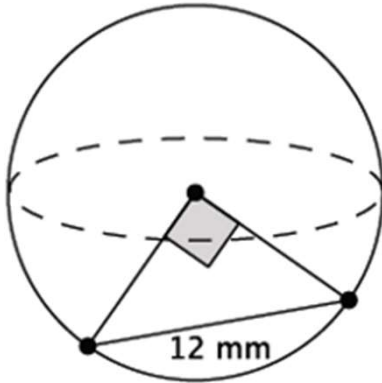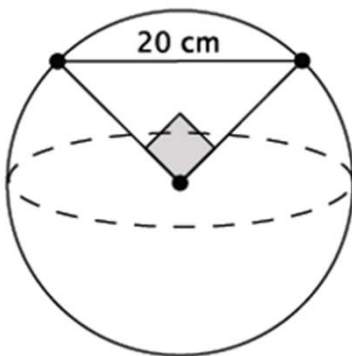# Pythagorean Theorem in 3D Solids

1. What is the volume of the sphere shown below? Give an exact answer using a square root.

12 mm

2. What is the volume of the sphere shown below? Give an exact answer using a square root.

20 cm

Pythagorean Theorem in 3D Solids

1. What is the volume of the sphere shown below? Give an exact answer using a square root.
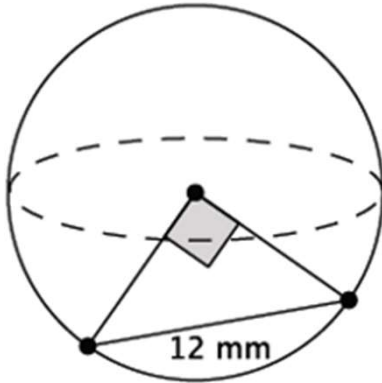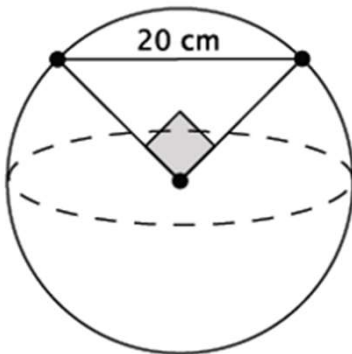
Let r mm represent the radius of the sphere.

$$r^2 + r^2 = 12^2$$
$$2r^2 = 144$$
$$r^2 = 72$$
$$\sqrt{r^2} = \sqrt{72}$$
$$r = \sqrt{6^2 \times 2}$$
$$r = 6\sqrt{2}$$

$$V = \frac{4}{3}\pi r^3$$
$$= \frac{4}{3}\pi(6\sqrt{2})^3$$
$$= \frac{4}{3}\pi(6^3)(\sqrt{2})^3$$
$$= \frac{4}{3}\pi(216)(\sqrt{8})$$
$$= \frac{4}{3}\pi(216)\left(\sqrt{2^2 \times 2}\right)$$
$$= \frac{4}{3}\pi(216)(2)(\sqrt{2})$$
$$= \frac{1728\sqrt{2}}{3}\pi = 576\sqrt{2}\pi$$

The volume of the sphere is $576\sqrt{2}\pi$ mm^3.

2. What is the volume of the sphere shown below? Give an exact answer using a square root.

Let r cm represent the radius of the sphere.

$$r^2 + r^2 = 20^2$$
$$2r^2 = 400$$
$$r^2 = 200$$
$$\sqrt{r^2} = \sqrt{200}$$
$$r = \sqrt{200}$$
$$r = \sqrt{10^2 \times 2}$$
$$r = 10\sqrt{2}$$

$$V = \frac{4}{3}\pi r^3$$
$$= \frac{4}{3}\pi(10\sqrt{2})^3$$
$$= \frac{4}{3}\pi(10^3)(\sqrt{2})^3$$
$$= \frac{4}{3}\pi(1000)(\sqrt{8})$$
$$= \frac{4}{3}\pi(1000)\left(\sqrt{2^2 \times 2}\right)$$
$$= \frac{4}{3}\pi(1000)(2)(\sqrt{2})$$
$$= \frac{8000\sqrt{2}}{3}\pi$$

The volume of the sphere is $\frac{8000\sqrt{2}}{3}\pi$ cm^3.

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