Geometry H
12.6 – Surface Area and Volume of Spheres

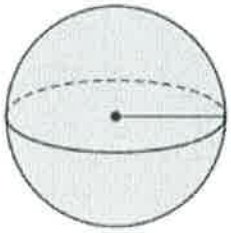
Name: Key
Date: _____ Period: _____

- I can find surface area and volume of spheres.

The diagram below describes the parts of a sphere.

A **hemisphere** is half a sphere. A **great circle** divides a sphere into two hemispheres.

A **sphere** is the locus of points in space that are a fixed distance from the **center** of the sphere.



A **radius** *r* connects the center of the sphere to any point on the sphere.

Complete the following:

1. The radius of a sphere connects the center of the sphere to any point on the sphere.
2. A(n) hemisphere is half a sphere.
3. The radius of a sphere is 6 cm. What is the radius of its great circle? 6cm
   ↳ the 2-d circle that is made when you split the sphere in half
4. The volume of a sphere is 900π ft^3. What is the volume of one of its hemispheres? 450π ft^3
   ÷2

The formula for the **Surface Area** of a sphere with radius r is

$SA = 4\pi r^2$.

Example 1: Find surface area of sphere.

a) An orange has a radius of 2 inches. Find the amount of peel on the outside of the orange.
↳ surface area

$SA = 4\pi r^2$
$= 4\pi(2)^2$
$= 4\pi(4)$ → $SA \approx 50.2 \text{ in}^2$

b) The area of the great circle of a sphere is 121π in^2. What is the surface area of the sphere?

Solve for r using area: $A = \pi r^2$
$\frac{121\pi}{\pi} = \frac{\pi r^2}{\pi}$
$121 = r^2$
$r = 11$

$SA = 4\pi r^2$ ← don't have radius
$= 4\pi(11)^2$
$= 4\pi(121)$
$= 484\pi$
$SA \approx 1519.8 \text{ in}^2$

SA of sphere = $4\pi r^2$ ÷ 2 ⇒ SA of hemisphere = $2\pi r^2$

c) Find the total surface area of the hemisphere.

SA = $2\pi r^2$
= $2\pi(25)^2$
= $2\pi(625)$
= 1250π
SA ≈ 3925 cm²

+ area of circular base
$A = \pi r^2$
= $\pi(25)^2$
= $\pi(625)$
= 1962.5

Total SA = 3925 + 1962.5 = **5887.5 cm²**

The formula for the **Volume** of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.

Example 2: Find the volume of a sphere.

Find the volume of a sphere whose surface area is 10π square feet.

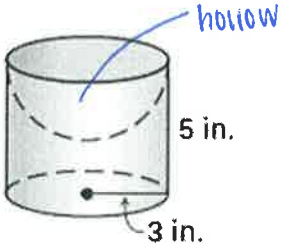
*use SA to solve for radius

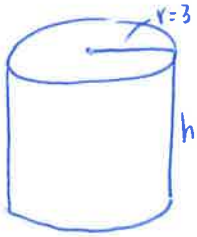
$SA = 4\pi r^2$
$\frac{10\pi}{4\pi} = \frac{4\pi r^2}{4\pi}$
$2.5 = r^2$
$r = 1.58$

$V = \frac{4}{3}\pi r^3$
$= \frac{4}{3}\pi(1.58)^3$
$= \frac{4}{3}\pi(3.94)$
$V \approx 16.5\ ft^3$

Example 3: Find the volume of a composite figure.

a) Find the volume of the composite solid.



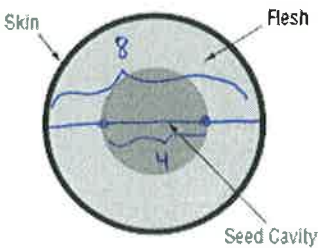
outer cylinder: $V = \pi r^2 h$


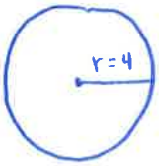
$= \pi(3)^2(5)$
$= \pi(9)(5)$
$= 45\pi$
≈ 141.3

inner sphere: $V = \frac{4}{3}\pi r^3$
$= \frac{4}{3}\pi(3)^3$
$= \frac{4}{3}\pi(27)$
= 113.04 ← whole
÷ 2
= 56.52 ← hemisphere

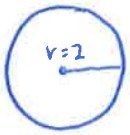
Total Volume = 141.3 − 56.52 = **84.8 in³**

b) A cantaloupe is a nearly spherical fruit. Inside, there is a roughly spherical cavity in the center that holds seeds. The flesh surrounds this cavity and extends to the skin of the fruit. The diameter of the cantaloupe is 8 inches, and the diameter of the seed cavity is 4 inches. Please find the volume of the flesh.



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


$= \frac{4}{3}\pi(4)^3$
$= \frac{4}{3}\pi(64)$
= 267.95

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


$= \frac{4}{3}\pi(2)^3$
$= \frac{4}{3}\pi(8)$
= 33.49

Volume of fruit: 267.95 − 33.45 = **234.4 in³**