APPENDIX- B
(Socioeconomic Status Scale-updating for 2007)

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APPENDIX-B

SCORES OBTAINED ON SOCIO-ECONOMIC STATUS SCALE

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Directions; Today you will be taking the grade 9 mathematics achievement test on the topic **surface areas and volumes**. Three different kinds of questions appear on this test; Fill in the blanks, True-False type, multiplication Choice.

A. There are several important things to remember; Read each question carefully. Think about what is being asked.

B. Don’t spend too much time on one question. Go on to the next question and return to the question skipped after answering the remains questions.

C. Write the answers to the following questions 1 to 21 in the blank space in each question.

D. Questions 22 to 44 be true and false. Write T against each true statement and F against each false statement in the blank space provided for the answer in the test.

E. In each of the questions 45 to 80 there are four possible answers marked at a,b,c,d. Only one of these answers is correct. Write the space given against the correct answer in the blank space provided for the answer in the test.

F. If you change an answer make sure that you erase your old answer completely.

G. Against each question write statement no. which suits you most

1. I am 100% confident that that I am correct.

2. I think I am correct.

3. I think I am wrong.

4. I am 100% confident that that I am wrong.
FILL IN THE BLANKS

1. Cubic units is a standard measure of ______
2. Half of a sphere is called a _____________
3. Half of a diameter is a _____________
4. Every solid has _____________
5. If ‘r’ is the radius of the sphere then surface area of the sphere is ________
6. Cylinders are ________ closed surfaces.
7. ________ is the segment formed when two edges of a solid figure meet.
8. Sum of the number of edges and number of vertices of a cuboids is ___________
9. If the axis of a circular cylinder is not perpendicular to the bases, it is called a ________ circular cylinder.
10. A cylinder whose bases are circles, the line connecting the centers of the base is called the __________.
11. The sum of the areas of a plane figures making up the boundary of a solid object is called its __________.
12. A ____________ is a solid generated by revolution of a rectangle about one of its sides, which remains fixed.
13. A ____________ is a solid generated by revolution of a rectangle about one of its sides, which remains fixed.
14. The volume formula for the cylinder is $V = \__________$. 
15. The corners of a solid shape are called its ________;
16. The shapes using the volume formula $V=\frac{1}{3}$ Area of base $\times$ h all have a “top” that is a _____.
17. The surface area of a cube is $6S^2$, where _____ is the length of one edge.
18. The height and radius of a right circular cylinder are both in centimeters, and then volume will be in centimeters.
19. A cube has _____ faces.
20. The volume of a sphere is ----- the radius cubed.
21. The height and radius of a right circular cone are both in centimeters, and then volume will be in centimeters

TRUE OR FALSE

22. If you know the diameter of a sphere, you can find its surface area. ( )
23. The surface area of a cube of side length “a” centimeters is 6a squared centimeter ( )
24. The slant height of a cone of radius 5cm and height 12cm is 13cm. ( )
25. Each plane end of a right circular cylinder is called its base ( )
26. The line segment forming the vertex of the cone to the center of its base is called the axis of the cone; the length of the area is called the height of the cone. ( )
27. A sphere with center ‘O’ and radius ‘r’ is the figure (in space) consisting of all points (in space) which are at a distance r from O. ( )
28. The curved surface connecting the vertex to the circular edge of the right circular cone is called its lateral surface. ( )
29. Total surface area of the cylinder = Curved surface area + Area of the base. ( )
30. The larger cube occupies less space. ( )
31. The volume of a cone is one third the volume of a cylinder having the same radius and same height. ( )
32. Total surface area of a hemisphere of radius r is $3\pi r^2$. ( )
33. Plane figures are of two-dimensions (2_D) and the solid shapes are of three dimensions (3-D). ( )
34. The circle, the square, the rectangle, the quadrilateral and the triangle are examples of plane figures; the cube, the cuboids, the sphere, the cylinder, the cone and the pyramid are examples of solid shapes. ( )
35. Solid shapes can be drawn on a flat surface (like paper) realistically. We call this 2-D representation of a 3-D solid. ( )
36. The area of a circle with the same radius as a sphere is the same as the surface area of the sphere. ( )
37. The radius of a sphere is the longest segment possible inside the sphere. ( )
38. The radius of a cylinder is doubled but its lateral surface is unchanged, then its height halved.
39. The volume of a cylinder is found by multiplying the area of one end of the cylinder by its height.

40. A cube has six faces which are all rectangle.

41. The axis of a cylinder is parallel to the base.

41. If you know the volume of a cube, you can find the length of its edge.

42. Surface area of a sphere is the sum of the five times the area of the circle having same radius.

43. If you know the volume of a sphere you can find the volume of a hemisphere having the same radius.

44. Surface area of a cube is the sum of the areas of all its faces of a solid figure.

**Multiple choice type questions**

Q.45 The volume of a cube is $V$. The total length of its edges is:
   a) $6V^{1/3}$  b) $8\sqrt{V}$  c) $12V^{2/3}$  d) $12V^{1/3}$

Q.46 Two cubes have volume in the ratio 1:27 find the ratio of the area of the face of one to that of the other is:
   a) 1:3  b) 1:6  c) 1:9  d) 1:18

Q.47. How many cubes of 10cm edge can be put in a cubic box of 1m edge?
   a) 10  b) 100  c) 1000  d) 10,000

Q.48 The areas of three adjacent faces of a cuboids are $a$, $b$ and $c$. If the volume of the cuboids is $V$, then $V$ is equal to:
   a) $a$ $b$ $c$  b) $(ab+bc+ac)$  c) $c/ab$  d) None of these

Q.49 Three cubes of a metal are of edges 3cm, 4cm and 5cm are melted together to form one new cube. Find the edge of the new cube.
   a) 8cm  b) 10cm  c) 9 cm  d) 6cm

Q.50 The volume of a cube is numerically equal to the sum of its edge. What is its total surface area in square units?
   a) 66  b) 183  c) 36  d) 72

Q.51 A Solid has;
   a) 3 dimensions  b) 4 dimensions  c) 2 dimensions  d) None
Q.52 Volume has:
   a) 4 dimensions   b) 2 dimensions   c) 3 dimensions   d) None

Q.55 A cuboids has:
   a) 6 edges   b) 12 edges   c) 18 edges   d) None

Q.53 When all the sides of cuboids are equal in length, it is called:
   a) Plane cuboids b) Equilateral cuboids c) Cube d) Cylinder

Q.54 If the length, breadth and height of cuboids are 2cm, 2cm and 1cm respectively, find its surface area (in cm²).
   a) 8   b) 12   c) 16   d) 24

Q.55. To find surface area of a rectangular solid have to find the area of each face and
   a) multiplying by six   b) add to the areas c) divide the number of faces d) None.

Q.56 Example of one dimensional figure is
   a) Cube   b) line c) square   d) cuboids

Q.57 The radius of a cylinder is doubled and height is halved, find the ratio between the new volume and the previous volume.
   a) 2:1   b) 1:2   c) 2:3   d) 3:2

Q.58 A right circular cone and a right circular cylinder are of the same radius and height, find the volume of the cylinder.
   1) Twice that of the cone
   2) Thrice that of the cone
   3) Half that of the cone
   4) Equal to that of the cone

Q.59 The diameter of the base of a right circular cylinder is 42cm, and the area of the curved surface is 1320cm², find the height of the cylinder.
   a) 8 cm   b) 9 cm   c) 10 cm   d) 12 cm

Q.60 Find the number of iron rods, each of length 7m and diameter 2cm that can be made out of 0.88 cubic meters of iron .(use \( \pi = \frac{22}{7} \))
   a) 300   b) 400   c) 500   d) 600

Q.61 The number of surfaces in a right circular cylinder is
   a) 4   b) 3   c) 2   d) 1
Q.62) A sphere and a cube are the same height, find the ratio of the volume.
   a) 11:21  b) 21:11  c) 3:4  d) 4:3  (   )

Q.63) Find the volume of a cylinder with a base area of 10 cm\(^2\) and a height of 25 cm.
   a) 321 cm\(^3\)  b) 250 cm\(^3\)  c) 350 cm\(^3\)  d) 502 cm\(^3\)  (   )

Q.64) The lateral surface of a cylinder is 440 sq cm. The height of this cylinder is 10 cm, find the diameter of the cylinder (cm).
   a) 14  b) 7  c) 28  d) 21  (   )

Q.65) The capacity of a cylinder tank is 1848 cm\(^3\) and the diameter of its base is 14 cm, find the depth of the tank.
   a) 6 cm  b) 7 cm  c) 24 cm  d) 12 cm  (   )

Q.66) The radius and height of a right circular cone are 3 cm and 7 cm respectively, find the curved surface area of the right circular cone.
   a) 156 cm\(^2\)  b) 66 cm\(^2\)  c) 65 cm\(^2\)  d) 46 cm\(^2\)  (   )

Q.67) Find the curved surface of a right circular cone of height 15 cm and base diameter 16 cm.
   a) 120\(\pi\) cm\(^2\)  b) 60\(\pi\) cm\(^2\)  c) 136\(\pi\) cm\(^2\)  d) 68\(\pi\) cm\(^2\)  (   )

Q.68) The surface area of a cone with base radius ‘r’ and slant height ‘l’ is
   a) \(\pi r (r+l)\)  b) \(\pi (r-l)\)  c) \(\pi (r^2+l)\)  d) \(\pi r^2\)  (   )

Q.69) The volume of a cone, whose height ‘h’ is twice the radius ‘r’ of its base is:
   a) \(\frac{2}{3}\pi r^3\)  b) \(\frac{1}{3}\pi r^2h\)  c) \(3\pi r^2n\)  d) \(\frac{1}{3}\pi r^2\)  (   )

