

ST. JEAN DE BREBEUF
MATHEMATICS

CHAPTER 9.4

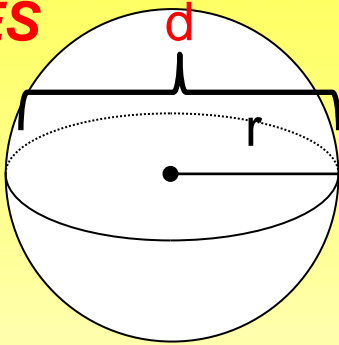
VOLUME OF CONES and
SPHERES



CHAPTER 9.4 VOLUME OF CONES and SPHERES

KEY CONCEPTS

SPHERES

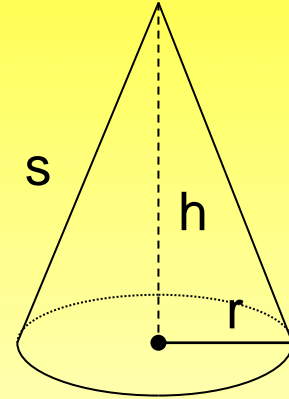


A three-dimensional ball-shaped object

Every point on the surface is an equal distance from a fixed point (the centre)

FORMULA $V = \frac{4\pi r^3}{3}$ or $V = \frac{\pi d^3}{6}$

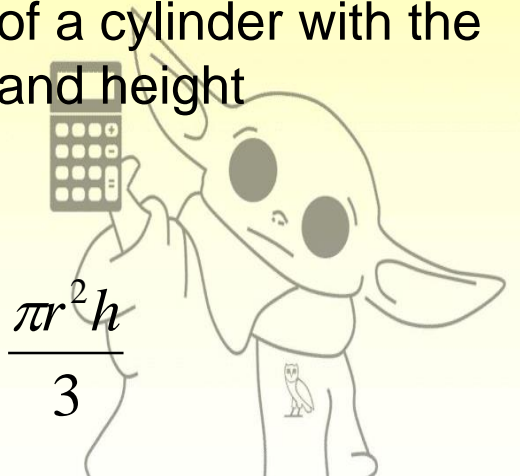
CONES



The volume of a cone is one third the volume of a cylinder with the same base and height

FORMULA

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



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***** ALL VOLUMES ARE EXPRESSED AS CUBIC UNITS (ie. cm³)**

CHAPTER 9.4 VOLUME OF CONES and SPHERES

WHERE DID THE VOLUME OF THE SPHERE COME FROM?

Volume of a sphere = Volume of a cylinder – Volume of a cone

$$= \pi r^2 h - \frac{\pi r^2 h}{3}$$

$$= \frac{3\pi r^2 h}{3} - \frac{\pi r^2 h}{3}$$

Common denominator
= 3

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

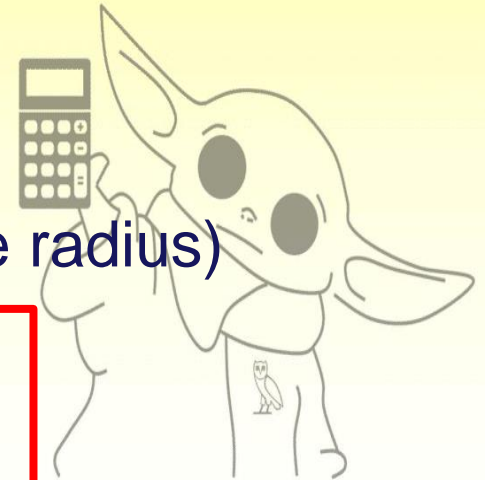
h = diameter

= 2r (twice the radius)

