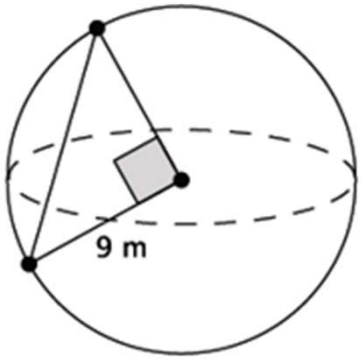
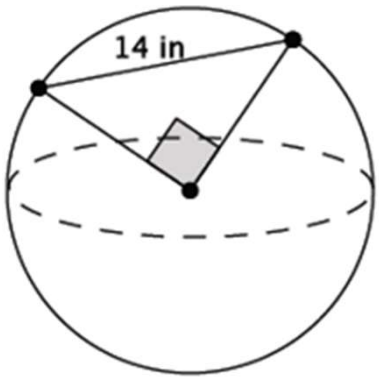
Pythagorean Theorem in 3D Solids

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



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



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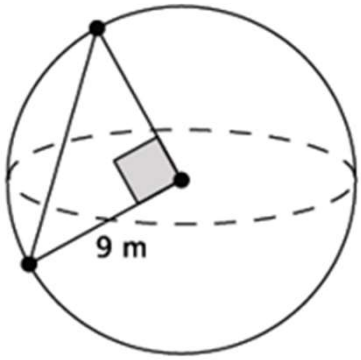
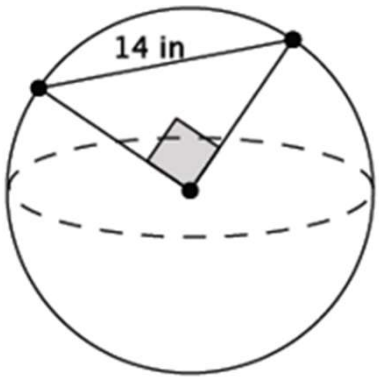


Let c m represent the length of the chord.

$$9^2 + 9^2 = c^2$$
$$81 + 81 = c^2$$
$$162 = c^2$$
$$\sqrt{162} = \sqrt{c^2}$$
$$\sqrt{162} = c$$
$$\sqrt{9^2 \times 2} = c$$
$$9\sqrt{2} = c$$

The length of the chord is $\sqrt{162}$ m, or $9\sqrt{2}$ m.

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



Let r in. represent the radius.

$$r^2 + r^2 = 14^2$$
$$2r^2 = 196$$
$$r^2 = 98$$
$$\sqrt{r^2} = \sqrt{98}$$
$$r = \sqrt{7^2 \times 2}$$
$$r = 7\sqrt{2}$$

$$\boldsymbol{V = \frac{4}{3}\pi r^3}$$
$$= \frac{4}{3}\boldsymbol{\pi}\left(7\sqrt{2}\right)^3$$
$$= \frac{4}{3}\boldsymbol{\pi}(343)\left(\sqrt{8}\right)$$
$$= \frac{4}{3}\boldsymbol{\pi}(343)\left(2\sqrt{2}\right)$$
$$= \frac{2744\sqrt{2}}{3}\boldsymbol{\pi}$$

The volume of the sphere is $\frac{4}{3}\left(\sqrt{98}\right)^3 \pi\ in^3$, or $\frac{2744\sqrt{2}}{3}\pi\ in^3$.