Q.70) The curved surface area of a cone of radius ‘r’, height ‘h’ and slant height ‘l’ is:
   a) \(\pi R^2h\)  b) \(\pi rl\)  c) \(\pi rl + 2\pi rh\)  d) \(\frac{1}{3}\pi rlh\)  (   )

Q.71) The ratio of the volumes of two right circular cones is 3:1, the radii of their bases are also in the ratio 3:1, find the ratio of their heights:
   a) 1:2  b) 1:3  c) 1:6  d) 1:9  (   )

Q.72) If the radius of the base and the height of a right circular cone are doubled, find its change in volume.
   a) 2 times  b) 3 times  c) 4 times  d) 8 times  (   )

Q.73) The radii of two spheres are in the ratio 2:3, find the ratio of their surface area.
   a) 4:3  b) 4:5  c) 4:7  d) 4:9  (   )

Q.74) Surface area of the given fig.
   (a) 72\(\pi\)  (b) 70\(\pi\)  (c) 80\(\pi\)  (d) 90\(\pi\)  (   )
Q.75. The curved surface area of a sphere is 616 sq cm, find the radius of a hemisphere of this sphere.

a) 7 cm   b) 14 cm   c) 21 cm   d) None

Q.77. Find the volume of the sphere with a radius of 14 cm.

a) 14888.21 cm\(^2\)  b) 18488.12 cm\(^2\)  c) 11488.22 cm\(^2\)  d) 14182.32 cm\(^2\)

Q.78 Find the approximate volume of sphere with a diameter of 4 cm.

a) 268 cm\(^3\)  b) 134 cm\(^3\)  c) 175 cm\(^3\)  d) 33.5 cm\(^3\)

Q.79. Find the surface area of the sphere with a radius of 14 cm,

a) 264.76 cm\(^2\)  b) 246.76 cm\(^2\)  c) 246.67 cm\(^2\)  d) 624.76 cm\(^2\)

Q.80 Find the approximate volume of sphere with a diameter of 4 cm.

a) 268 cm\(^3\)  b) 134 cm\(^3\)  c) 175 cm\(^3\)  d) 33.5 cm\(^3\)
APPENDIX-E

Opinionnaire (Power Point Programme)

Name..........................................................
Gender..........................................................
Age..........................................................
Profession..........................................................
Place of work.............................................

Use of the computer
very good
Good
Medium
Poor
Very poor

Read the statements below and decide to what extent they correspond to the characteristics of the “Power Point Programme “on topic ‘Surface Areas and Volumes” for 9 classes CBSE.

Circle, on the number that best corresponds to the below mentioned characteristics.
D=Disagree(1) A=Agree(2) U=Undecided(3)

Thank you for your time and for the effort of filling this Opinionnaire.

A. The evaluation of the content presented in the ‘Power Point Programme’

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<th>“Power Point Presentation Programme “on topic “Surface Areas and Volumes”</th>
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<td>D</td>
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<tr>
<td>1. The mathematical content of the Software is modern and flawless.</td>
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<td>2. The origin of the information offered By the software is well known (Curriculum, textbook, exercise books)</td>
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<td>4. The mathematical content is presented In a clear and objective manner.</td>
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5. The information presented here is relevant for the users’ age.

6. Information is of sufficient scope and depth

7. The terminology and the language used respect the age particularities of the children.

8. The use of language is grammatically correct.

9. The exercises from the software are presented gradually in a logical manner.

10. The types of exercises vary and present different degrees of complexity.

11. The Programme’s design is based on adequate teaching and learning theories (The way pupils learn and think).

12. The Programme’s design is greatly connected to the mathematical content of the curriculum.

13. The Programme’s content aims to acquire the objectives which are specific to mathematics.

14. The content of the Programme is structured in a clear manner.

15. The organization of content is such that it retains learner’s interest.

16. The illustrations are attractive and useful.

17. The programme aims at applying the knowledge, not a memorizing them mechanically

18. The topics and sub-topics are illustrated with suitable pictures, diagrams.
**B Screen design**

19. The users are satisfied with the programme.  

20. The programme menus have a clear structure.  

21. The way of presenting the Programme is appealing to the user.  

22. The way of presenting the information stimulates its bringing up to date.  

23. The Programme’s design does not overload the users’ memory (it is easy to remember).  

24. There are adequate characters as style and dimension used in the programme’s design.  

25. The texts used in the programme are legible, so are the colours.  

26. The quality of the texts, the images and the animations presented in the programme is very good.  

27. There is a contrast between the background and the written texts or the Images which contribute to remembering them easier.  

28. There is only one animation at the same time on a menu, not more than one.  

29. The sound used in the programme is of a good quality and facilitate rendering of Information.  

30. The users consider the educational Programme interesting.
## APPENDIX-F
### ITEM ANALYSIS OF ACHIEVEMENT TEST

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R_{LU}=\text{No. Of Correct Responses in Upper Group} \\
R_{RL}=\text{No. Of Correct Responses in Lower Group} \\
D_{P}=\text{Discriminatory Power} \\
D_{V}=\text{Difficulty Value}
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<td>1.</td>
<td>Anil Kumar</td>
<td>Partap Public School,Karnal</td>
<td>Lecturer(M)</td>
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<td>Renu</td>
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CUBOIDS

SURFACE AREA

BY

KUMUD
The surface area of a solid is the measure of the area or “space” of the external body.

This space is sometimes flat (Cube and Cuboids) and sometimes not (Sphere).

The surface area measures the area of 2-dimension boundary of a 3-dimensional figure; it is the area of outside of a solid.

It is expressed in square units; such as square inches, square feet, square cms. and so on.
TOTAL SURFACE AREA
OF
CUBOIDS
CUBOIDS
CUBOIDS

Geometrical representation

In a cuboids

- there are 8 vertexes
- 12 edges
- 6 rectangular surfaces known as faces.
EXAMPLES
To Find The Surface Area Of A Cuboid

in this cuboids if we take

- length as ‘l’
- Breadth as ‘b’
- Height as ‘h’
Cuboids

6 rectangular faces

- Front and Back
- Top and bottom
- Right side and left side
surface area of a cuboid

Front and back are the same
Top and bottom are the same
Right and left are the same
SURFACE AREA

When cuboids is opened we can see 6 different rectangular faces.

6 faces
Top and bottom congruent
Front and back congruent
Left and right congruent
Add the areas of all the six rectangles

i.e.

Area of rectangle 1

+ 

Area of rectangle 2

+ 

Area of rectangle 3

+ 

Area of rectangle 4

+ 

Area of rectangle 5

+ 

Area of rectangle 6
So the sum of the areas of 6 rectangles is:

- Area of rectangle 1 = \((l \times h)\) 
- Area of rectangle 2 = \((l \times b)\) 
- Area of rectangle 3 = \((l \times h)\) 
- Area of rectangle 4 = \((l \times b)\) 
- Area of rectangle 5 = \((b \times h)\) 
- Area of rectangle 6 = \((b \times h)\)
To determine the surface area of Cuboid

- \( = (lxh) + (lxb) + (lxh) + (lxb) + (bxb) + (bxb) \)
- \( = 2(lxh) + 2(lxb) + 2(bxb) \)
- \( = 2lh + 2lb + 2bh \)
- \( = 2(lh + lb + bh) \)

Surface area of cuboid = \( 2lh + 2lb + 2bh \)

\( l, b, h \) are respectively the 3 edges of the cuboid.
 QUESTION

The Length, width and height of a Cuboid are 10 cm, 8cm and 7cm. Find the total surface area of a cuboid.
The Length, width and height of a Cuboid are 10 cm, 8 cm and 7 cm. Find the total surface area of a cuboid.

**Sol.**

In a cuboid:
- \(l = 10\text{ cm}\)
- \(b = 8\text{ cm}\)
- \(h = 7\text{ cm}\)

The total surface area of a cuboid is given by:

\[2(lb + bh + hl)\]

Substituting the given values:

\[= 2(10 \times 8 + 8 \times 7 + 7 \times 10)\]
\[= 2(80 + 56 + 70)\]
\[= 2(206)\]
\[= 412 \text{ cm}^2\]

Total surface area of a cuboid = 412 cm\(^2\)
Evaluation

Ques. : The length, breadth and height of a cuboid are 8 cm, 6 cm, and 4 cm respectively. Find the total surface area of a cuboid.
Home Work

Find the surface area of a slab of stone measuring 3m in length, 2m breadth and 25 cm in thickness.
Lateral surface area of Cuboid
To determine the Lateralsurface area of a Cuboid

- Add the area of Four faces leaving the bottom and top faces
  - i.e.
  - Area of rectangle 1
  - +
  - Area of rectangle 3
  - +
  - Area of rectangle 5
  - +
  - Area of rectangle 6
To determine the surface area of Cuboid

- So the sum of the areas of Four faces is:
  - Area of rectangle 1(=l×h)
    +
  - Area of rectangle 3(=l×h)
    +
  - Area of rectangle 5(=b×h)
    +
  - Area of rectangle 6(=b×h)
To determine the Lateral surface area of Cuboid

- \( = (l \times h) \) + \( (l \times h) \)
- \( + (b \times h) \) + \( (b \times h) \)
- \( = 2(l \times h) + 2(b \times h) \)
- \( = 2lh + 2bh \)
- \( = 2(l+b)h \)

Lateral Surface area of cuboid = \( 2(l+b)h \)

l, b, h are respectively the 3 edges of the cuboid.
QUES:
The length of a hall is 20 m and breadth 16m. The sum of the areas of the floor and the flat roof is equal to the sum of the areas of the four walls. Find the height of the hall.
**QUES:** The length of a hall is 20 m and breadth 16 m. The sum of the areas of the floor and the flat roof is equal to the sum of the areas of the four walls. Find the height of the hall.

