Topic: Volume/Surface area of spheres

Question: What is the surface area of a sphere with a diameter of π cm?

Answer choices:

A $\quad \dfrac{\pi^2}{2}$ cm^2

B $\quad \pi^3$ cm^2

C $\quad 2\pi^3$ cm^2

D $\quad \dfrac{\pi^3}{4}$ cm^2

Solution: B

If the diameter is π cm, then the radius is

$$r = \frac{d}{2} = \frac{\pi \text{ cm}}{2} = \frac{\pi}{2} \text{ cm}$$

Use the formula for surface area of a sphere, and plug in the radius.

$$S = 4\pi r^2$$

$$S = 4\pi \left(\frac{\pi}{2} \text{ cm} \right)^2$$

$$S = 4\pi \left(\frac{\pi^2}{4} \text{ cm}^2 \right)$$

$$S = \pi^3 \text{ cm}^2$$

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Question: Find the surface area to volume ratio of a sphere with radius 6.

Answer choices:

A $\dfrac{1}{1}$

B $\dfrac{2}{1}$

C $\dfrac{1}{2}$

D $\dfrac{1}{4}$

Solution: C

The surface area of a sphere is given by

$$S = 4\pi r^2$$

Plugging in the radius gives

$$S = 4\pi (6)^2$$

$$S = 144\pi$$

The volume of a sphere is given by

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

Plugging in the radius gives

$$V = \frac{4}{3}\pi (6)^3$$

$$V = \frac{4}{3}\pi (216)$$

$$V = 288\pi$$

Therefore, the surface area to volume ratio is

$$\frac{144\pi}{288\pi} = \frac{1}{2}$$

Topic: Volume/Surface area of spheres

Question: A water tower in the shape of a sphere has a diameter of 30 ft. Assuming π ft$^3 \approx 24$ gallons, how many gallons of water does it hold?

Answer choices:

A $54{,}000$ gallons

B $108{,}000$ gallons

C $205{,}000$ gallons

D $234{,}000$ gallons

Solution: B

Because the diameter is 30 ft, the radius of the sphere is 15 ft. Plug the radius into the formula for the volume of a sphere.

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

$$V = \frac{4}{3}\pi (15 \text{ ft})^3$$

$$V = \frac{4}{3}\pi (3{,}375 \text{ ft}^3)$$

$$V = 4{,}500\pi \text{ ft}^3$$

Using π ft$^3 \approx 24$ gallons, we get

$$V \approx 4{,}500(24 \text{ gallons})$$

$$V = 108{,}000 \text{ gallons}$$