

Activity 31

OBJECTIVE

To obtain the formula for the surface area of a sphere.

MATERIAL REQUIRED

A ball, cardboard/wooden strips, thick sheet of paper, ruler, cutter, string, measuring tape, adhesive.

METHOD OF CONSTRUCTION

1. Take a spherical ball and find its diameter by placing it between two vertical boards (or wooden strips) [see Fig. 1]. Denote the diameter as d .
2. Mark the topmost part of ball and fix a pin [see Fig. 2].
3. Taking support of pin, wrap the ball (spirally) with string completely, so that on the ball no space is left uncovered [see Fig. 2].
4. Mark the starting and finishing points on the string, measure the length between these two marks and denote it by l . Slowly, unwind the string from the surface of ball.
5. On the thick sheet of paper, draw 4 circles of radius ' r ' (radius equal to the radius of ball).

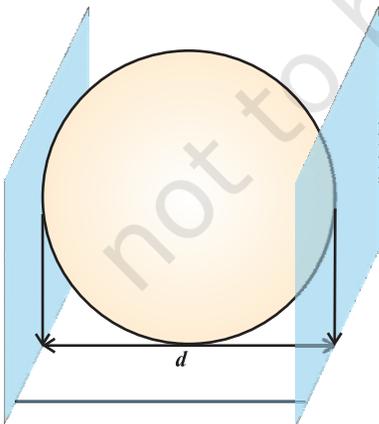


Fig. 1

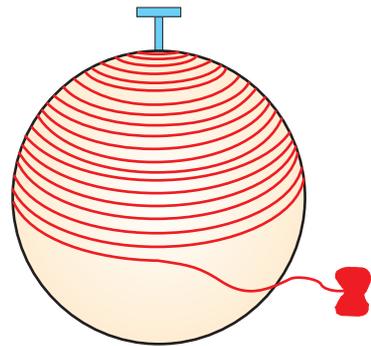


Fig. 2

6. Start filling the circles [see Fig. 3] one by one with string that you have wound around the ball.

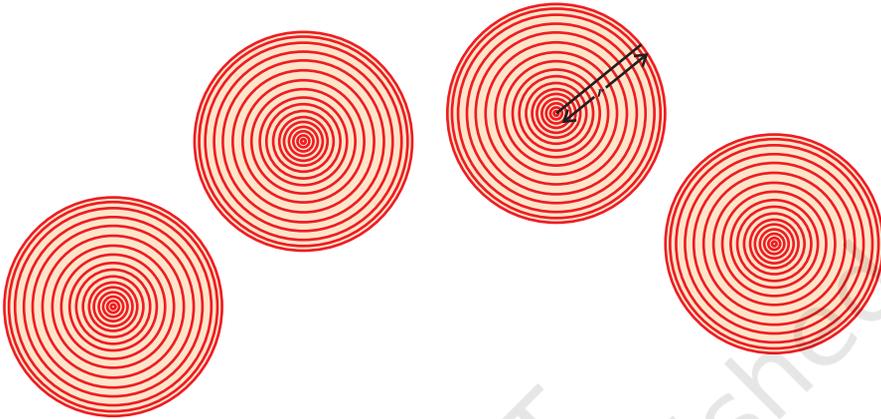


Fig. 3

DEMONSTRATION

Let the length of string which covers a circle (radius r) be denoted by a .

The string which had completely covered the surface area of ball has been used completely to fill the region of four circles (all of the same radius as of ball or sphere).

This suggests:

Length of string needed to cover sphere of radius $r = 4 \times$ length of string needed to cover one circle

$$\text{i.e., } l = 4a$$

or, surface area of sphere = $4 \times$ area of a circle of radius r

So, surface area of a sphere = $4\pi r^2$

OBSERVATION

Diameter d of the spherical ball = units

radius r = units

Length l of string used to cover ball = units

Length a of string used to cover one circle = units

So $l = 4 \times$ _____

Surface area of a sphere of radius $r = 4 \times$ Area of a circle of radius _____ = $4\pi r^2$.

APPLICATION

This result is useful in finding the cost of painting, repairing, constructing spherical and hemispherical objects.

PRECAUTIONS

- Measure diameter of ball carefully.
- Wrap the ball completely so that no space is left uncovered.
- Thinner the string more is the accuracy.