

Name _____

Date _____

Answers

11.6 –Surface Area and Volume of Spheres

Find the surface area of the sphere with the given diameter or radius. Leave your answer in terms of π .

1) $d = 8$ ft

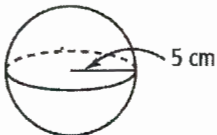
$$\begin{aligned} SA &= 4\pi r^2 \\ &= 4 \times \pi \times 4^2 \\ &= 64\pi \text{ ft}^2 \end{aligned}$$

2) $r = 3$ yd

$$\begin{aligned} SA &= 4\pi r^2 \\ &= 4 \times \pi \times 3^2 \\ &= 36\pi \text{ yd}^2 \end{aligned}$$

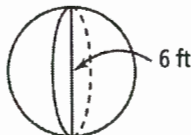
Find the surface area of each sphere. Leave each answer in terms of π .

3)



$$\begin{aligned} SA &= 4\pi r^2 \\ &= 4 \times \pi \times 5^2 \\ &= 100\pi \text{ cm}^2 \end{aligned}$$

4)



$$\begin{aligned} SA &= 4\pi r^2 \\ &= 4 \times \pi \times 3^2 \\ &= 36\pi \text{ ft}^2 \end{aligned}$$

5)



$$\begin{aligned} SA &= 4\pi r^2 \\ &= 4 \times \pi \times 10^2 \\ &= 400\pi \text{ mm}^2 \end{aligned}$$

Use the given circumference to find the surface area of each spherical object. Round your answer to the nearest tenth.

6) an asteroid with $C = 83.92$ m

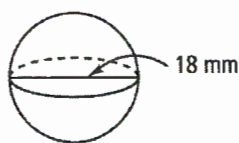
$$\begin{aligned} C &= 83.92 \\ C &= 2\pi r \\ 83.92 &= 2 \times 3.14 \times r \\ 13.4 &\approx r \\ SA &= 4 \times 3.14 \times 13.4^2 \\ &\approx 2255.3 \text{ m}^2 \end{aligned}$$

7) an orange with $C = 50.24$ mm

$$\begin{aligned} C &= 2\pi r \\ 50.24 &= 2 \times 3.14 \times r \\ 8 &\approx r \\ SA &= 4 \times 3.14 \times 8^2 \\ &\approx 803.8 \text{ mm}^2 \end{aligned}$$

Find the volume of each sphere. Give each answer in terms of π and rounded to the tenth.

8)



$$\begin{aligned} V &= \frac{4}{3}\pi r^3 \\ &= \frac{4}{3} \times \pi \times 18^3 \\ &= 972\pi \text{ mm}^3 \end{aligned}$$

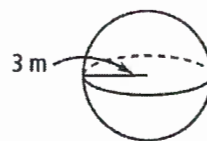
9)



$$\text{S.A.} = 16\pi \text{ cm}^2$$

$$\begin{aligned} 16\pi &= 4\pi r^2 \\ 4 &= r^2 \\ 2 &= r \\ V &= \frac{4}{3}\pi r^3 \\ &= \frac{4}{3} \times \pi \times 2^3 \\ &= \frac{32}{3}\pi \text{ cm}^3 \end{aligned}$$

10)



$$\begin{aligned} V &= \frac{4}{3}\pi r^3 \\ &= \frac{4}{3} \times \pi \times 3^3 \\ &= 36\pi \text{ m}^3 \end{aligned}$$

A sphere has the volume given. Find its surface area to the nearest tenth.