**SOLU:**

\[ l = 20 \text{ m} \]
\[ b = 16 \text{ m} \]

Area of the floor = \( l \times b \)
\[ = 20 \times 16 \]
\[ = 320 \text{ m}^2 \]

Area of the flat roof = \( l \times b \)
\[ = 20 \times 16 \]
\[ = 320 \text{ m}^2 \]

Sum of the areas of the floor and flat floor = 320 + 320
\[ = 640 \text{ m}^2 \]

Sum of the areas of the four walls of the halls = \( 2(l+b) \times h \)
\[ = 2(20+16) \times h \]

\[ 72h = 640 \]
\[ h = \frac{640}{72} = \frac{80}{9} \text{ m} = 8.88 \text{ m} \]
Evaluation

Ques.: Calculate the lateral surface area of a cuboid whose length, breadth, height are 2cm, 2cm and 1cm respectively.
Home Work

Ques1: Fill in the blanks
(1) The lateral surface area of a cuboid is________.
(2) Lateral surface area are usually expressed in terms of some _____ units.

Ques2: Find the lateral surface area and total surface area of a cuboid of length 80 cm, breadth 40 cm and height 20 cm.
Problems based on the surface area of a cuboid
Exercise-13.1
(Problem No;1,2,3)
Objectives:

1. To enable the students to recall the formula for the computation of the surface area of a cuboid
2. To enable the students to find out any one dimension of a cuboid when the surface area and its two other dimensions are given.
Ques1. A plastic box 1.5 m long, 1.25 m wide and 0.65 m deep is to be made. It is to be open at the top. Ignoring the thickness of the plastic sheet, determine:

(1) The area of the sheet required for making the box.
(2) The cost of sheet for it, if a sheet measuring 1 m$^2$ costs Rs. 20

Solu:

\[ l = 1.5 \text{ m} \]
\[ b = 1.25 \text{ m} \]
\[ h = 0.65 \text{ m} \]

Total surface area = \(2(lb + bh + hl)\)

(1) Area of sheet required for making box which is open at the top = \(lb + 2bh + 2hl\)

\[ \text{top} = lb + 2lh + 2bh \]
\[ = lb + 2h(l + b) \]
\[ = 1.5 \times 1.25 + 2 \times 0.65(1.5 + 1.25) \]
\[ = 1.875 + 1.30(2.75) \]
\[ = 1.875 + 3.575 \]
\[ = 5.45 \text{ m}^2 \]

(2) Total cost = \(\text{cost per m}^2 / \text{Area of sheet required for making}\)
Ques2: The length, breadth and height of a room are 5m, 4m and 3m respectively. Find the cost of white washing the walls of the room and ceiling at the rate of Rs. 7.50 per m².

Solu:

- l = 5m
- b = 4m
- h = 3m

Area of four walls of the rooms = 2(l+b)h
  = 2(5+4)3
  = 2x9x3
  = 54 m²

Area of the ceiling = lb
  = 5x4
  = 20 m²

Area of four walls of the room and Area of the ceiling = 54 + 20
  = 74 m²

Total cost of white washing = Total area x cost per m²
  = 74x7.5 = Rs. 555
Ques3. The floor of a rectangular hall has a perimeter 250 m. If the cost of painting the four walls at the rate of Rs.10 per m² is Rs.15000, find the height of the hall.

Solu;

Perimeter of the hall \( P \) = \( 2(l+b) \)

= 250 m

Area of the four walls = \( 2(l+b)h \)

= \( P \times h \)

= \( 250h \)

Cost of painting = 15000 Rs.

\( h \) (height of the hall) = \( \frac{15000}{250} \)

= 6 m
Evaluation

Ques1; A small indoor greenhouse is made entirely of glass sheets (including the base) held together with tape. It is 40 cm long, 30 cm wide and 30 cm height. Find (1) The area of the glass sheet required and (2) The total length of the tape required for all the 12 edges.
Ques1: Fill in the blanks:

(1) Plane figures are of two –dimensions(2D) and the solid shapes are of--

(2) A cuboid has six faces which are all------

Ques2: Find the surfaces area (in cm2) of a cuboids if its length, breadth and heights are 2cm,2cm and 1cm respectively.
A Cuboid whose length breadth and height are equal is called a cube.

- \( \text{length} = \text{breadth} = \text{height} \)
- \( l = b = h = a \)
A Cube is a 3 Dimensional figure having 6 matching square sides
In a cube there are
➢ 8 vertexes
➢ 12 edges
and
➢ 6 square surfaces known as faces.
EXAMPLES
EXAMPLES
Sectional Evaluation

• Define cube
• How many square faces are there in a cube.
SURFACE AREA

When cube is opened we can see 6 different square faces.
To determine the surface area of Cube

Add the areas of all the six Squares i.e.

Area of Square 1 + Area of Square 2 + Area of Square 3 + Area of Square 4 + Area of Square 5 + Area of Square 6
To determine the surface area of Cube

So the sum of the areas of 6 rectangles is:

Area of Square 1 (= axa) +
Area of Square 2 (= axa) +
Area of Square 3 (= axa) +
Area of Square 4 (= axa) +
Area of Square 5 (= axa) +
Area of Square 6 (= axa)
To determine the surface area of a Cube

\[ \text{Surface area of a Cube} = 6a^2 \]

Where \( a \) is the edge of the Cube

\[
= 2(axa) + 2(axa) + 2(axa) \\
= 2a^2 + 2a^2 + 2a^2 \\
= 6a^2
\]
Sectional Evaluation

• Fill un the blanks
• Sum of the number of edges and number of vertices of a cube is______.
• The surface area of a cube is $6 s^2, m$ where ____is the length of one edge.
• A cube has _____ face.
• Ques;What is the Total Surface Area of a cube , if ‘a’ is the its edge.
Ques; Find the total Surface Area of a cube which has sides of length 3 cm.

• Solu
• In a cube 
• $a=3 \text{ cm}$
• where $a$ is the edge .
• Total Surface Area of a Cube = $6 \times a^2$
• $= 6(3)^2$
• $=6 \times 3 \times 3$
• $=54 \text{ cm}^3$
• Total Surface Area of a Cube = $54 \text{ cm}^3$
Evaluation

• (True and False )
• The corners of a solid shape are called its edges.
• Surface areas is the sum of the areas of all the faces of a solid figures.
• A cube has six faces which are all rectangle.
• To find surface area of a rectangle solid, you have to find the area of each face and add to the areas.
• Define a cube.
• Find the surface area of a cube whose side is of 4 m.
Lateral surface area of a Cube
To determine the Lateral surface area of Cube

Add the areas of Four faces leaving the bottom and top faces
i.e.
Area of Square 1 + Area of Square 3 + Area of Square 5 + Area of Square 6
To determine the Lateral surface area of Cube

So the sum of the areas of Four faces is:

Area of Square 1(=axa)
+ Area of Square 3(= axa)
+ Area of Square 5(= axa)
+ Area of Square 6(= axa)
To determine the Lateral surface area of a Cube

\[
(a \times a) + (a \times a) + (a \times a) + (a \times a)
\]

\[= a^2 + a^2 + a^2 + a^2\]

\[= 4a^2\]

Lateral Surface area of a Cube = 4a^2

Where \( a \) is the edge of the Cube.
Sectional Evaluation

- Ques; Differentiate between Lateral Surface Area and Total Surface Area of a cube.
Ques; Find the Lateral Surface Area of a cube with side 4 cm.

• Solu;
• Let ‘a’ be the side
• \(a=4 \text{ cm}\)
• Lateral Surface Area of a cube =4 \(a^2\)
• \(=4(a)^2\)
• \(=4 \times 4 \times 4\)
• \(=64 \text{ cm}^2\)

Lateral Surface Area of a cube=64 cm\(^2\)
Evaluation

- Ques;
- Find the Lateral Surface Area of a cube whose side length is 3 feet.
Home Work

• Fill un the blanks
• The Lateral Surface Area of a cube is ______ whose side length is ‘a’.
• The Total Area of a cube is____ whose side length is ‘a’.
• Ques;Find the side of a cube whose Lateral Surface Area is 64cm$^2$
Problem based on Surface Area of a cube
Exercise 13.1
(Problem no.4,5)
Ques 4; The Paint in a container is sufficient to paint an area equal to 9.375 m². How many bricks of dimensions 2.5 cm X 10 cm X 7.5 cm can be painted out of this container?

- Solu; l (length) = 22.5cm
- b (breadth) = 10 cm
- h (height) = 7.5 cm
- Total Surface Area of a brick
  \[= 2(l \times b + b \times h + h \times l)\]
  \[= 2(22.5 \times 10 + 10 \times 7.5 + 7.5 \times 22.5)\]
  \[= 2(225 + 75 + 168.75)\]
  \[= 937.5 \text{ cm}^2\]
- Total Surface Area of ‘n’ bricks = nx 937.5 cm²
- No. of bricks = \(9.375 \times 100 / 937.5\)
  \[= 100\]

**NO. OF BRICKS = 100**
Ques 5; A cubical box has each edge 10 cm and another cubical box is 12.5 cm long, 10 cm wide and 8 cm high.

(1) Which box has greater Lateral Surface Area and by how much.

(2) Which box has smaller Total Surface Area and by how much.

