

Math 10

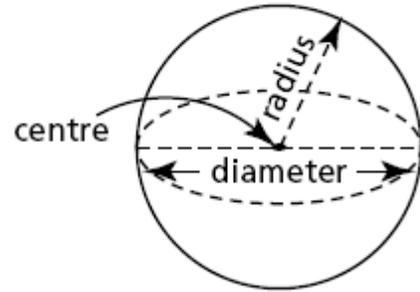
Lesson 6–6 Area and Volume of a Sphere

I. Lesson Objectives:

- 1) Solve problems involving the surface area and volume of a sphere.

II. Surface area and volume of a sphere

A **sphere** is the set of points in three dimensional space that are the same distance from a fixed point called the *centre*. A line segment that joins the centre to any point on the sphere is a *radius*. A line segment that joins two points on a sphere and passes through the centre is a *diameter*.



Surface Area of a Sphere

The surface area, SA , of a sphere with radius r is:

$$SA = 4\pi r^2$$

Volume of a Sphere

The volume, V , of a sphere with radius r is:

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

Question 1

The diameter of a softball is approximately 4 in. Determine the surface area of a softball to the nearest square inch.



Question 2

The surface area of a soccer ball is approximately 250 square inches. What is the diameter of a soccer ball to the nearest tenth of an inch?

Question 3

The moon approximates a sphere with diameter 2160 mi. What is the approximate volume of the moon?

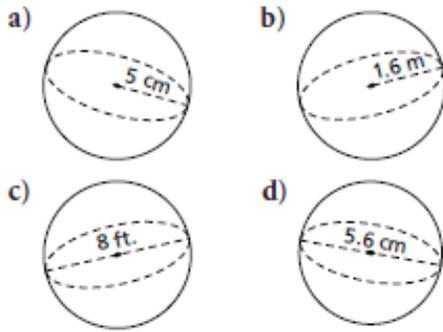
Question 4

A hemisphere has radius 5.0 cm. What is the surface area and volume of the hemisphere to the nearest tenth?

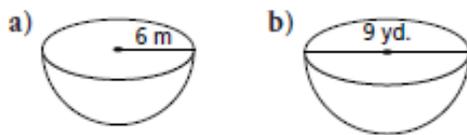


III. Assignment

1. Determine the surface area and volume of each sphere to the nearest square/cubic unit.



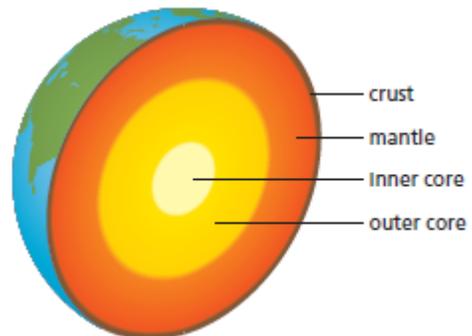
2. Determine the volume of each sphere in question 1 to the nearest cubic unit.
3. Determine the surface area and volume of each hemisphere. Write your answers to the nearest whole unit.



4. The surface area of a tennis ball is approximately 127 cm^2 . What is the radius of the tennis ball to the nearest tenth of a centimetre?
5. A sphere has a diameter of 12 cm. A hemisphere has a radius of 8 cm.
- a) Which object has the greater surface area?
 - b) Which object has the greater volume?

6. Earth approximates a sphere but its diameter varies. The mean diameter of Earth is approximately 12 756 km.

- a) Determine the surface area of Earth to the nearest square kilometre.
- b) About 70% of Earth's surface is covered in water. What is this area in square kilometres?
- c) Determine the volume of Earth to the nearest thousand cubic kilometres.
- d) The inner core of Earth has a radius of approximately 1278 km. Determine, to the nearest thousand cubic kilometres, the volume of Earth that is *not* part of the inner core.



7. The centre of a doughnut is removed and formed to make a sphere of dough with diameter 2.5 cm. A batch of these spheres is to be covered in a sugar glaze. There is enough glaze to cover an area of 4710 cm^2 . How many spheres can be glazed?

8. The size of a ball used in sport is often described by the measure of its circumference. The circumference of a ball is the length of the longest circle that can be drawn on the surface of the ball. A volleyball has a circumference of 66 cm and a basketball has a circumference of 29 in.
- Determine the radius of each ball to the nearest unit.
 - Determine the surface area of each ball to the nearest square unit.
 - Determine the volume of each ball to the nearest cubic unit.
 - Which ball is larger? Justify your answer.
9. Giselle has a block of wood that measures 14 cm by 12 cm by 10 cm. She is making a wooden ball in tech class.
- What percent of the wood is wasted?
 - What assumptions are you making?
10. A beach ball that was deflated to 70% of its maximum volume now has a volume of 420 cubic inches. What is the radius of the beach ball when it is at its maximum volume?
11. A spherical balloon has a radius of 10 cm. It is blown up until its radius is three times the original radius. For the inflated balloon and the original balloon:
- How do the circumferences compare?
 - How do the surface areas compare?
 - How do the volumes compare?