Multiply together

$$= \frac{2\pi r^2 (2r)}{3}$$

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



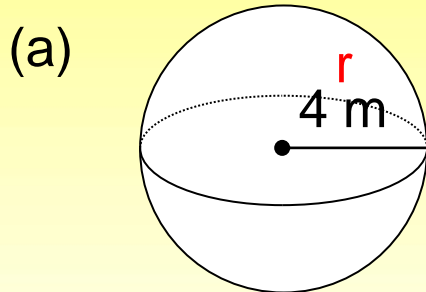
CHAPTER 9.4 VOLUME OF CONES and SPHERES

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

$$V = \frac{\pi d^3}{6}$$

EXAMPLE 1 Volume of a Sphere

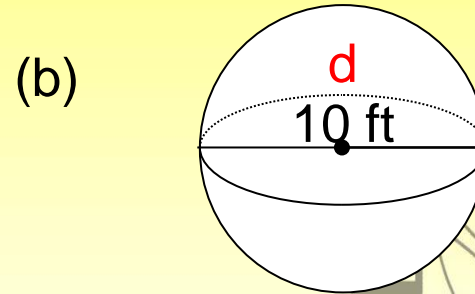
Find the volume for the pictured spheres



$$\begin{aligned} V &= \frac{4\pi r^3}{3} \\ &= \frac{4\pi(4)^3}{3} \end{aligned}$$

The volume is **268.08 cubic metres**

$$= 268.08 m^3$$



$$\begin{aligned} V &= \frac{\pi d^3}{6} \\ &= \frac{\pi(10)^3}{6} \end{aligned}$$

The volume is **523.6 cubic feet**

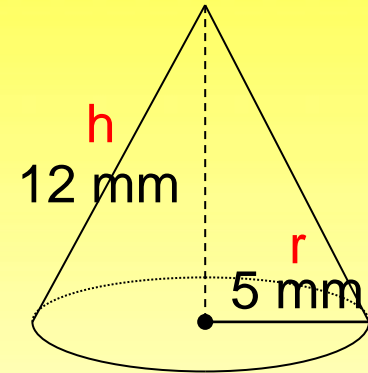
$$= 523.6 ft^3$$

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EXAMPLE 2 Volume of a Cone

Find the volume of the pictured cone

$$\begin{aligned} V &= \frac{\pi r^2 h}{3} \\ &= \frac{\pi(5)^2(12)}{3} \\ &= 314.16 \text{ mm}^3 \end{aligned}$$



The volume is **314.16 cubic millimetres.**



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EXAMPLE 3 Volume of a Cone and Sphere

An ice cream cone is made in the shape of a cone, and the scoop of ice cream is in the shape of a sphere (approximately).



The *radius* of the scoop of ice cream is **4 cm** and the *radius* of the cone is **3 cm**.

What cone **height** would be needed to hold the scoop of ice cream?

Step 1: Calculate the volume of the ice cream scoop

→ An ice cream scoop is a **sphere**

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

$$= 268.0826 \text{ cm}^3$$



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EXAMPLE 3 Volume of a Cone and Sphere

An ice cream cone is made in the shape of a cone, and the scoop of ice cream is in the shape of a sphere (approximately).



The *radius* of the scoop of ice cream is **4 cm** and the *radius* of the cone is **3 cm**.

r

What cone **height** would be needed to hold the scoop of ice cream?

Step 2: Use the volume of the ice cream scoop and substitute for Volume (V) in the cone formula

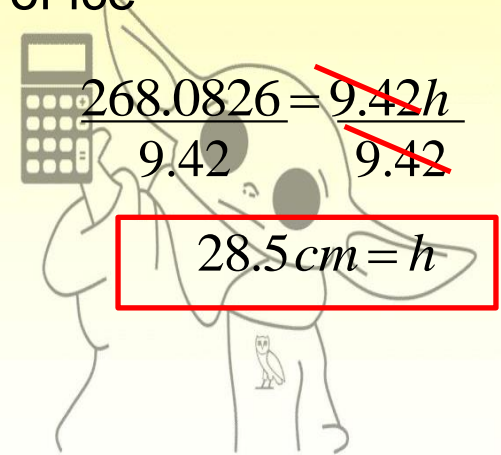
$$V = 268.0826 \text{ cm}^3$$

Solve for h

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

$$268.0826 = \frac{\pi (3)^2 h}{3}$$

$$268.0826 = \frac{9\pi h}{3}$$



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The height of the cone has to be **28.5 centimetres**.

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Homework:

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#1 ace, 2 ace, 3a, 5ac,
6acd