- Solu; Lateral Surface Area of a cube = $4a^2$
  where ‘a’ is the edge of a cube
  $= 4(10)^2$
  $= 400 \text{ cm}^2$

- Lateral Surface Area of a cubical box = $2(l+b)h$
  $= 2(12.5+10)8$
  $= 360 \text{ cm}^2$

- Total Surface Area of a cube = $2(lxb+bxh+hxl)$
  $= 2(12.5\times10 + 10\times8 + 8\times12.5)$
  $= 610 \text{ cm}^2$

- Total Surface Area of a cubical box = $6 \text{ a}^2$
  $= 6(10)^2 = 600$
• Lateral Surface Area of a cube is greater than the
• Lateral Surface Area of a cuboids = 400 - 360
  = 40 cm²
• Total Surface Area of a cube is smaller than the
• total Surface Area of a cuboids = 610 - 600
  = 10 cm²
Evaluation

• Ques;
• The paint in a certain container is sufficient to paint an area equal to $17.5\text{m}^2$. How many bricks of dimensions $45\text{cm} \times 10 \text{ cm} \times 7.5\text{cm}$ can be painted out of this container.
Evaluation

• Ques; A box has each edge 20 cm and another cubical box is 22.5 cm long, 10 cm wide and 8 cm high.

• 1) Which box has greater Lateral Surface Area and by how much.

• (2) Which box has smaller Total Surface Area and by how much.
Home Work

• Ques; The paint in a container is sufficient to paint 2.6m². How many cuboidal bricks of dimensions 20 cm x 15 cm x 10 cm can be painted out of this container.

• Ques; Which of the following pairs is not correctly matched

• (a) Volume (a) centimeter
• (b) surface area (b) Square centimeter
• (c) Perimeter (c) (centimeter)³
• Problem based on
• Surface Area of a cube
Exercise 13.1
(Problem no.6)
A small indoor greenhouse (herbarium) made entirely of glass panes (including base) held together with tape. It is 30 cm long, 25 cm wide and 25 cm high.

(1) What is the area of the glass?
(2) How much of tape is needed for all its 12 edges.

Solu:
- length of a glass (l) = 30 cm
- breadth of a glass (b) = 25 cm
- Height of a glass (h) = 25 cm

(1) Total Surface Area of a Glass = 2(lxb + bxh + hxl)
  = 2(30x25 + 25x25 + 25x25)
  = 2(2125)
  = 4250 cm²

(2) Required length of tape = length of 12 edges
  = 4(30 + 25 + 25)
  = 4(80)
  = 320 cm
Evaluation

• QUES:A small indoor greenhouse in the shape of a cube is made entirely of glass panes (including base) held together with tape. Each glass pane is a square having its side 20 cm. Find (1) The total area of the glass sheet used.

• 1) The total length of the tape used.
Home Work

• QUES: A small indoor greenhouse (herbarium) made entirely of glass panes (including base) held together with tape. It is 40 cm long, 30 cm wide and 30 cm high.

(1) What is the area of the glass?
(2) How much of tape is needed for all its 12 edges.
• Problem based on
• Surface Area of a cube
  Exercise 13.1
  (Problem no.7,8)
Ques7: Shanti sweets stall was placing an order for making cardboard boxes for packing their sweets. Two sizes of boxes are required. The bigger of dimensions 25cm x 20cm x 5cm and smaller of dimensions 15cm x 12cm x 5cm. For all the overlap, 5% of the total surface area is required extra. If the cost of the cardboard is Rs. 4. For 100 cm², find the cost of cardboard required for supplying 250 boxes of each kind.
• Solu:
• length (l) of a bigger box=25 cm
• breadth (b) of a bigger box=20 cm
• height (h) of a bigger box=5 cm
• Total Surface Area of bigger box = 2(lxb+ bxh+ hxl)
• =2(25x20+20x5+5x25)
• =2(725)
• =1450 cm²
• Total Surface Area of 250 boxes =1450x250
• =362500cm²
• Surface Area of one box
  \[=2(15 \times 12 + 12 \times 5 + 5 \times 15)\]
  \[=630 \text{ cm}^2\]
• Surface Area of 250 boxes
  \[=250 \times 630\]
  \[=157500 \text{ cm}^2\]
• Total Surface Area of the boxes of two type
  • \(=362500 + 157500\)
  • \(=520000 \text{ cm}^2\)
• Area of sheet required for making 250 boxes of each including extra required area of 5% for overlaps
  • \(=520000 + 520000 \times \frac{5}{100}\)
  • \(=520000 + 26000\)
  • \(=546000 \text{ cm}^2\)
• Total cost of sheet at the rate of Rs. 4 for 1000 cm²
  • \(=(Rs. 4/100) \times 546000\)
  • \(=Rs. 2184\)
Ques8:-Parveen wanted to make a temporary shelter for her car, by making a box-like structure with tarpaulin that covers all the four sides and the top of the car (with the front face as a flap which can be rolled up). Assuming that the stitching margins are very small, and therefore negligible, how much tarpaulin would be required to make the shelter of height 2.5 m, with base dimensions 4mx3m.
• Solu :
  • $l=4m$
  • $b=3m$
  • $h=2.5$ m
  • Area of tarpaulin required to cover four sides and the roof = $l \times b + 2(l+b) \times h$
  • $=4 \times 3 + 2(4+3) \times 2.5 \text{ m}^2$
  • $=12 + 14 \times 2.5$
  • $=12 + 35$
  • $=47 \text{ m}^2$
Evaluation

• Gopal sweets placed an order for making 30cmx20cmx6cm cardboard boxes for packing their sweets. For all overlaps, 4% of the total area is required extra. If the cost of the cardboard is 25p for 100 cm\(^2\), find cost of the cardboard used for making 1000 boxes.
Home Work

- Sham sweets placed an order for making 20cmx30cmx10cm cardboard boxes for packing their sweets. For all overlaps, 5% of the total area is required extra. If the cost of the cardboard is 50p for 100 cm$^2$, find cost of the cardboard used for making 1000 boxes.
End
CYLINDER

SURFACE AREA
Right Circular Cylinder

Not Right Circular Cylinder
TOTAL SURFACE AREA OF CYLINDER

- A Cylinder has a total 3 surfaces:
  - A top
  - A bottom
  - Middle
In a right circular cylinder

The Top and bottom are circles With radius \((r)\)

Middle part is curved surface with height \((h)\)
DEFINITION OF A CYLINDER

◆ A RECTANGULAR FIGURE COMPRISING FIGURE TWO CIRCULAR BASES JOINED BY A CURVED HEIGHT IS CALLED A CYLINDER
To determine the surface area of cylinder

Add Areas of the

- **Top**
- and
- **bottom circles**

to the area of the

- **curved surface**

between them
Surface area of cylinder

Surface area =

Area of top circle
+ 
Area of bottom circle
+ 
Area of curved surface
To determine the surface area of a cylinder

- Imagine the cylinder opened out
- And cut the curved surface along the height
DEFINITION OF A CYLINDER

A RECTANGULAR FIGURE COMPRISING FIGURE TWO CIRCULAR BASES JOINED BY A CURVED HEIGHT IS CALLED A CYLINDER
Surface Area of a Cylinder

Cut along the height curve side

\[ 2\pi r \]
Surface area of a cylinder

$C = \pi d$ or $2\pi r$

Top and bottom are circles with radius $r$

Curved surface is rectangle with length $2\pi r$ and breadth $h$

Curved surface AREA $= 2\pi rh$
Surface area of a cylinder

Area of top and bottom circles = \( \pi r^2 + \pi r^2 = 2\pi r^2 \)

Area of top circle = \( \pi r^2 \)

Area of Bottom circle = \( \pi r^2 \)
Surface area of a cylinder

Area of the rectangle is length x breadth

\[ = 2\pi r \times h \]

\[ = 2\pi rh \]
Surface area of a cylinder

Total surface area

\[= 2\pi rh + 2\pi r^2 = 2\pi r(r+h)\]
The Curved Surface Area of a right circular cylinder of height 14 cm. is 88 cm$^2$. Find the diameter of the base of the cylinder.

**Solution**

Curved Surface Area of a Right Circular Cylinder = 88 cm$^2$

Height (h) = 14 cm

\[2\pi r h = 88\]

\[2 \times \frac{22}{7} \times r \times 14 = 88\]

\[r = \frac{88 \times 7}{2 \times 22 \times 14}\]

\[r = 1 \text{ cm}\]

We know that

Diameter (d) = 2 \times \text{radius}

\[d = 2 \times 1\]

\[d = 2 \text{ cm}\]
EVALUATION

The diameter of the base of a right circular cylinder is 42 cm and area of the curved surface is 1320 cm², Find the height of the cylinder.
HOME WORK

◆ Ques1 (True and False)
◆ Each plane end of a right circular cylinder is called its base.
◆ Total surface area of a right circular cylinder = Curved Surface Area + Area of the base.
◆ The radius of a cylinder is doubled but its lateral surface area is unchanged. Then its height halved.
Ques2 The Lateral Surface Area of a cylinder is 440 cm$^2$, the height of this cylinder is 10 cm, Find the diameter (cm).
Problems based on the surface area of a Right circular cylinder

Exercise-13.2

(Problem No; 2, 3, 4)
Ques 2: It is required to make a closed cylindrical tank of height 1m and base diameter 140 cm from a metal sheet. How many square meters are required for the same?

