

## Constructing a Life-sized Icosahedron

### Learning Objectives

- Construct an icosahedron, a 20-sided geometric solid
- Explore its geometric and spatial properties

### Background

An icosahedron looks like this (Figure 1). It is a geometric solid composed of equilateral triangles. If you've ever used a 20-sided die, you've used an icosahedron before.



Figure 1. An icosahedron with solid (left) and transparent (right) faces.

### Activity

Use the dowels and rings to build a life-sized icosahedron.

1. Create a 5-spoked star by connecting 5 dowels to one ring.
2. Connect the spokes of the star with 5 more dowels, creating a somewhat raised pentagon (see Figure 2, left).
3. Add 2 dowels to each edge of the pentagon and connect them with a ring. You should have a triangular "tooth" coming off each edge of the pentagon (Figure 2, right). Create a tooth off each edge of the pentagon for a total of 5 teeth.
4. Connect the tips of the teeth tips with 5 more dowels. You may need to turn the original pentagon on its side and close in the teeth slightly. These new sticks connecting the teeth tips will form a new pentagon rim.
5. Finally, make another 5-spoked star (without a rim), and use it to close off the icosahedron from the new pentagon rim formed in Step 4.

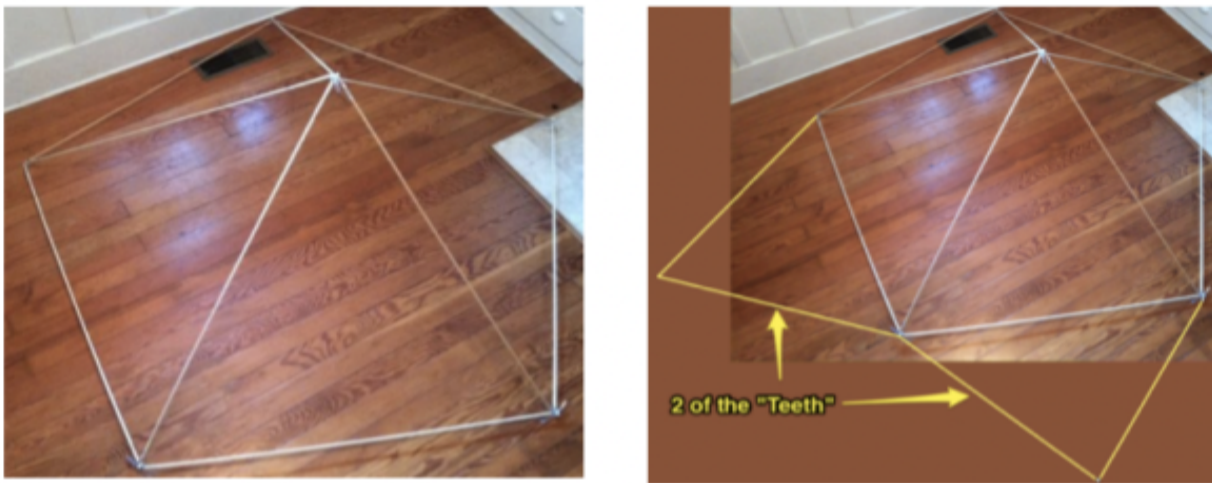


Figure 2. Left, the pentagon formed in Step 1. Right, 2 "teeth" off the rim of the pentagon.

### Discussion questions

- 1) How many sides/faces does an icosahedron have?
- 2) How many vertices does an icosahedron have?
- 3) How many edges does an icosahedron have?
- 4) Any parallel edges in an icosahedron?
- 5) If the icosahedron were half full with water, what would be the shape of the surface of the water when the icosahedron is on a triangular base (Figure 3, left)? What about when the icosahedron is tilted onto a single vertex (Figure 3, right)?

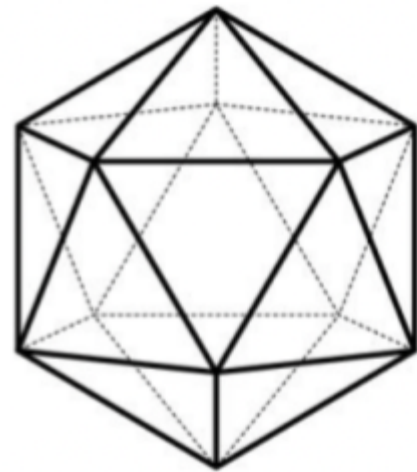


Figure 3. Icosahedron resting on a triangular base (left) and a single vertex (right).