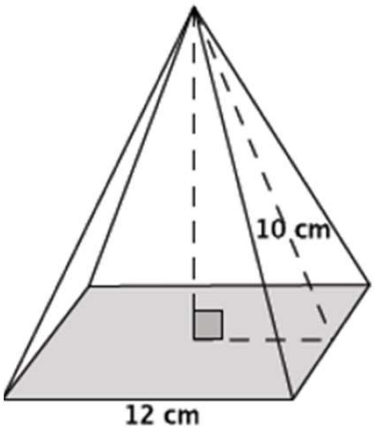
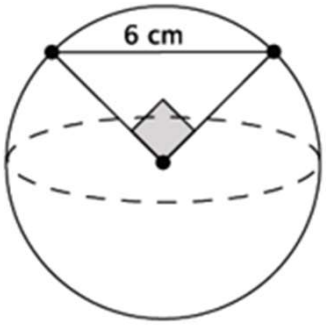
Pythagorean Theorem in 3D Solids

Which has the larger volume? Give an exact answer using a square root.





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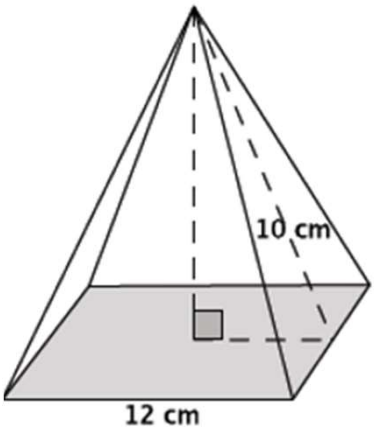

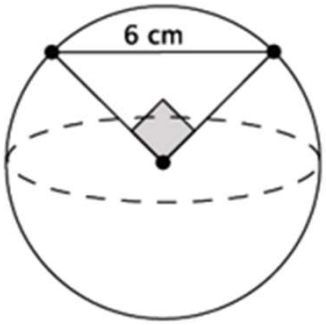

Let h cm represent the height of the square pyramid.

$$h^2 + 6^2 = 10^2$$
$$h^2 + 36 = 100$$
$$h^2 = 64$$
$$h = 8$$

$$V = \frac{1}{3}(12^2)(8)$$
$$V = \frac{1}{3}(144)(8)$$
$$V = 384$$

The volume of the square pyramid is $384\ cm^3$.

Let r represent the radius of the sphere in centimeters.

$$r^2 + r^2 = 6^2$$
$$2r^2 = 36$$
$$r^2 = 18$$
$$\sqrt{r^2} = \sqrt{18}$$
$$r = \sqrt{3^2 \times 2}$$
$$r = 3\sqrt{2}$$

$$V = \frac{4}{3}\pi r^3$$
$$= \frac{4}{3}\pi\left(3\sqrt{2}\right)^3$$
$$= \frac{4}{3}\pi(3)^3\left(\sqrt{2}\right)^3$$
$$= \frac{4}{3}\pi(27)\left(\sqrt{8}\right)$$
$$= \frac{4}{3}\pi(27)\left(\sqrt{2^2 \times 2}\right)$$
$$= \frac{4}{3}\pi(27)(2)\left(\sqrt{2}\right)$$
$$= 72\pi\sqrt{2}$$

The volume of the sphere is $72\pi\sqrt{2}\ cm^3$ which is bigger than the volume of the pyramid.

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