- Height of a cylindrical tank = 1m
- Diameter = 140 cm
  - $= \frac{140}{100} = 1.4$ m
- Radius = $\frac{1.4}{2} = .7$ m
- Total Surface Area = $2\pi rh(r+h)$
  - $= 2 \times \frac{22}{7} \times .7 \times (1.7)$
  - $= 7.48m^2$
Ques3; A metal pipe is 77 cm long. The inner diameter of a cross section is 4 cm, and outer diameter being 4.4 cm. Find its

1) Inner curved surface area
2) Outer curved surface area
3) Total surface area

*Solu*

- Inner diameter = 4 cm
- Outer diameter = 4.4 cm

1) Inner curved surface area

\[ = 2\pi rh \]
\[ = 2 \times \frac{22}{7} \times 2 \times 77 \]
\[ = 968 \text{ cm}^2 \]

2) Outer curved surface area

\[ = 2 \times \frac{22}{7} \times 2.2 \times 11 \]
\[ = 1064.8 \text{ cm}^2 \]
3) Total surface area = Curved surface area of a Hollow Pipe + Inner curved surface area + Outer curved surface area

= 2\pi(R^2 - r^2) + 968\text{cm}^2 + 1064.8\text{cm}^2

= 2 \times \frac{22}{7}((2.2)^2 - (2)^2) + 968\text{cm}^2 + 1064.8\text{cm}^2

= 5.8\text{cm}^2 + 968\text{cm}^2 + 1064.8\text{cm}^2

= 2038.08\text{cm}^2
The diameter of a roller is 84 cm and its length is 120 cm. It takes 500 revolutions to move once over to level a playground. Find the area of the playground in m².

- **Solu**
- Height (h) = 120 cm
- Diameter = 84 cm
- Curved surface area = \(2\pi rh\)
  
  \[= 2 \times \frac{22}{7} \times 42 \times 120\]
  
  \[= 31680 \text{ cm}^2\]
- Area covered by one revolution = 31680 cm²
- Area covered by 500 revolutions = \((31680 \times 500)/1000\) m²
  
  \[= 1584 \text{ m}^2\]
Evaluation

- The diameter of a garden roller is 2.8 m and it is 1.5 m long. How much area will it cover in 100 revolutions.
HOME WORK

- Ques; Fill in the blank
- Surface Area of a closed cylinder = __________
- Surface Area of a cylinder open at the top = ____
- Surface Area of a cylinder open at both ends = __________
Ques: Find the total surface area of the following cylinders.

<table>
<thead>
<tr>
<th></th>
<th>Radius</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>7 cm</td>
<td>12 cm</td>
</tr>
<tr>
<td>(2)</td>
<td>10 cm</td>
<td>3.5 cm</td>
</tr>
<tr>
<td>(3)</td>
<td>5 cm</td>
<td>1.4 cm</td>
</tr>
</tbody>
</table>
Thank you
Problems based on the surface area of a Right circular cylinder
Exercise-13.2
(Problem No;5-8)
Ques5; A cylinder pillar is 50 cm in diameter and 3.5 m in height. Find the cost of painting the curved surface of the pillar at the rate of Rs 12.50 per m²

- **Solu;** height \((h)\)=3.5 m
- radius \((r)\)=25 cm
- \(r=\frac{25}{100}\) = .25 m
- Curved Surface Area\(=2\pi rh\)
- \(=2\times\frac{22}{7}\times\frac{25}{20}\times\frac{25}{10}\)
- \(=\frac{11}{2}\) m²
- Cost of paint per m²=12.50Rs
- Total cost of painting\(=(1/2)\times12.50\)
- \(=68.75\) Rs.
Ques6; Curved Surface Area of a right circular cylinder is $4.4 \text{m}^2$. If the radius of the base of the cylinder is $0.7 \text{m}$, find its height.

- **Solu**

- Curved Surface Area of a right circular cylinder = $4.4 \text{m}^2$

- $2 \pi r h = 4.4 \text{ m}^2$

- $2 \times (22/7) \times (7/10) \times h = 44/10$

- $h = (44 \times 7 \times 10) / (10 \times 2 \times 22 \times 7)$

- $h = 1 \text{ m}$
Ques 7: The inner diameter of a circular well is 3.5 m. It is 10 m deep. Find
1) Its inner curved surface area
2) The cost of plastering this curved surface at the rate of Rs 40 per m².

- **Solu**
  - Radius (r) of a circular well = \((1/2) \times 3.5\)
  - Height (h) = 10 m
  - Inner curved surface area = \(2\pi rh\)
    
    \[= 2 \times \left(\frac{22}{7}\right) \times \left(\frac{7}{4}\right) \times 10\]
    
    \[= 110 \text{ m}^2\]
  - Total cost of plastering = 10 \times 40
    
    \[= 440 \text{ Rs.}\]
Ques 8: In a hot water heating system, there is a cylindrical pipe of length 28 cm and diameter 5 cm. Find the total radiating surface in the system.

- **Solu:**
  - \( h = 28 \text{ m} \)
  - \( r = \frac{5}{2} \text{ cm} \)
  - \( r = \frac{5}{200} \text{ m} = \frac{1}{40} \text{ m} \)
  - **Total radiating surface area**
    - \( = \text{Curved surface area} \)
    - \( = 2\pi rh \)
    - \( = 2 \times \left(\frac{22}{7}\right) \times \left(\frac{1}{40}\right) \times 28 \text{ m}^2 \)
    - \( = 4.4 \text{ m}^2 \)
Ques; The radii of two cylinder are in the ratio 3:2 and their height are in the ratio 7:4, Calculate the ratio of their curved surface area.
HOME WORK

Ques; The diameter of a roller 1m long is 70 cm. If it takes 200 revolutions to level a playground, find the cost of leveling at the rate of 75 paisa per square meter.
Thank you
Problems based on the surface area of a Right circular cylinder
Exercise-13.2
(Problem No;9-11)
Ques9; Find 1) the Lateral or Curved Surface Area of a closed cylindrical petrol storage tank that is 4.2 m in diameter and 4.5m height
2) how much was actually used, if 1/12 of the steel actually used was wasted in making the tank.

Solu;

Diameter (D) = 4.2 m
Radius (r) = 4.2/2 = 2.1 m
Height (h) = 4.5 m
Curved Surface Area = 2Πrh
\[ = 2 \times \frac{22}{7} \times \frac{22}{10} \times \frac{45}{10} \]
\[ = 59.4 \text{ m}^2 \]

Total Surface Area = 2ΠR^2 + 2Πrh
\[ = 2 \times \frac{22}{7} \times \left( \frac{21}{10} \right)^2 + 59.4 \text{ m}^2 \]
\[ = 27.72 \text{ m}^2 + 59.4 \text{ m}^2 \]
\[ = 87.12 \text{ m}^2 \]
Ques10: In fig. you see the frame of a Lampshade, it is to be covered with a decorative cloth. The frame has a base diameter of 20 cm and height of 30 cm. A margin of 2.5 cm is to be given for folding it over the top and bottom of the frame. Find how much cloth is required for covering the lampshade.

- Let
- Radius \( r = \frac{20}{2} = 10 \text{ CM} \)
- Height \( h = 30 \text{ cm} \)
- Height \( h = (30 + 2.5 + 2.5 \text{ cm}) \)
- Curved Surface \( = 2\pi rh \)
  \( = 2 \times \left(\frac{22}{7}\right) \times 10 \times 35 \)
  \( = 2200 \text{ cm}^2 \)
Ques11; The students of a vidyalaya were asked to participate in a competition for making and decorating penholders in the shapes of a cylinder with a base, using cardboard. Each penholder was to be of radius 3 cm and height 10.5 cm. The vidyala was to supply the competitions with card board. If there were 35 competitors, how much cardboard was required to be bought for the competition.
Solu;

- Radius \((r) = 3\) cm
- Height \((h) = 10.5\) cm
- Cardboard required for one penholder
  \[= \pi r^2 + 2 \pi r h\]
  \[= \pi r (r + 2h)\]
  \[= \left(\frac{22}{7}\right) \times 3(3 + 2 \times 10.5)\]
  \[= \left(\frac{22}{7}\right) \times 3(24)\]
- Cardboard required for 35 competitors
  \[= \left(\frac{22}{7}\right) \times 3(24) \times 35\]
  \[= 7920\) cm\(^2\]
Ques; A circular cylinder has base radius 8 cm and height 35 cm. Find the curved surface area of the cylinder.
HOME WORK

- Ques1; Define cylinder
- Ques2; The curved surface area of a right circular cylinder of height 14 cm is 88 cm². Find the radius of the base of the cylinder.
Thank you
SPHERE

• Surface Area

KUMUD

28-11-2011  160
SPHERE
A sphere is a three dimensional figure (solid figure), which is made up of all points in the space, which lie at a constant distance called the radius, from a fixed point called the centre of the sphere.
GEOMETRICAL REPRESENTATION OF A SPHERE

r is called the radius

O is called the center
A tennis ball is a sphere with a radius of about 2.5 inches.
The shape of the earth is like a large sphere -- it has radius of about 4000 miles.
Foot Ball
Globe
Surface area of a sphere

The sphere has no flat surfaces. It has sets of points that are the same distance from the center.

\( r \) is called the radius

\( O \) is called the center
Surface area of a sphere

To determine the surface area of the sphere
Take a ball and wind a string around the ball in such a way that it completely covered the ball.
Surface area of a sphere

Mark the starting and finishing points on the string,
And slowly unwind the string from the surface of the ball.
Surface area of a sphere

Measure the Diameter (D) of the ball. From which we get its radius.

\[ r = \frac{D}{2} \]

\( r \) is called the radius

\( O \) is called the center
Surface area of a sphere

- Draw four circles with
- radius equal to the
- radius of the ball.
Surface area of a sphere

Unwind the string from the surface of the ball. Start filling the circles one by one with this string...
Surface area of a sphere

We observe that the string which have completely covered the surface area of the sphere, has been used to completely fill the regions of four circles, all of same radius as of the sphere.
Surface area of a sphere

This suggests that the surface area of a sphere of radius $r$ is equal to The four times the area of a circle of radius $r$

Area of circle = $\pi r^2$
Surface area of a sphere

Hence

Surface area of Sphere

$= 4\pi r^2$

$r$ is the radius

Surface area of Sphere $= 4\pi r^2$
Q1. find the surface area of a sphere of radius:
   (i) 10.5 cm    (ii) 5.6 cm    (iii) 14 cm
Assume \(\pi = \frac{22}{7}\), unless stated otherwise.

