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Volume with Algebra

1. A brick in the shape of a rectangular prism has a base that measures 3 inches by 5 inches. If the volume of the brick is 90 cubic inches, what is the height of the brick?

$V = lwh$ $x = 6$

$90 = 3(5)(x)$

$\frac{90}{15} = \frac{15x}{15}$

2. A right circular cylinder has a volume of 1,000 cubic inches and a height of 8 inches. What is the radius of the cylinder to the *nearest tenth of an inch*?

$V = \pi r^2 h$ $r = 6.3$

$\frac{1000}{8\pi} = \frac{\pi r^2 (8)}{8\pi}$

$\sqrt{39...} = \sqrt{r^2}$

3. The base of a pyramid is a rectangle with a width of 6 cm and a length of 8 cm. Find, in centimeters, the height of the pyramid if the volume is 288 cm³.
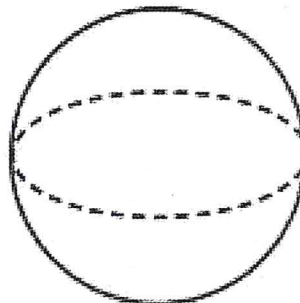
$V = \frac{1}{3} lwh$ $\frac{288}{16} = \frac{16x}{16}$

$288 = \frac{1}{3}(6)(8)x$ $18 = x$

4. Find the radius of a sphere with a volume of 576π cubic units. Find the answer to the *nearest tenth of a unit*. _____

$V = \frac{4}{3}\pi r^3$ $\sqrt[3]{r^3} = \sqrt[3]{132}$

$3(576\pi) = (\frac{4}{3}\pi r^3)3$ $r = 7.6$

$\frac{1728\pi}{4\pi} = \frac{4\pi r^3}{4\pi}$

5. The volume of a cylinder is 12,566.4 cm³. The height of the cylinder is 8 cm. Find the radius of the cylinder to the *nearest tenth of a centimeter*.

$$V = \pi r^2 h$$

$$\frac{12566.4}{8\pi} = \frac{\pi r^2 (8)}{8\pi}$$

$$\sqrt{500...} = \sqrt{r^2}$$

$$\boxed{r = 22.4}$$

6. The Parkside Packing Company needs a rectangular shipping box. The box must have a length of 11 inches and a width of 8 inches. Find, to the *nearest tenth of an inch*, the minimum height of the box such that the volume is *at least* 800 cubic inches.

$$V = lwh$$

$$800 = 11(8)(x)$$

$$\frac{800}{88} = \frac{88x}{88}$$

$$\boxed{9.1 = x}$$

7.   If the volume of a sphere is 36π, what is the radius of the sphere?
    (1) 3   (2) 6   (3) 12   (4) 24

$$V = \frac{4}{3}\pi r^3$$

$$3\left(36\pi\right) = \left(\frac{4}{3}\pi r^3\right)3$$

$$\frac{108\pi}{4\pi} = \frac{4\pi r^3}{4\pi}$$

$$\frac{36\pi}{?} = r^3$$

$$3 = r$$

8. Find the length of the radius of a cylinder to the *nearest tenth* if it has a volume of $60\ cm^3$ and a height of $10\ cm$.

$$V = \pi r^2 h$$

$$\frac{60}{10\pi} = \frac{\pi r^2 (10)}{10\pi}$$

$$\sqrt{1.909...} = \sqrt{r^2}$$

$$1.4 = r$$

9. The volume of a rectangular prism is 144 cubic inches. The height of the prism is 8 inches. Which measurements, in inches, could be the dimensions of the base?
1) 3.3 by 5.5 $3.3(5.5)=18.15$
2) 2.5 by 7.2 $2.5(7.2)=18$
3) 12 by 8 $12(8)=96$
4) 9 by 9 $9(9)=81$

$V = lwh$

$$\frac{144}{8} = \frac{lw\,8}{8}$$

$$18 = lw$$

10. The volume of a sphere is approximately 44.6022 cubic centimeters. What is the radius of the sphere, to the *nearest tenth of a centimeter?*
1) 2.2
2) 3.3
3) 4.4
4) 4.7

