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Edu2000

Geometry Journey Video Series

Program #13

Volume

Satellite Broadcasting
VHS
and Internet/Intranet Streaming

Program Description

By demonstrating that more complex 3D shapes are merely combinations of basic shapes, this video helps develop the ability to derive volume formulas based on the understanding of just a unit cube. All commonly seen volumes are covered, including the volumes of rectangular solids, parallelepiped, prism, cylinder, pyramid, cone and sphere. Again, this video helps eliminate another boring, pure memory game by developing the ability to derive.

This program is the #13 episode in the fifteen 15-minute Geometry Journey Series.

Synopsis

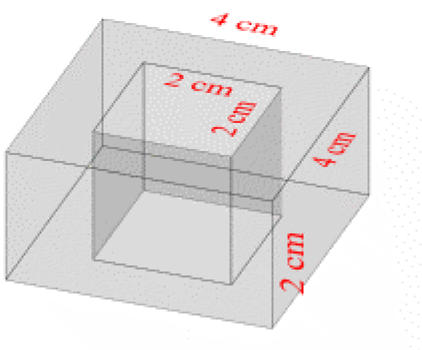
This program will cover the following topics:

1. Volumes of Solid Figures
2. Volume of a Rectangular Solid and Cube
3. Volume of an Oblique Parallelepiped
4. Volume of a Right Triangular Prism
5. Volume of an n-Sided Prism
6. Volume of a Right Cylinder
7. Volume of a Pyramid
8. Volume of a Cone
9. Volume of a Sphere

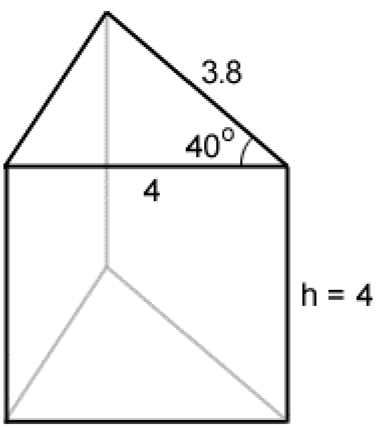
Geometry Journey Series
Program #13 - Volumes of Solid Figures

Student Worksheet
Name ___________________

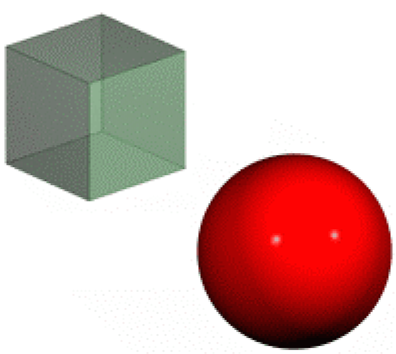
1) Find the volume of the solid shown in the figure.



2) Find the volume of the right triangular prism shown below.



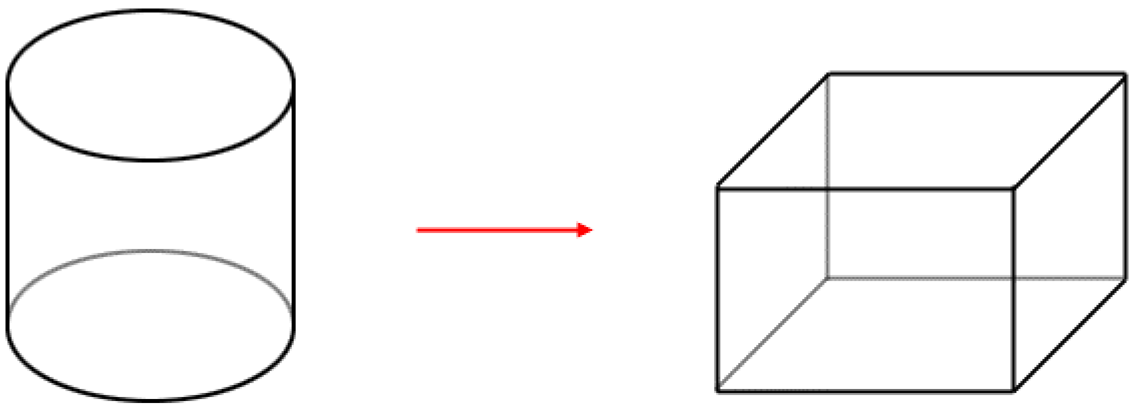
3) A cube has a length of 10 cm. The volume of the sphere shown in the figure is the same as that of the cube. What is the radius of the sphere?