• Ans.
• (i) Surface area
  • \(= 4 \times \frac{22}{7} \times (10.5)^2\) cm\(^2\)
  • \(= 1386\) cm\(^2\)
• (ii) Surface area
  • \(= 4 \times \frac{22}{7} \times 5.6 \times 5.6\) cm\(^2\)
  • \(= 394.24\) cm\(^2\)
• (iii) Surface area
  • \(= 4 \times \frac{22}{7} \times 14 \times 14\) cm\(^2\)
  • \(= 2464\) cm\(^2\)
Q 2. Find the surface area of a sphere of diameter:
   (i) 14 cm  (ii) 21 cm  (iii) 3.5 cm

Ans. (i) \( r = 7 \text{ cm} \)
    Surface area = \( 4 \times \frac{22}{7} \times 7 \times 7 \text{ cm}^2 \)
    = 616 cm\(^2\)

(ii) \( r = 10.5 \text{ cm}^2 \)
    As in 1 (i),
    Surface area = 1386 cm\(^2\)

(iii) \( r = \frac{35}{20} \text{ m} \)
    = \( \frac{7}{4} \text{ m} \)
    Surface area = \( 4 \times \frac{22}{7} \times \frac{7}{4} \times \frac{7}{4} \text{ m}^2 \)
    = 38.5 cm\(^2\)
Q 4. The radius of a spherical balloon increases from 7 cm to 14 cm as air is being pumped into it. Find the ratio of surface areas of the balloon in the two cases.

Ans.

Ratio of two surface areas

\[
\frac{4 \pi (7)^2}{4 \pi (14)^2} = \frac{1}{4},
\]

Ratio of two surface areas = 1:4.
EVALUATION

»Ques:

• Find the surface area of a sphere of radius 2.1 cm.
Home Work

• Ques:( True / False)
• 1) If you know the diameter of a sphere, you can find its surface area.
• 2) A sphere with centre ‘o’ and radius ‘r’ is the figure (in shape) consisting of all points.
• 3) The radius of a sphere is the longest segment possible inside the sphere.
• 4) Surface Area of a sphere is the sum of the five times the area of the circle having same radius.
Total Surface Area of a Hemisphere
Take a solid sphere, and slice it exactly “through the middle“ with a plane that passes through its centre.
It gets divided in two equal parts

‘Hemi’ means half

Each equal part is called a hemisphere

A hemisphere is half of a sphere
Total Surface Area of a Hemisphere

- A Hemisphere has a total 2 surfaces:
  - A Flat Base circular in shape with radius $r$
  - A curved surface
Total Surface Area of a Hemisphere

• Add Areas of the
  • Base (Flat) and
  • curved surface.
Total Surface Area of a Hemisphere

- Total Surface area =
  - Area of Base +
  - Area of curved surface
Curved Surface Area of a Hemisphere

The curved surface area of a hemisphere

= half the surface area of a sphere

= \frac{1}{2}(\text{surface area of a sphere})

= \frac{1}{2}(4\pi r^2)

= 2\pi r^2

where \( r \) is the radius of a sphere of which hemisphere is the part
Total Surface Area of a Hemisphere

- The Total surface area of a hemisphere
  
  $= \text{Area of Base} + \text{Area of Curved surface}$
  
  $= \pi r^2 + 2\pi r^2$
  
  $= 3\pi r^2$

where $r$ is the radius of a sphere of which hemisphere is the part

Total Surface Area of a Hemisphere $= 3\pi r^2$
Q 3. Find the total surface area of a hemisphere of radius 10 cm.
(Use \( \pi = 3.14 \))

Ans.
Surface area of hemisphere

\[
= 3 \pi r^2
\]

\[
= 3 \times 3.14 \times (10)^2 \text{ cm}^2
\]

\[
= 942 \text{ cm}^2
\]
Q 5. A hemispherical bowl made of brass has inner diameter 10.5 cm. Find the cost of tin-plating it on the inside at the rate of Rs. 16 per 100 $4 \text{ cm}^2$.

Ans. Inner surface area of the bowl = 
$$2 \times \frac{22}{7} \times 5.25 \times 5.25 \text{ cm}^2$$

Cost of tin-plating
$$= \text{Rs. } \frac{16}{100} \times 2 \times \frac{22}{7} \times \frac{525}{100} \times \frac{525}{100}$$
$$= \text{Rs. } \frac{2 \times 22 \times 63}{100}$$
$$= \text{Rs. } 27.72$$
EVALUATION

• Ques:
• A dome of building is in the form of a hemisphere. Its radius is 6.3 m. Find the cost of painting it at the rate of Rs. 12 per $m^2$. 
HOME WORK

• Ques1:
• Fill in the blanks:
• 1) Half of a sphere is called a _____.
• 2) Half of a diameter is _____.
• 3) If ‘r’ is the radius of the sphere then surface area of the sphere ____.
• Ques2: The curved surface area of a sphere is 616 sq cm, find the radius of a hemisphere.
Total Surface Area of a Hemisphere
• Problem based on the formula of surface area of a sphere
• Ques😊( 6,7,9)
Q 6. Find the radius of a sphere whose surface area is 154 cm$^2$

Ans. $4 \pi r^2 = 154$

\[ 4 \times \frac{22}{7} \times r^2 = 154 \]

\[ r^2 = \frac{7 \times 7}{4} \]

\[ r = \frac{7}{2} \text{ cm}, \]

i.e.,

\[ r = 3.5 \text{ cm} \]
Q 7. The diameter of the moon is approximately one fourth of the diameter of the earth. Find the ratio of their surface areas.

Ans. diameter of moon = 2 r
and
diameter of earth = 2 R

Given that,

\[ 2 r = \left(\frac{1}{4}\right)2 R, \]
i.e., \( R = 4 r \) (\( R \) is the radius of earth and \( r \) is the radius of moon)

\[
\text{Ratio of the surface area of moon and earth} = \frac{4\pi r^2}{4\pi R^2} = \frac{r^2}{16r^2} = \frac{1}{16}
\]

Thus, the required ratio is 1 : 16.
Q 8. A hemispherical bowl is made of steel, 0.25 cm thick. The inner radius of the bowl is 5 cm. Find the other curved surface area of the bowl.

Ans.

\[ r = 5 \text{ cm}, \]

Thickness of steel sheet = 0.25 cm

\[ R = 5 \text{ cm} + 0.25 \text{ cm} = 5.25 \text{ cm} \]

Outer curved surface area of the bowl = \(2 \pi R^2\)

\[ = 2 \times \left( \frac{22}{7} \right) \times \left( \frac{525}{100} \right) \times \left( \frac{525}{100} \right) \text{cm}^2 \]

\[ = 173.25 \text{ cm}^2 \]
Q9: A right circular cylinder just encloses a sphere of radius $r$ see fig.

Find
(i) surface area of the sphere,
(ii) curved surface area of the cylinder,
(iii) ratio of the areas obtained in (i) and (ii).
Ans.9  (i) Radius of the sphere = $r$

Then, surface area of the sphere = $4 \pi r^2$.

(ii) Radius of the cylinder = $r$,
Height of the cylinder = $2r$

Curved surface area of the cylinder

$$= 2 \pi \times \text{(Radius)} \times \text{(Height)}$$
$$= 2 \pi \times r \times 2r = 4 \pi r^2$$

(iii) Required ratio = $4 \pi r^2 / 4 \pi r^2 = 1/1$,
i.e. the ratio is 1:1.
EVALUATION

• Ques:
• The surface area of a sphere is 452.16 cm². Find the radius of the sphere. (Take = 3.14)
HOME WORK

• Ques: A solid hemisphere of radius 11 cm. Find its
• (1) curved surface area

• (2) Total surface area.
THANK YOU
cube
volume
by
kumud

3-12-2009
Volume of cube
Volume of a cube

We already know that there are 9 cubes on the bottom level and all (3) levels contain the exact number of cubes.

Volume of a cube

= Total number of unit cubes in bigger cube

Total number of unit cubes in bigger cube

= cubes on the bottom level x levels contains the exact number of cubes.

=( 9)x3

=(3x3)x3

=27
Volume of a cube

Volume of a cube

= (cube’ length x cube’ width) X cube’ height

=a x a x a

=a^3

Volume of a cube = edge x edge x edge
EVALUATION

Ques: True /False

1) The longer cube occupies less space.

2) A cube has six faces which are all rectangle.

3) Cubic units is a standard measure of volume.

4) When all the sides of cuboids are equal in length, it is called cylinder.
HOME WORK

Ques:

Derive the formula for finding the volume of a cube.
THANK YOU
Problem based on the volume of a cube

Exercise - 13.5

Ques: 8
8. A solid cube of side 12 cm is cut into eight cubes of equal volume. What will be the side of the new cube? Also, find the ratio between their surface areas.

Ans. Let the side of the new cube be a cm.

Then $8X{a}^3 = {12}^3$

$\rightarrow a^3 = 12X12X12/8$

$\rightarrow a^3 = (6)^3$

$\rightarrow a = 6$

Hence, the length of the side of the new cube is 6 cm.

Required ratio $= 6(6)^2/ 6(12)^2$

$= 1/4 = 1:4$
Ques: Find the volumes of the cubes with edges

(a) 5 cm
(b) 3.6 cm
HOME WORK

Ques:
Find the edges of a cube whose volume
(1) 3375 cu cm
(2) 2.197 cu m
(3) 15.625 cu cm
Problem based on the volume of a cube

Exercise - 13.5

(Special Problem)
Ques: Find the edge of the cube whose volume is 5832 cm$^3$.

