Spheres

Information

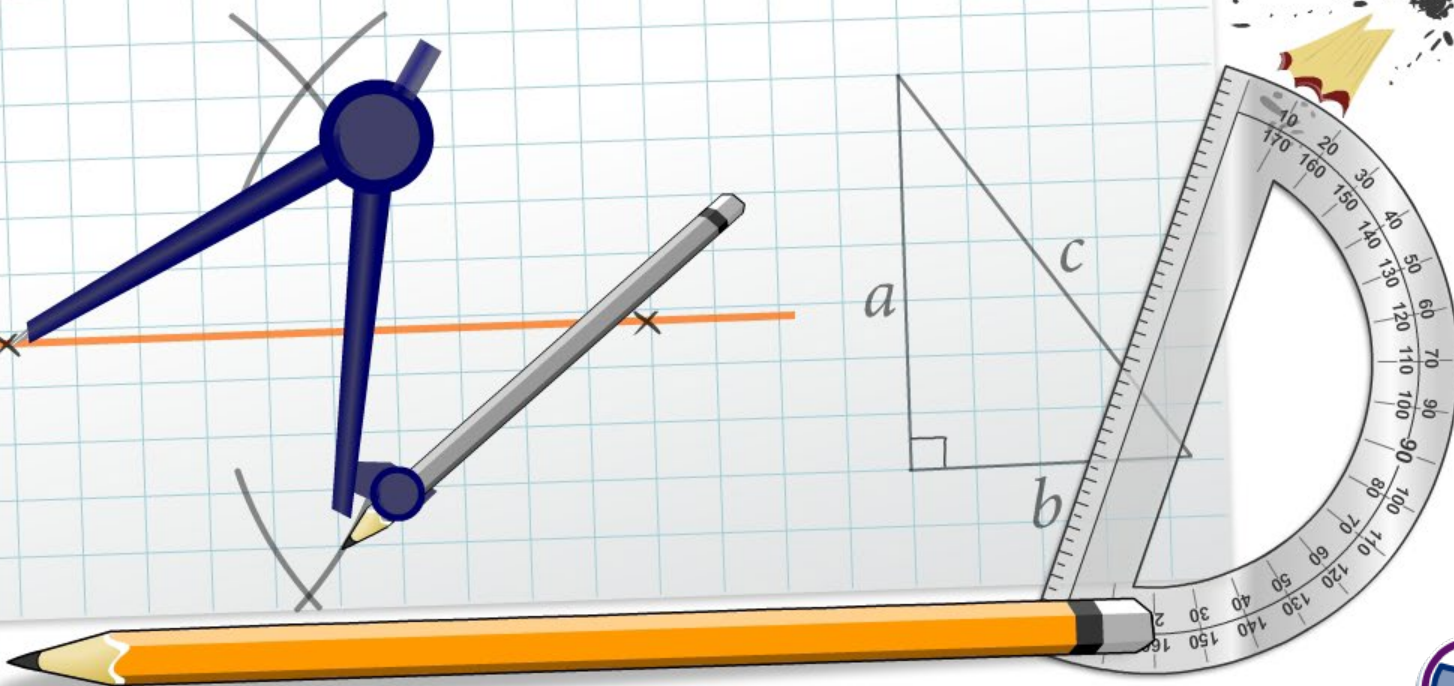## Common core icons

This icon indicates a slide where the Standards for Mathematical Practice are being developed. Details of these are given in the Notes field.

MODELING

Slides containing examples of mathematical modeling are marked with this stamp.

This icon indicates an opportunity for discussion or group work.

