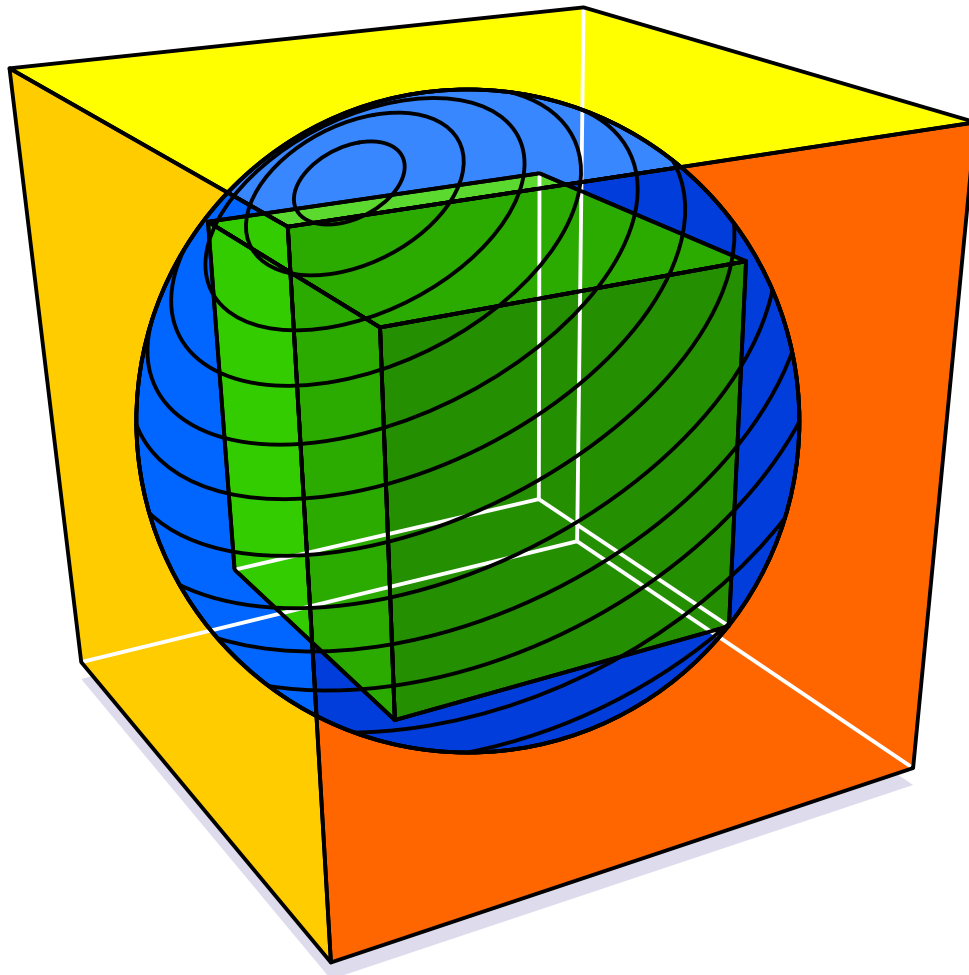


Sphere Between Cubes

by Peter Grabarchuk

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A bigger cube is circumscribed outside a sphere, while a smaller cube is inscribed in the same sphere - just as shown in the illustration. What is the volume of the smaller cube, if the bigger one's volume is 1?

More from the author at PeterPuzzle.com

Posted: March 23, 2008

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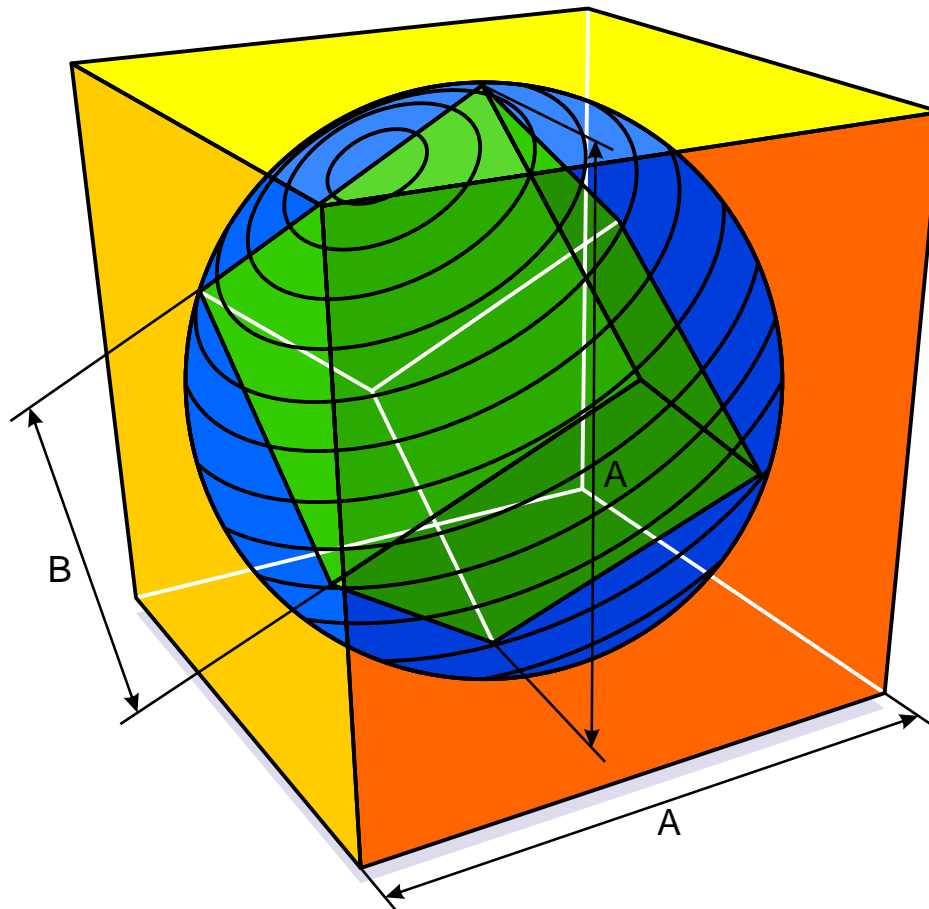


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Solution

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In order to make proper calculations, let's rotate the small (green) cube in the sphere first in such a way as it is shown in the illustration. Now it can be seen clearly the small cube's diagonal is equal the side of the big (orange) cube.

The following calculations provide us with the final volume of the small (green) cube.

Volume of the Orange Cube = 1;

Edge of the Orange Cube = 1;

Main Diagonal of the Green Cube = 1;

$(\text{Edge of the Green Cube})^2 + (\text{Edge of the Green Cube})^2 + (\text{Edge of the Green Cube})^2 = 1^2;$

$3 * (\text{Edge of the Green Cube})^2 = 1;$

$(\text{Edge of the Green Cube})^2 = 1/3;$

Edge of the Green Cube = $1/\sqrt{3} = \sqrt{3}/3;$

Volume of the Green Cube = $[\sqrt{3}/3]^3 = \sqrt{3}/9 = 0.193.$

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