- **Volume of the cube**: 5832 cm$^3$
- **Let the edge of a cube = a**
- $a^3 = 5835$
- $a^3 = 18 \times 18 \times 18$
- $a = 18$ cm
Ques : Find the edge of the cube whose volume is 79507 cm³.
Home work

Ques:
If the surface area of cube is 864 cm$^2$, find the volume of the cube.
THANK YOU
CUBOIDS

volume

BY

KUMUD

7-12-2009
The volume of a solid body is the amount of “space” it occupies.

The volume has units of length cubed.

Capacity of the an object is the volume of substance its interior can accommodate.

We measure the volume as cubic units. i.e. cubic inches, cubic feet, cubic meter etc.
VOLUME OF A CUBOIDS
in this cuboids if we take

- length as ‘l’
- Breadth as ‘b’
- Height as ‘h’
To understand volume of a cuboids let us start by filling the bottom of the cuboids with a rectangle of length $l$ and breadth $b$ so that

\[
\text{Area of rectangle} \ 'A' = l \times b
\]
Stack rectangles on top of each other until the cuboids is completely filled as shown in the figure.

The height up to which rectangles are stacked is ‘h’
Let us take the volume of the cuboids is $V$

We know that:

The volume of a cuboids is the amount of “space” it occupies.
So that:

The volume of a cuboids = Measure of the “space” occupied by the cuboids. = The area of the plane region occupied by each rectangle x height.

$V = A \times h$
$V = (l \times b) \times h$
$V = l \times b \times h$
Volume of a cuboids = length x breadth x height

l, b, h are respectively the 3 edges of the cuboid
Q 1. A matchbox measures 4 cm X 2.5 cm X 1.5 cm. What will be the volume of a packet containing 12 such boxes?

Ans. Volume of a packet containing 1 matchbox

\[ \text{Volume of a packet containing 1 matchbox} = \text{length} \times \text{breadth} \times \text{height} \]

\[ = 4 \times 2.5 \times 1.5 \text{ cm}^3 \]

Volume of a packet containing 12 matchboxes

\[ = 12 \times (4 \times 2.5 \times 1.5) \text{ cm}^3 \]

\[ = 180 \text{ cm}^3 \]
Q 2. A cuboidal water tank is 6 m long, 5 m wide and 4.5 m deep. How many liters of water can it hold?

\[(1 \text{ m}^3 = 1000 \text{ l}).\]

Ans. Capacity of water tank = \[6 \times 5 \times 4.5 \text{ m}^3\]

\[= 6 \times 5 \times 4.5 \times 1000 \text{ liters}\]

\[= 135000 \text{ liters}\]
Ques:
A match box measures 6cm x 2 cm x 1.5 cm.
What will be the volume of a packet containing 10 such boxes.
Ques:
The areas of three adjacent faces of a cuboid are $a$, $b$ and $c$. If its volume is $V$, prove that $V^2 = abc$.
thank you
- Problem based on the volume of cuboid
- Exercise ----13.5
- (Ques 3,4,5)
Q 3. A cuboidal vessel is 10 m long and 8 m wide. How high must it be made to hold 380 cubic metres of a liquid?

- **Ans.**
- **Height (h)**
  - \[ h = \frac{\text{Volume}}{l \times b} \]
  - \[ h = \frac{380}{10 \times 8} \text{ m} \]
  - \[ = 4.75 \text{ m} \]
Q 4. Find the cost of digging a cuboidal pit 8 m long, 6 m broad and 3 m deep at the rate of Rs. 30 per m$^3$.

Ans. Internal space of the pit = $(8 \times 6 \times 3)$ m$^3$

cost of digging a cuboidal pit = Rs$(30 \times 8 \times 6 \times 3)$

= Rs. 4320
Q 5. The capacity of a cuboidal tank is 5000 liters of water. Find the breadth of the tank, if its length and depth are respectively 2.5 m and 10 m.

Ans. Capacity of tank = 50000 liters

\[ \text{Capacity of tank} = \frac{50000}{1000} \text{ m}^3 \]

\[ = 50 \text{ m}^3 \]

Breadth of the tank =

\[ \frac{\text{Capacity of tank}}{l \times h} \]

\[ = \frac{50}{(2.5 \times 10)} \text{ m} \]

i.e., Breadth of the tank = 2 m
Ques:

A cuboidal beam is 8 meters long, 50 cm broad and 20 cm thick. What will its cost of Rs. 7000 per cubic meter be?
HOME WORK

Ques:

A field is 600 m long and 50 m broad. A tank 30 m long, 20 m broad and 12 m deep is dug in the field. The earth taken out of it is spread evenly over the field. Find the height of the field raised by it.
thank you
Problem based on the volume of cuboid
Exercise ----13.5
( Ques 6,7,8,9)
Q 6. A village, having a population of 4000, requires 150 liters of water per head per day. It has a tank measuring 20 m X 1.25 m X 6 m that can be stored in the godown. For how many days will the water of this tank last.

Ans. Quantity of water per day = 4000X150 liters

Capacity of tank = 20X15X6 m³
= 1800 m³
= 1800X1000 liters
= 1800000 liters

Number of days = 1800000/4000X150
= 180/4X15 = 3

Water tank can serve for 3 days
Q 7. A godown measures 60 m X 25 m X 10 m. Find the maximum number of wooden crates each measuring 1.5 m X 1.25 m X 0.5 m that can be stored in the godown.

Solu

Maximum number of wooden crates = 
Capacity of the godown / Volume of one wood crate

= \frac{60 \times 25 \times 10}{1.5 \times 1.25 \times 0.5}

= \frac{15000 \times 16}{15}

= 16000
Q 8. A solid cube of side 12 cm is cut into eight cubes of equal volume. What will be the side of the new cube? Also, find the ratio between their surface areas.

Ans. Let the side of the new cube be ‘a’ cm.

\[
\begin{align*}
\text{Then } 8 \times a^3 &= 12^3 \\
a^3 &= \frac{12 \times 12 \times 12}{8} \\
\rightarrow a^3 &= 6^3 \\
\rightarrow a &= 6
\end{align*}
\]

Hence, the length of the side of the new cube is 6 cm.
Q 9. A river 3 m deep and 40 m wide is flowing at the rate of 2 km per hour. How much water will fall into the sea in a minute?

Ans. Water flowing in one minute

\[ = \frac{2000}{(60 \times 40 \times 3)} \text{ m}^3 \]

\[ = 4000 \text{ m}^3 \]
EVALUATION

- Ques:
  - A tank contains 60,000 cubic meters of water. If length and breadth are 50 m and 40 m respectively, find its depth.
HOME WORK

Ques:
A closed wooden box measures externally as 42 cm by 32 cm by 27 cm. The wood used is 1 cm thick. Find the internal capacity (Volume) of the box.

Ques:
A river 10 meters deep and 100 meters wide is flowing at the rate of 4.5 m per hour. Find how many cubic meter of water runs into the sea per second
THANK YOU
The volume of a solid body is the amount of “space” it occupies.

The volume has units of length cubed.

We measure the volume as cubic units. i.e. cubic inches, cubic feet, cubic meter etc.
VOLUME OF CYLINDER
in this cylinder if
we take
Radius as ‘r’
Height as ‘h’
in this cylinder if we take Radius as ‘r’ Height as ‘h’
To understand volume of a cylinder let us start by filling the bottom of the cylinder with a circle of radius $r$.

Area of a circle ‘$A$’ = $\pi r^2$
Stack circles on top of each other until the cylinder is completely filled as shown in the figure.

The height up to which circles are stacked is ‘\( h \)’
We know that: The volume of a cylinder is the amount of "space" it occupies.

Let us take the volume of the cylinder as $V$. 
So that:
The volume of a cylinder = Measure of the “space” occupied by the cylinder.

\[ V = A \times h \]

\[ V = (\pi r^2) \times h \]

\[ V = \pi r^2 h \]

= The area of the plane region occupied by each circle \( \times \) height.
Volume of cylinder = Base Area $\times$ height = $\pi r^2 h$

$r, h$ are respectively the radius and height of the cylinder.
Volume of cylinder = Base Area x height = πr²h

r, h are respectively the radius and height of the cylinder
$V = \pi r^2 h$

Where $r, h$ are the radius and height of a cylinder respectively.
Q 1. The circumference of the base of a cylindrical vessel is 132 cm and its height is 25 cm. How many liters of water can it hold? (1000 cm$^3 = 1$)

- Ans. $H = 25$ cm
- $2 \pi r = 132$
- $\rightarrow 2 \times \frac{22}{7} \times r = 132$
- $\rightarrow r = 21$ cm

- Capacity of the cylindrical vessel $= \pi r^2 \times h$

- $= \frac{22}{7} \times 21 \times 21 \times 25$ cm$^2$
- $= 22 \times 3 \times 21 \times 25/1000$ liters
- $= 34.65$ liters
EVALUATION

- Ques:
- A water storage tank has a cylindrical shape. If it is 2.1 m high and has a diameter 1 m, find its volume.
HOME WORK

- Ques:
  - Find the volume of the cylinder whose radius is 7 cm and height is 12 cm.

- Ques:
  - Area of the base of a right circular cylinder is 154 sq cm. and height is 10 cm.
  - Calculate the Volume of the cylinder.
THANK YOU
- Problems based on the Volume of a cylinder
- Exercise 13.6
- (Ques 2,3,4)
2. The inner diameter of a cylindrical wooden pipe is 24 cm and its outer diameter is 28 cm. The length of the pipe is 35 cm. Find the mass of the pipe, if 1 cm³ of wood has a mass of 0.6 g.

