

Comparison of Volumes of Two Right Circular Cylinders

Objective

To compare the volumes of two right circular cylinders which are formed from two rectangular sheets of paper with same dimensions.

Prerequisite Knowledge

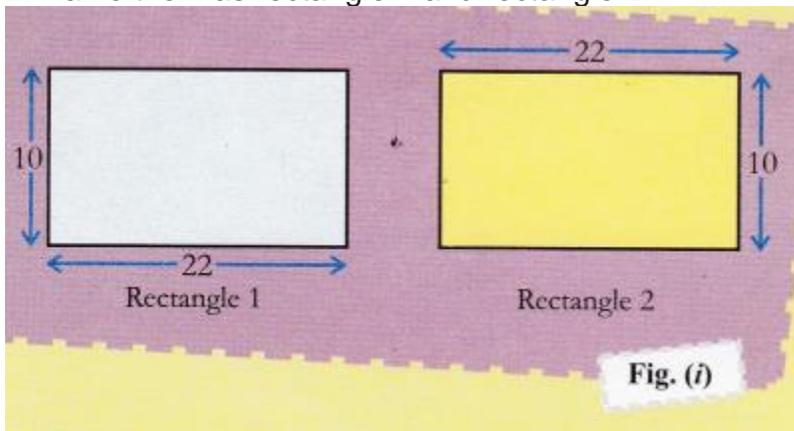
1. To make a cylinder from a rectangular sheet.
2. Circumference of circle = $2\pi r$ and area of circle = πr^2 where r is the radius of the circle.
3. Volume of right circular cylinder = $\pi r^2 h$ ($r \rightarrow$ radius of circular base and h is the height of the cylinder)

Materials Required

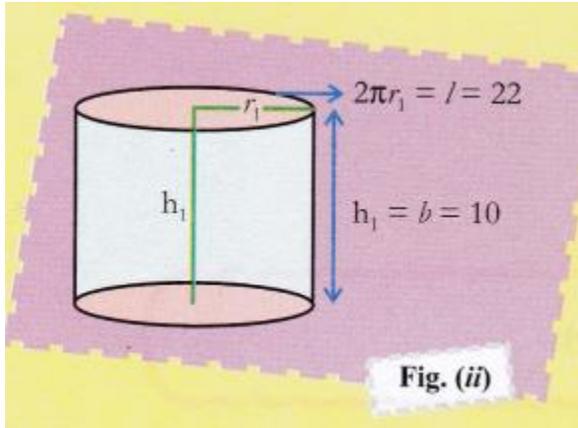
Coloured glaze paper, a pair of scissors, cello tape, geometry box, fevicol.

Procedure

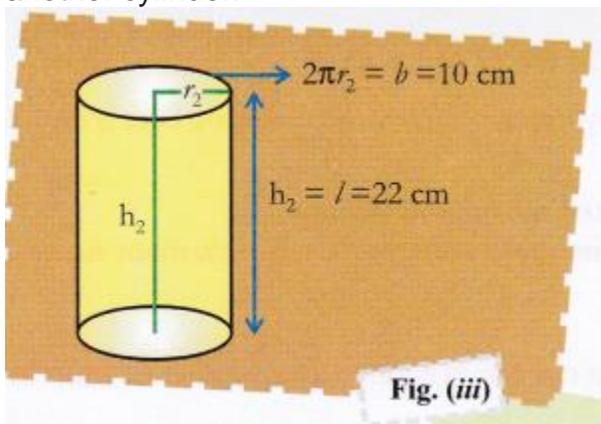
1. Cut two rectangles of same dimensions as $l = 22$ cm and $b = 10$ cm.
2. Name them as rectangle 1 and rectangle 2.



3. Curve the rectangle 1 along its length and join the ends with cello tape to get a cylinder.



4. Curve the rectangle 2 along its breadth and join the ends with cellotape to get another cylinder.



Observation

For rectangle 1:

length of the rectangle = circumference of the circular base of the cylinder

i.e. $l = 2\pi r_1 = 22$ cm.

$$r_1 = \frac{11}{\pi}$$

breadth of the rectangle = height of the cylinder

i.e. $b = h_1 = 10$ cm.