The **Standards for Mathematical Practice** outlined in the Common Core State Standards for Mathematics describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

These are:

1) **Make sense of problems and persevere in solving them.**

2) **Reason abstractly and quantitatively.**

3) **Construct viable arguments and critique the reasoning of others.**

4) **Model with mathematics.**

5) **Use appropriate tools strategically.**

6) **Attend to precision.**

7) **Look for and make use of structure.**

8) **Look for and express regularity in repeated reasoning.**

This icon indicates that the slide contains activities created in Flash. These activities are not editable.
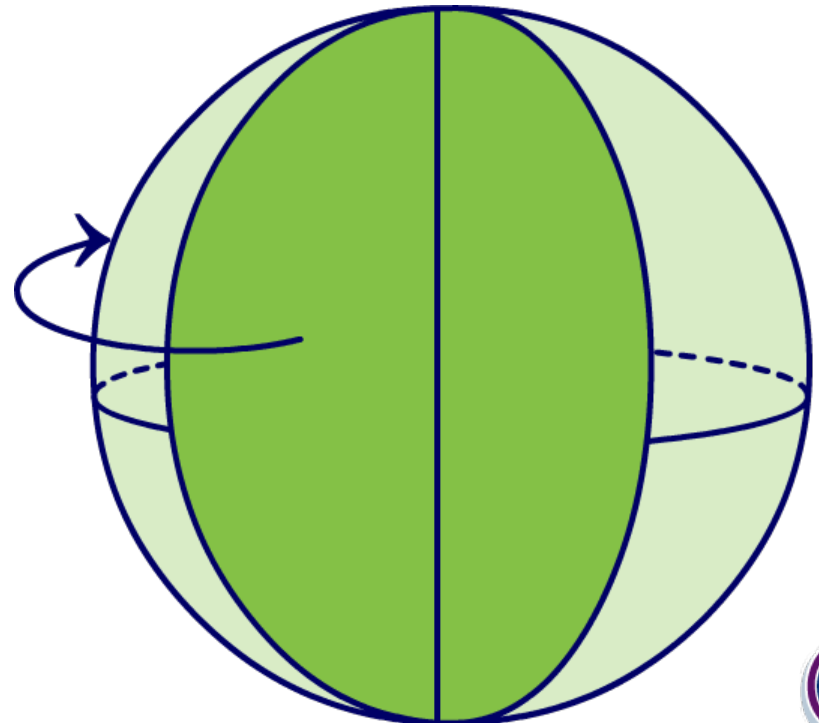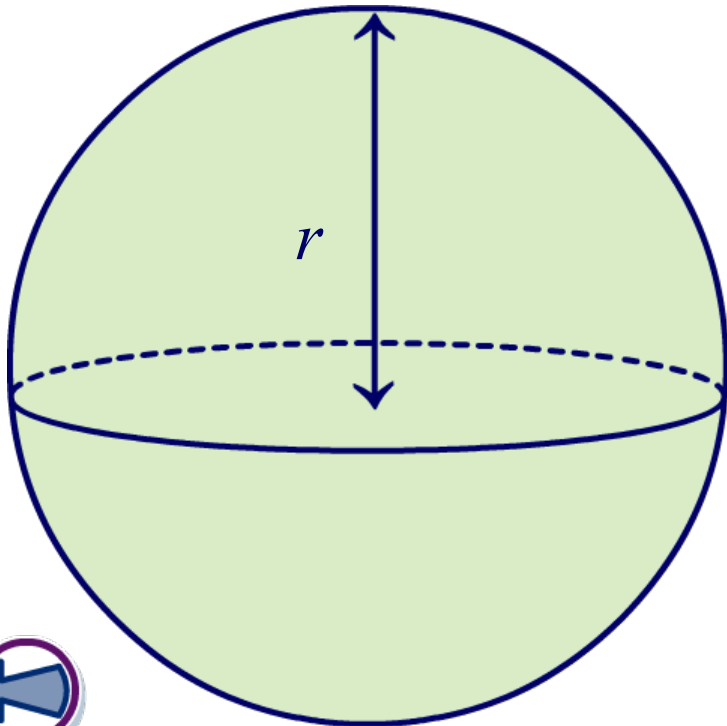
This icon indicates teacher's notes in the Notes field.

A **sphere** is a 3D shape with a surface the same distance from the center at every point. This fixed distance is the radius of the sphere.

A sphere is generated by rotating a circle, or half circle, around an axis.

r

Volume of a sphere

The volume of a sphere can be described in terms of the volume of a cylinder.

The volume of a sphere is $\frac{2}{3}$ the volume of a cylinder with the same radius and with a height of $2r$.