Discussion Questions

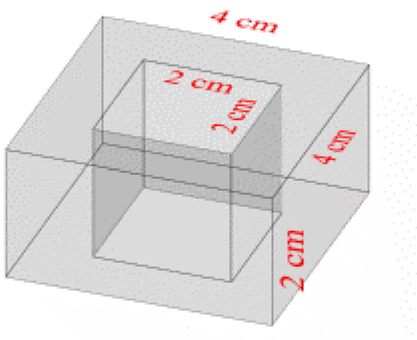
Question: Assume that we have already learned how to calculate the volume of a rectangular solid and we are trying to derive the formula for calculating the volume of a cylinder.

How can we change a right cylinder into a corresponding rectangular solid whose volume can be readily calculated without changing the original volume?



Answers to the Student Worksheet

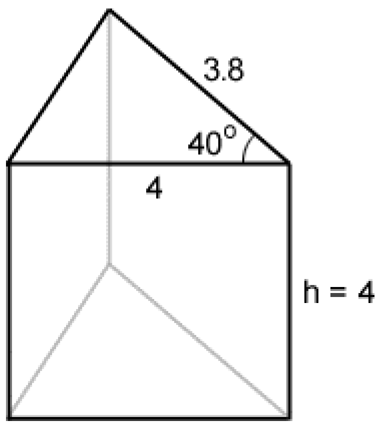
1) Find the volume of the solid shown in the figure.

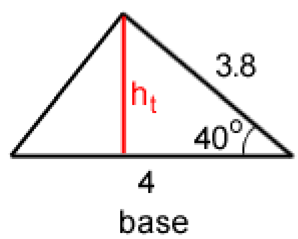


The volume of the solid is equal to the volume difference between the outer rectangular solid and the cube at the center, that is,

$$V = V_{outer} - V_{cube} = 4 \times 4 \times 2 - 2 \times 2 \times 2 = 24$$

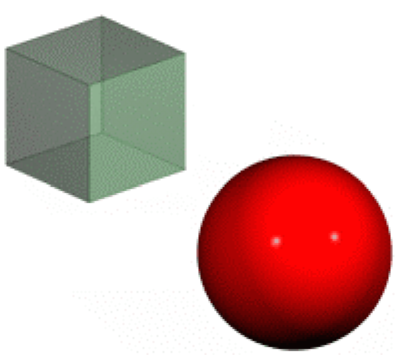
2) Find the volume of the right triangular prism shown below.





Step 1: The height of the base triangle $h_t = 3.8 \sin 40^\circ = 3.8 \times 0.643 = 2.443$
Step 2: The area of the base $S = (1/2)\ 4 \times h_t = (1/2) \times 4 \times 2.443 = 4.886$
Step 3: The volume of the right triangular prism $V = S\ h = 4.886 \times 4 = 19.544$

3) A cube has a length of 10 cm. The volume of the sphere shown in the figure is the same as that of the cube. What is the radius of the sphere?



