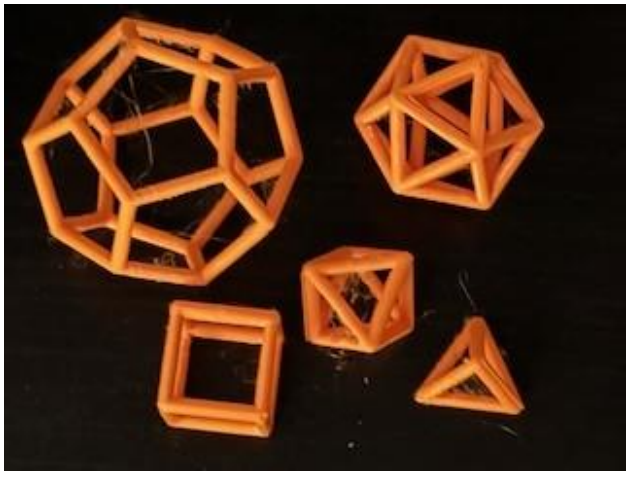
March 2024 Problem of the Month

You have containers in the shape of the 5 Platonic solids, each with edge 1 inch with their volumes listed in the chart below. You also have 5 bowls with volumes 20, 40, 60, 80, and 100 cubic inches. Each of these bowls can trivially be filled with water by using just the cube.

Suppose the cube is not available. Which of these bowls can be filled exactly using the other 4 platonic solids? You may use them to add water to or to remove water from the bowl and assume they must be completely filled when doing so. If a bowl can't be filled, show why not and if it can, show the most efficient way to do so. Please email solutions to Dr London at slondon@luc.edu in PDF form by 11:59 pm on March 31. The solution with the best explanation from a Loyola undergraduate will be the winner.

Name	Volume
Tetrahedron	$\frac{\sqrt{2}}{12}$
Cube	1
Octahedron	$\frac{\sqrt{2}}{3}$
Icosahedron	$\frac{5(3+\sqrt{5})}{12}$
Dodecahedron	$\frac{15+7\sqrt{5}}{4}$



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