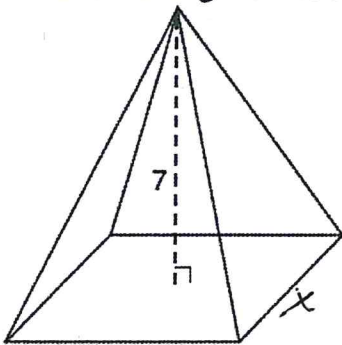$V = \frac{4}{3}\pi r^3$

$3(44.6022) = (\frac{4}{3}\pi r^3)3$

$$\frac{133.8066}{4\pi} = \frac{4\pi r^3}{4\pi}$$

$\sqrt[3]{10.647..}$

$2.2 = r$

11. The pyramid shown below has a square base, a height of 7, and a volume of 84.

What is the length of the side of the base?

$V = \frac{1}{3}lwh$

$3(84) = (\frac{1}{3}(x)^2(7))3$

$x = 6$

$$\frac{252}{7} = \frac{7x^2}{7}$$

$\sqrt{36} = \sqrt{x^2}$

12. An ice cream waffle cone can be modeled by a right circular cone with a base diameter of 6.6 centimeters and a volume of 54.45π cubic centimeters. What is the number of centimeters in the height of the waffle cone?

$V = \frac{1}{3}\pi r^2 h$

$3(54.45\pi) = (\frac{1}{3}\pi(3.3)^2 x)3$

$$\frac{163.35\pi}{10.89\pi} = \frac{10.89\pi x}{10.89\pi}$$

$15 = x$

13. The Great Pyramid of Giza was constructed as a regular pyramid with a square base. It was built with an approximate volume of 2,592,276 cubic meters and a height of 146.5 meters. What was the length of one side of its base, to the *nearest meter*?

$$V = \frac{1}{3}lwh$$

$$3(2,592,276) = \left(\frac{1}{3} \times x^2(146.5)\right)3$$

$$\frac{7776828}{146.5} = \frac{146.5 x^2}{146.5}$$

$$\sqrt{53084\ldots} = \sqrt{x^2}$$

$$\boxed{230 = x}$$

14. Two prisms have equal heights and equal volumes. The base of one is a pentagon ~~therefore the area of the bases are the same.~~ and the base of the other is a square. If the area of the pentagonal base is 36 square inches, how many inches are in the length of each side of the square base?

$$A = lw$$

$$36 = x^2$$

$$\boxed{6 = x}$$

15. A soda company is looking into different options for a new, 72 cubic inch soda can. They have found that anything larger than a 3 inch diameter is uncomfortable for people to hold. If they use a 3 inch diameter, what should the height of the cylindrical can be to the *nearest tenth* of an inch?

$$V = \pi r^2 h$$

$$\frac{72}{\pi(1.5)^2} = \frac{\pi(1.5)^2 x}{\pi(1.5)^2}$$

$$\boxed{10.2 = x}$$

16. When volleyballs are purchased, they are not fully inflated. A partially inflated volleyball can be modeled by a sphere whose volume is approximately 180 in^3. After being fully inflated, its volume is approximately 294 in^3. To the *nearest tenth of an inch*, how much does the radius increase when the volleyball is fully inflated?

Find radius of both spheres

Partially inflated

Fully inflated

$$4.12 - 3.502 = .6 \text{ inch}$$

$$V = \frac{4}{3}\pi r^3$$

$$3(180) = \left(\frac{4}{3}\pi r^3\right)3$$

$$\frac{540}{4\pi} = \frac{4\pi r^3}{4\pi}$$

$$\sqrt[3]{42.97} = \sqrt[3]{r^3}$$

$$3.502 = r$$

$$V = \frac{4}{3}\pi r^3$$

$$3(294) = \left(\frac{4}{3}\pi r^3\right)3$$

$$\frac{882}{4\pi} = \frac{4\pi r^3}{4\pi}$$

$$\sqrt[3]{70.18} = \sqrt[3]{r^3}$$

$$4.12 = r$$