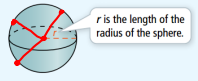


11.6 Surface Area & Volume of Spheres

Sphere:

A sphere is the set of all points in space equidistant from a given point called the center. A radius is a segment that has one endpoint at the center and the other endpoint on the sphere. A diameter is a segment passing through the center with endpoints on the sphere.



A baseball can model a sphere. To approximate its surface area, you can take apart its covering. Each of the two pieces suggests a pair of circles with radius  $r$ , which is approximately the radius of the ball. The area of the four circles,  $4\pi r^2$ , suggests the surface area of the ball.



Surface Area of a Sphere

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

Ex 1 | Earth's equator is about 24,902 miles long. What is the approximate surface area of Earth?

$S.A. = 4\pi r$



$SA = 4\pi(3963.276393)$   $C = 2\pi r$

$S.A. = 197,387,017.5$   
 $\frac{24,902}{2\pi} = \frac{2\pi r}{2\pi}$   
 $3963.276393 = r$

$197,387,000 \text{ mi}^2$

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Volume of a sphere:  $V: \frac{4}{3}\pi r^3$

Ex 2 | Recreation A spherical balloon has a 14-in. diameter when it is fully inflated. Half of the air is let out of the balloon. Assume that the balloon remains a sphere.

- a. Find the volume of the fully inflated balloon in terms of  $\pi$ .
- b. Find the volume of the half-inflated balloon in terms of  $\pi$ .
- c. What is the diameter of the half-inflated balloon to the nearest inch?

a.  $r = 7 \text{ in. } V = \frac{4}{3}\pi(7)^3$   
 $V = 457.3\pi = 457\frac{1}{3}\pi$

$V = \frac{1372}{3}\pi \text{ in}^3$

b.  $\frac{1}{2}V = \frac{1.1372}{3}\pi = \frac{686}{3}\pi$   $d = 11 \text{ in}$

c.  $V = \frac{4}{3}\pi r^3$   $\frac{686}{3} = \frac{4}{3}\pi r^3$   $171.5 = r^3$   $5.556 = r$

Ex 3 | The volume of a sphere is 5,000 m<sup>3</sup>.

What is the surface area to the nearest square meter?

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

$\rightarrow 5000 = \frac{4}{3}\pi r^3$

$\frac{15000}{4\pi} = \frac{4\pi r^3}{4\pi}$

$1193.66 = r^3$

$10.6078 = r$

$S.A. = 4\pi r^2 = 4\pi(10.6078)^2$   
 $= 1414 \text{ m}^2$

$S.A. = 4\pi r^2$   $V = \frac{4}{3}\pi r^3$

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