Use this information to derive the formula for the volume of a sphere.

volume of a cylinder:	$\pi r^2 h$
substitute height of cylinder:	$\pi r^2 (2r)$
distribute:	$2\pi r^3$
multiply by $\frac{2}{3}$:	$\frac{4}{3}\pi r^3$

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

Surface area of a sphere

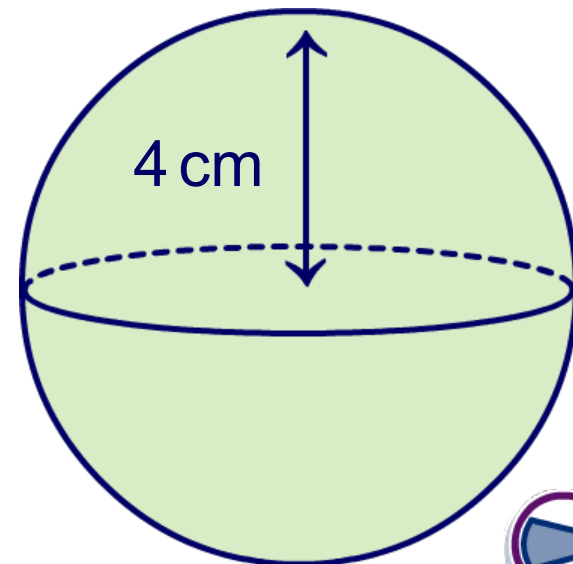For a sphere with a radius of r the surface area is:

sphere surface area

$= 4\pi r^2$

Find the surface area and volume of a sphere with a radius of 4 cm, to the nearest hundredth.

find surface area:
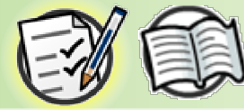
$SA = 4\pi(4)^2$

$= 201.06\,\text{cm}^2$

find volume:

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

$= 268.08\,\text{cm}^3$

4 cm

The earth is not perfectly spherical, but it is very close. The radius of the earth is approximately 3,963.2 miles.

What is the approximate volume of the earth?

use the formula for volume of a sphere:

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

$$V = \frac{4}{3}\pi(3{,}963.2)^3$$

$$V = \textbf{260,751,356,862 cubic miles}$$

What is the surface area of the earth?

use the formula for surface area of a sphere:

$$V = 4\pi(3{,}963.2)^2$$

$$V = \textbf{197,379,408.2 square miles}$$

About 71% of the earth's surface is water. What area is water? What area is land?

Crystal ball

A fortune teller puts four identical crystal balls in a rectangular fish tank. The tank's base is 35 cm by 50 cm. When the crystal balls are put in, the water rises by 4.5 cm.

What is the radius of one crystal ball?

Press the "**=**" button to show the calculations step-by-step.

7.915 cm

5.722 cm

7.775 cm

6.814 cm

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No matter which way you take a cross-section of a sphere it will always be circular.

A cross-section of a sphere that passes through the center of the sphere will have the same radius as the sphere.

A cross-section of a sphere has a radius of 6.6 cm. What is the volume of the sphere? What is the surface area?

volume $= \dfrac{4}{3}\pi(6.6)^3$

$= $ **1204.3 cm³**

surface area $= 4\pi(6.6)^2$

$= $ **547.4 cm²**
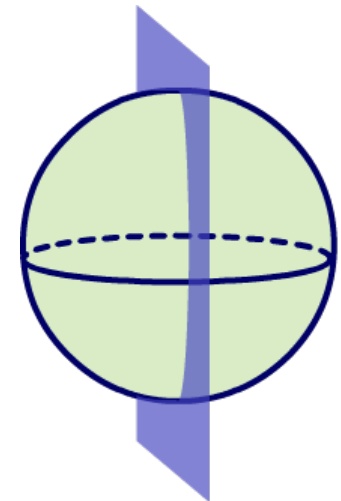
Spheres

Question: 1/4

Find the

Find the radius, volume, and surface area in terms of π to the nearest hundredth.

Press **"start"** to begin.

start

in

π in³

π in²

type the answers in the boxes above