For rectangle 2:

breadth of the rectangle = circumference of circular base of the cylinder

$$b = 2\pi r_2 = 10 \text{ cm}$$

$$r_2 = \frac{10}{2\pi} = 1.59 \text{ cm}$$

length of the rectangle = height of the cylinder

$$l = h_2 = 22 \text{ cm.}$$

$$V_2 = \pi r^2 h_2 = \frac{22}{7} \times 1.59 \times 1.59 \times 22 = 174.8 \text{ m}^3$$

Result

Volume of these two cylinders are not same.

Learning Outcome

Students can easily understand the concept that the volume of the right circular cylinder formed by curving a rectangular sheet along its length not equal to the volume of the cylinder formed by curving another rectangular sheet of same dimensions along its breadth.

Activity Time

1. A cylinder is formed by curving a rectangular sheet 22 cm x 20 cm along its length. Another cylinder is formed by curving a squared sheet of side 22 cm along its any side. Compare the volume of two cylinders so formed.

Viva Voce

Question 1:

If the height of a right circular cylinder is halved and radius of base is doubled, what effect will it make on the volume of the cylinder ?

Answer:

The volume will become double of the original volume.

Question 2:

If the radius of base of a right circular cylinder is halved, how many times the height should become to keep the volume same?

Answer:

4 times the original height

Question 3:

What will be the height of a right circular cylinder if the number of units in its volume is equal to the number of units in area of its base ?

Answer:

$h = 1$ unit [Hint: $\pi r^2 h = \pi r^2$]

Question 4:

Find the volume of a cylinder for radius 2 cm and height 1 cm.

Answer:

$4\pi \text{ cm}^3$

Question 5:

If the height of a cylinder is twice the radius of its base, then find its volume in terms of height.

Answer:

$\frac{\pi}{4}h^3$ cubic units, where h — height of the cylinder.

Multiple Choice Questions

Question 1:

If the circumference of the base of a cylinder is 44 cm and height is 10 cm, then the volume of the cylinder is

- (a) 1540cm^3
- (b) 1450cm^3
- (c) 1045cm^3
- (d) none of these

Question 2:

If the height of a cylinder is four times the radius of its base, then the volume in terms of height is

- (a) $\frac{\pi}{12}h^3$
- (b) $\frac{\pi}{16}h^3$
- (c) $\frac{\pi}{8}h^3$
- (d) none of these

Question 3:

If the volume of a right circular cylinder is $2nr$ cubic units, then find the relation between its radius and height.

- (a) $h = 2r$
- (b) $h = \frac{2}{r}$
- (c) $h = \frac{4}{r}$
- (d) non of these

Question 4:

Volume of a cylindrical container is 264 m^3 . How many full bags of wheat can be emptied to fill up the container, if the space required for wheat in each bag is

- (a) 66 bags
- (c) 132 bags
- (b) 528 bags
- (d) none of these

Question 5:

If the circumference of the base of a cylinder is 132 cm and its height is 25 cm, then the volume of the cylinder is

- (a) 34650 cm^3
- (b) 34605cm^3
- (c) 36405 cm^3
- (d) 35406cm^3

Question 6:

Volume of a cylinder of base radius 2 cm and height 1 cm is

- (a) 16.2 cm^3
- (b) 12.4 cm^3
- (c) 14.2 cm^3
- (d) 12.6 cm^3

Question 7:

What will happen to the volume of a cylinder, if its radius is doubled keeping the height same ?

- (a) two times the original one
- (b) half of the original one
- (c) four times the original one
- (d) none of these

Answers

- 1. (a)
- 2. (b)
- 3. (b)
- 4. (c)
- 5. (a)
- 6. (d)
- 7. (c)