Step 1: The volume of the cube $V_c = 10^3$ (cm^3)

Step 2: Assume that the radius of the sphere is r, th the volume of the sphere $V_s = (4/3)\pi r^3$

Step 3: Because $V_s = V_c$, we have

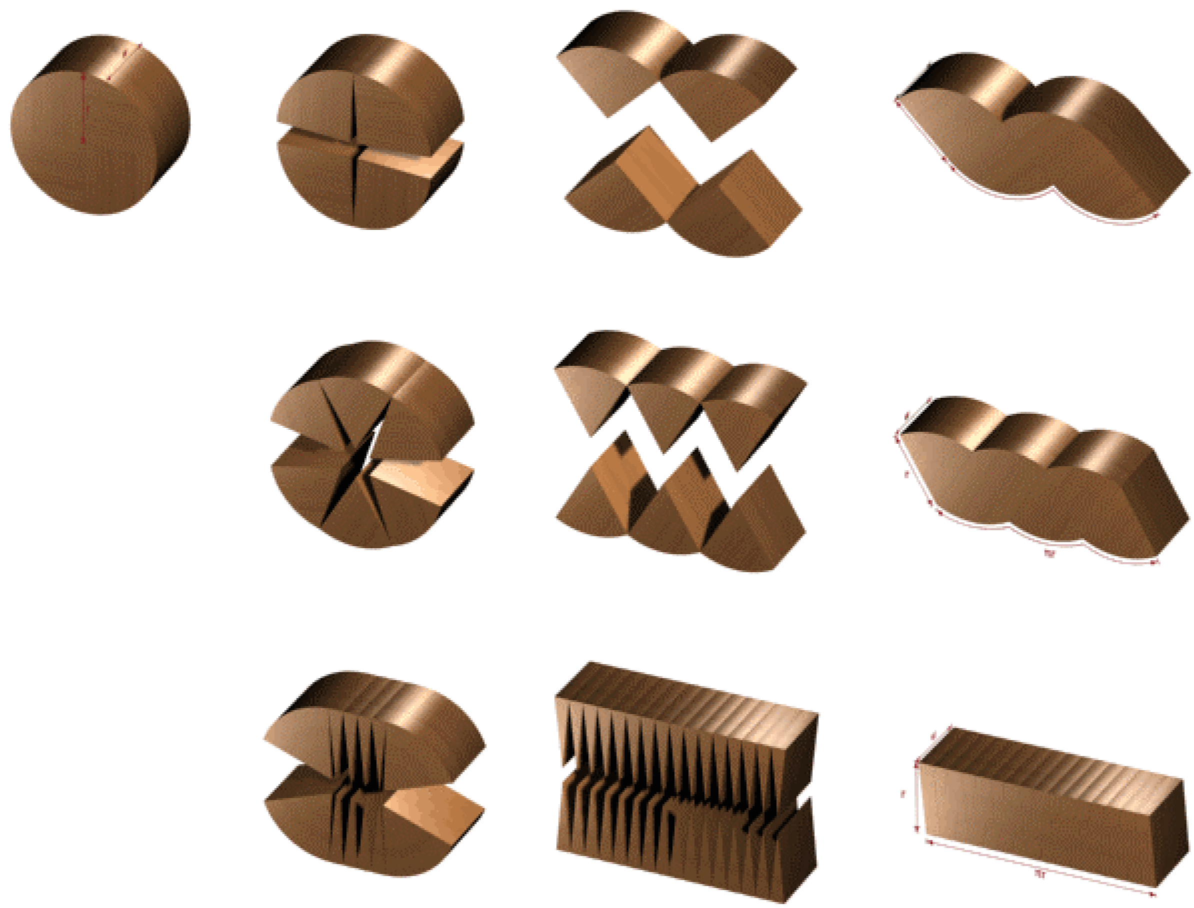
$$(4/3)\pi r^3 = 10^3$$
$$r = 6.205 \text{ (cm)}$$

Hints to Discussion Questions

<u>Question:</u> Assume that we have already learned how to calculate the volume of a rectangular solid and we are trying to derive the formula for calculating the volume of a cylinder.

How can we change a right cylinder into a corresponding rectangular solid whose volume can be readily calculated without changing the original volume?

<u>Hint:</u> See below. As a cylinder is cut into more and more congruent pieces, they can be re-arranged into a rectangular solid without changing the original volume as the number approaches infinity. The length of the front face of the newly formed rectangular solid is πr and its width is r, while both still have the same "height." Therefore, the volume is πr^2(height).



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