relationship among the number of edges, vertices, and faces can be represented using the equation $F + V - E = 2$, where F is the number of faces, E is the number of edges, and V is the number of vertices. This equation is known as Euler's formula.

For example, the following cube has 6 faces, 8 vertices, and 12 edges.

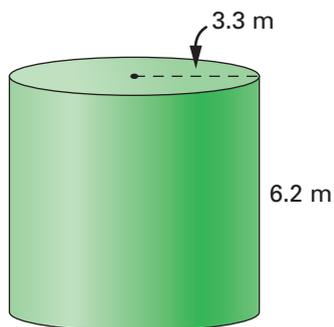
$$F + V - E = 2$$

$$6 + 8 - 12 = 2$$



Practice Questions

- (11.2) 1. Calculate the surface area of this cylinder.



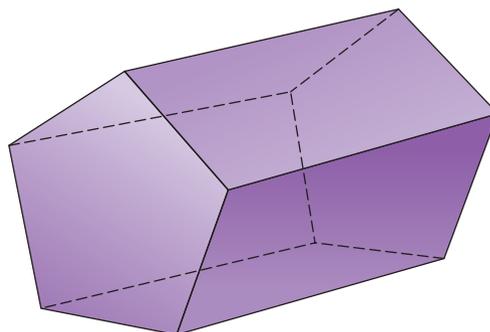
- (11.3) 2. Calculate the volume of the cylinder in question 1.

3. Mohammed is choosing a bass drum to buy for his band. The “Bashmaster” is 71.1 cm in diameter and 35.6 cm high. The “Crash” is 91.5 cm in diameter and 66.0 cm high. The “Boomalot” is 81.3 cm in diameter and 45.7 cm high.

- (11.2) a) Which drum has the greatest surface area? Justify your answer.
 (11.3) b) Which drum has the greatest volume in cubic centimetres? Justify your answer.



4. A glass in the shape of a cylinder is 10.0 cm high and has a diameter of 3.5 cm. How many millilitres of juice will the glass hold if it is filled to the top? (11.3)
5. What might be the dimensions of a cylindrical container that holds 750 mL of juice? (11.3)
6. Sketch a shape made up of a cylinder and a triangular prism that has a total volume between 100 cm^3 and 200 cm^3 . (11.4)
7. Why is it impossible to have a Platonic solid in which six or more equilateral triangles meet at each vertex? (11.5)
8. Show that Euler’s formula works for a pentagonal prism. (11.6)



9. A polyhedron has 9 edges and 6 vertices.
 a) Calculate the number of faces.
 b) Sketch the polyhedron. (11.6)
10. A polyhedron has 6 faces and 6 vertices. Calculate the number of edges. (11.6)
11. A polyhedron has 8 faces and 12 edges. Calculate the number of vertices. (11.6)