11) $V = 1200 \text{ ft}^3$

$$\begin{aligned} V &= \frac{4}{3}\pi r^3 \\ 1200 &= \frac{4}{3} \times 3.14 \times r^3 \\ 286.6 &\approx r^3 \\ 6.6 &\approx r \\ \text{SA} &= 4\pi r^2 \\ &= 4 \times 3.14 \times 6.6^2 \\ &\approx 547.1 \text{ ft}^2 \end{aligned}$$

12) $V = 750 \text{ m}^3$

$$\begin{aligned} V &= \frac{4}{3}\pi r^3 \\ 750 &= \frac{4}{3} \times 3.14 \times r^3 \\ 179.1 &\approx r^3 \\ 5.6 &\approx r \\ \text{SA} &= 4\pi r^2 \\ &\approx 4 \times 3.14 \times 5.6^2 \\ &\approx 393.9 \text{ mm}^2 \end{aligned}$$

Find the volume in terms of π of each sphere with the given surface area.

13) $900\pi \text{ in.}^2$

$$\begin{aligned} \text{SA} &= 4\pi r^2 \\ 900\pi &= 4\pi r^2 \\ 225 &= r^2 \\ 15 &= r \\ V &= \frac{4}{3}\pi r^3 \\ &= \frac{4}{3} \times \pi \times 15^3 \\ &= 4500\pi \text{ in}^3 \end{aligned}$$

14) $81\pi \text{ in.}^2$

$$\begin{aligned} \text{SA} &= 4\pi r^2 \\ 81\pi &= 4\pi r^2 \\ 20.25 &= r^2 \\ 4.5 &= r \\ V &= \frac{4}{3}\pi r^3 \\ &= \frac{4}{3} \times \pi \times 4.5^3 \\ &= 121.5\pi \text{ in}^3 \end{aligned}$$

- 15) The difference between drizzle and rain has to do with the size of the drops, not how much water is actually falling from the sky. If rain consists of drops larger than 0.02 in. in diameter, and drizzle consists of drops less than 0.02 in. in diameter, what can you say about the surface area and volume of rain and drizzle?

$$\text{Rain: } SA > 0.0013 \text{ in}^2$$

$$V > .000004 \text{ in}^3$$

$$\text{Drizzle: } SA < 0.0013 \text{ in}^2$$

$$V < .000004 \text{ in}^3$$

- 16) A spherical scoop of ice cream with a diameter of 4 cm rests on top of a sugar cone that is 10 cm deep and has a diameter of 4 cm. If all of the ice cream melts into the cone, what percent of the cone will be filled?



$$\text{Cone } V = \frac{1}{3} \pi r^2 h$$

$$= \frac{1}{3} \times \pi \times 2^2 \times 10$$

$$= \frac{40}{3} \pi$$

$$\text{Scoop } V = \frac{4}{3} \times \pi \times 2^3$$

$$= \frac{32}{3} \pi$$

$$\text{Percent} = \frac{\text{Scoop}}{\text{Cone}}$$

$$= \frac{\frac{32}{3} \pi}{\frac{40}{3} \pi}$$

$$= \frac{32}{40} = .8$$

$$= 80\%$$

- 17) What are the formulas for the volumes of a sphere, a cone with a height equal to its radius, and a cylinder with its height equal to its radius? How are these formulas related?

$$\text{Sphere} = \frac{4}{3} \pi r^3$$

$$\text{Cone} = \frac{1}{3} \pi r^2 h$$

$$= \frac{1}{3} \pi r^2 \times r$$

$$= \frac{1}{3} \pi r^3$$

$$\text{Cylinder} = \pi r^2 H$$

$$= \pi r^2 \times r$$

$$= \pi r^3$$

- 18) Find the radius of a sphere such that the ratio of the surface area in square inches to the volume in cubic inches is 4 : 1.

$$\frac{\text{Ratio}}{1} = \frac{4\pi r^2}{\frac{4}{3}\pi r^3}$$

Proportion!
Cross-Multiply!

$$\frac{16}{3} \pi r^3 = 4\pi r^2$$

$$\frac{16}{3} r = 4$$

$$r = .75 \text{ in}$$

Relationship: ~~Volume of Sphere~~

$$\text{Volume of Sphere} = \text{Volume of Cone} + \text{Volume of Cylinder}$$