Review

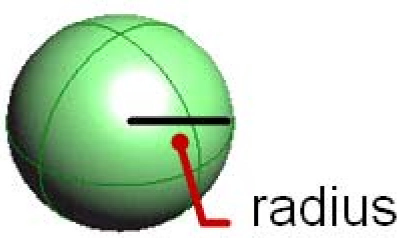
We have learned about

- Direct variation functions
  - y = xk
  - Linear graph through the origin (0,0)
  - Slope = k
  - As x increases, y increases
  - As x decreases, y decreases
- Inverse variation functions
  - $y = \frac{k}{x}$ or $xy = k$
  - The graph of inverse variation is a hyperbola.
  - As x increases, y decreases
  - As x decreases, y increases
  - k positive then graph is in 1st and 3rd coordinate
  - k negative then graph is in 2nd and 4th coordinate

2-4 Surface Area and Volume of Spheres

Key terms

Sphere – A round space figure.



Radius of a sphere – Distance from its center to its surface.

Diameter of a sphere – Twice the radius of the sphere.

Formulas

Surface Area of a sphere

$S.A. = 4\pi r^2$ or $S.A. = \pi d^2$ Square units

Volume of a Sphere

$V = \frac{4}{3}\prod r^3$ Cubic units

Which should be bigger, surface area or volume? Volume is bigger.

Example 1 – The radius of a field hockey ball is ~3.7cm.

- Find the Surface Area (SA)
  - Solution
    $SA = 4\pi r^2$
    $SA = 4\pi(3.7)^2$
  - $SA = 172.03cm^2$
- Find the volume
  - Solution
    $V = \frac{4}{3}\prod r^3$
    $V = \frac{4}{3}\prod(3.7)^3$
    $V = 212.17cm^3$

Example 2 – The diameter of a sphere is 10cm. Find the volume.

Solution

$V = \frac{4}{3}\prod r^3$ We need to find the radius.

r is ½ the diameter, 10/2 = 5, r = 5

$V = \frac{4}{3}\prod 5^3$

$V = \frac{4}{3}\prod(125)$

$V = 523.6\ cm^3$

Example 3 – The volume of a bubble is 14 cm^3. What is the radius?

Solution

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

$14 = \frac{4}{3}\prod r^3$

$14 = 4.19r^3$

$\frac{14}{4.19} = \frac{41.9r^3}{4.19}$

$3.34 = r^3$

$\sqrt[3]{3.34} = \sqrt[3]{r^3}$ Take the cube root of both sides.

r = 1.49 cm

Example 4 – The surface area of a sphere is 525 cm^2, find the radius.

Solution

$S.A. = 525cm^2$

$S.A. = 4\Pi r^2$

$525 = 4\Pi r^2$

$$\frac{525}{4} = \Pi r^2$$

$$\frac{131.25}{\Pi} = \frac{\Pi r^2}{\Pi}$$

$r^2 = 41.778$

r = 6.5 cm

Example 5 – The surface area of a sphere is 8π, find the radius.

Solution

SA = 8π

$8\pi = 4\pi r^2$

$$\frac{8\Pi}{4\Pi} = r^2$$ The π's cancel.

$$2 = r^2$$

$$r = \sqrt{2}$$

Example 6 - Volume of sphere is 800cm^3, find the radius.

Solution

$$800 = \frac{4}{3}\Pi r^3$$

$$\frac{3}{4}(800) = \Pi r^3$$

$$600 = \Pi r^3$$

$$r^3 = \frac{600}{\Pi}$$

$$r = 5.76cm$$

Similar Spheres

Similar – same "shape" different sizes. All spheres have the same shape, so all spheres are similar.

So, the ratio of the SA's is equal to the ratios of the corresponding radius squared.

The ratios of the volume is equal to the ratios of the corresponding radius cubed.

Proportions / Ratios of spheres

Write down formulas on p. 86 in notes.

$$\frac{\text{Surface area of sphere A}}{\text{Surface area of sphere B}} = \frac{(\text{radius of sphere A})^2}{(\text{radius of sphere B})^2} = \frac{a^2}{b^2}$$

$$\frac{\text{Volume of sphere A}}{\text{Volume of sphere B}} = \frac{(\text{radius of sphere A})^3}{(\text{radius of sphere B})^3} = \frac{a^3}{b^3}$$

Example 4 - Two spheres, one has radius of 6cm, one has radius of 11cm. What is the ratio of the surface area and volume of the two spheres?

Ratio of surface area $\frac{6^2}{11^2} = \frac{36}{121}$

Ratio of volume $\frac{6^3}{11^3} = \frac{216}{1331}$

Example 5 - Sphere A radius = 5 Sphere B radius = 8

What is the ratio of the volume of the two spheres?

Ratio of the volume of the two spheres is $\frac{5^3}{8^3} = \frac{125}{512}$

Remember – Ratios do not have units. Rates have units.

Homework

Read pg. 84-87

Pg. 87 #2-4, 6-10, 12-16, 18-20, 30-32, 34-41