- Ans. \( r = 12 \text{ cm}, \)
- \( R = 14 \text{ cm}, h = 35 \text{ cm} \)
- Volume of wood = \( \pi (R^2 - r^2) \times h \)
- \[ = \frac{22}{7} \{196-144\} \times 35 \text{ cm}^3 \]
- \[ = 22 \times 5 \times 52 \text{ cm}^3 \]
- \[ = 5720 \text{ cm}^3 \]
- Mass = 5720 \( \times 0.6 \text{ g} \)
- \[ = 3432 \text{ g} \]
- \[ = 3.432 \text{ kg} \]
Q 3. A soft drink is available in two packs – (i) a tin can with a rectangular base of length 5 cm and width 4 cm, having a height of 15 cm and (ii) a plastic cylinder with circular base of diameter 7 cm and height 10 cm. Which container has greater capacity and by how much?

Ans. $V_1 = 5 \times 4 \times 15 \text{ cm}^3$

$= 300 \text{ cm}^3$

$V_2 = \left(\frac{22}{7}\right) \times \left(\frac{7}{2}\right)^2 \times 10 \text{ cm}^3$

$= 385 \text{ cm}^3$

$V_2 > V_1$, i.e. the cylinder has 85 cm$^3$ greater capacity.
Q 4. The lateral surface of a cylinder is 94.2 cm$^2$ and its height is 5 cm, then find

(i) radius of its base  (ii) its volume (Use $\pi = 3.14$)

Ans.  (i) $2 \pi r \times h = 94.2$
→ $2 \times (3.14) \times r \times 5 = 94.2$
→ $r = 94.2/31.4 = 3 \text{ cm}$

(ii) Volume $= 3.14 \times (3)^2 \times 5 \text{ cm}^3$
→ $= 15.7 \times 9 \text{ cm}^3$
→ $= 141.3 \text{ cm}^3$
Ques:

A hollow cylindrical pipe is 21 dm long. Its outer and inner diameter are 10 cm and 6 cm respectively. Find the Volume of the copper vessel in making the pipe.
HOME WORK

Ques:
A curved surface of a cylinder piller is 264 cm² and its Volme is 92.4 m³, find the diameter of the piller.

Ques:
The capacity of a cylinder tank is 18.48cm³
And diameter of its base is 14 cm. Find the depth of the tank.
Problems based on the Volume of a cylinder

Exercise 13.6

(Ques5,6 )
If costs Rs. 2200 to paint the inner curved surface of a cylindrical vessel 10 m deep. If the cost of painting is at the rate of Rs. 20 per m², find

(i) inner curved surface area of the vessel,
(ii) radius of the base,
(iii) capacity of the vessel.

(i)
\[ h = 10 \text{ m} \]

Inner curved surface area = \[ \frac{2200}{20} \text{ m}^2 \]
= 110 m²

(ii) \[ 2\pi r h = 110 \]
→ \[ 2 \times \frac{22}{7} \times r \times 10 = 110 \]
→ \[ r = \frac{7}{4} \]
= 1.75 m
Q. 5 If costs Rs. 2200 to paint the inner curved surface of a cylindrical vessel 10 m deep. If the cost of painting is at the rate of Rs. 20 per m$^2$, find

(i) inner curved surface area of the vessel,
(ii) radius of the base,
(iii) capacity of the vessel.

(iii) Capacity = $\pi r^2 \times h = \frac{22}{7} \times \left(\frac{7}{4}\right)^2 \times 10 \ m^3$

= 96.25 m$^3$

= 96.25 kl
Q 6. The capacity of a closed cylindrical vessel of height 1 m is 15.4 liters. How many square meters of metal sheet would be needed to make it?

Ans. $h = 1 \text{ m} = 100 \text{ cm}$

Capacity = 15.4 liters

$= 15.4 \times 1000 \text{ cm}^3$

$= 15400 \text{ cm}^3$

$\pi r^2 \times h = 15400$

$\frac{22}{7} \times r^2 \times 100 = 15400$

$r^2 = (7)^2$

$r = 7 \text{ cm}$
The cost of painting the total outside surface of a closed cylindrical oil tank at 60 paise per sq. dm is Rs.237.60. The height of the tank is 6 times the radius of the base of the tank. Find the Volume correct to two decimal places.
HOME WORK

- Ques:
  - The radius and height of a cylinder are in the ratio 5:7 and its Volume is 550 cm³, find its radius.

- Ques:
  - The area of the curved surface of a cylinder is 1210 cm² and its radius is 10 cm. Find its height and hence its Volume.
- Problems based on the Volume of a cylinder
- Exercise 13.6
- (Ques7,8 )
Q 7. A lead pencil consists of a cylinder of wood with a solid cylinder of graphic filled in the interior. The diameter of the pencil is 7 mm and the diameter of the graphite is 1 mm. If the length of the pencil is 14 cm, find the volume of the wood and that of the graphite.

Ans. Volume of Graphite = \( \pi \times (1/20)^2 \times 14 \) cm\(^3\)

\[
= \frac{22}{7} \times 14 \left[\frac{49}{400} - \frac{1}{400}\right] \text{ cm}^3
= 0.11 \text{ cm}^3
\]

Volume of wood = \( \pi \times (7/20)^2 \times 14 - \pi \times (1/20)^2 \times 14 \) cm\(^3\)

\[
= \frac{22}{7} \times 14 \left[\frac{49}{400} - \frac{1}{400}\right] \text{ cm}^3
= 44 \times \frac{48}{400} \text{ cm}^3 = 5.28 \text{ cm}^3
\]
Q 8. A patient in a hospital is given soup daily in a cylindrical bowl of diameter 7 cm. If the bowl is filled with soup to a height of 4 cm, how much soup the hospital has to prepare daily to serve 250 patients?

Ans. \( r = \frac{7}{2} \text{ cm, } h = 4 \text{ cm} \)

Capacity of one bowl = \(
\frac{22}{7} \left( \frac{7}{2} \right)^2 \times 4 \text{ cm}^3
\)
\[ = 154 \text{ cm}^3 \]

Soup required for 250 patients = \( 250 \times 154 \text{ cm}^3 \)
\[ = 38500 \text{ cm}^3 \]
\[ = \frac{38500}{1000} \text{ liters} \]
\[ = 38.5 \text{ liters} \]
EVALUATION

Ques:

A patient in a hospital is given soup in a cylindrical bowl of diameter 14 cm. If the bowl is filled with soup to a height of 8 cm; how much soup the hospital has to prepare daily to serve 500 patients.
HOME WORK

- The Volume of a vessel in the form of right circular cylinder is $48\pi$ cm$^3$ and height is 7 cm. Find the radius of its base. Also find the curved surface area and toral surface area.
THANK YOU
volume of a right circular cone
Volume of a right circular cone

The formula for the volume of a cone can be determined from the volume formula for a cylinder.
Take a cylinder and a cone having the equal heights (h) and radii (r) (as in diagram)
Take a cylinder and a cone having the equal heights \( (h) \) and radii \( (r) \) (as in diagram)
empty it into the cylinder

It fills up only a part of the cylinder as shown in figure

Fill the cone up to the brim with sand once
When the cone is filled up for the third time, and emptied into the cylinder, it can be seen that the cylinder is also full to the brim. (as shown in figure)
We conclude that three times the volume of a cone, makes up the volume of a cylinder, having the same base radius and the same height as the cone.

$$3\text{ (volume of a cone)} = \text{volume of a cylinder}$$

$$\text{volume of a cone} = \frac{\text{volume of a cylinder}}{3}$$

$$\text{Volume of a cone} = \pi r^2 h / 3$$

Where $r$ is the base radius and $h$ is the height of the cone.
We conclude that three times the volume of a cone, makes up the volume of a cylinder, having the same base radius and the same height as the cone.

$$3(\text{volume of a cone}) = \text{volume of a cylinder}$$

$$\text{volume of a cone} = \frac{\text{volume of a cylinder}}{3}$$

**Volume of a cone** = $$\frac{\pi r^2 h}{3}$$

Where $r$ is the base radius and $h$ is the height of the cone.
Assume \( \pi = \frac{22}{7} \), unless stated otherwise.

Q 1: Find the volume of the right circular cone with
(i) radius 6 cm, height 7 cm
(ii) radius 3.5 cm, height 12 cm

Ans

(i) \( r = 6 \text{ cm}, \ h = 7 \text{ cm} \)

Volume = \( \frac{1}{3} \times \frac{22}{7} \times 6^2 \times 7 \text{ cm}^3 \)

= 264 \text{ cm}^3

(ii) \( r = \frac{7}{2} \text{ cm}, \ h = 12 \text{ cm} \)

Volume = \( \frac{1}{3} \times \frac{22}{7} \times \left(\frac{7}{2}\right)^2 \times 12 \text{ cm}^3 \)

= 154 \text{ cm}^3
Q 2. Find the capacity in liters of a conical vessel with
(i) radius 7 cm, slant height 25 cm
(ii) radius 12 cm, slant height 13 cm

Ans. (i) $r = 7 \text{ cm}, \ l = 25 \text{ cm}$

$$h^2 = l^2 - r^2$$

$$= 625 - 49$$

$$= 576$$

$\rightarrow$ $h = 24 \text{ cm}$

Capacity $= \frac{1}{3} \times \frac{22}{7} \times (7)^2 \times \frac{24}{cm^3}$

$$= 22 \times 7 \times 8/1000 = \text{ liters}$$

$$= 1.232 \text{ liters}$$
Ans. (ii) \( h = 12 \) cm, \( l = 13 \) cm

\[
r^2 = l^2 - h^2
\]

\[
= 169 - 144 = 25
\]

\[\rightarrow r = 5 \text{ cm}\]

Capacity = \( \frac{1}{3} \times \frac{22}{7} \times (5)^2 \times 12 \) cm\(^3\)

\[
= 22 \times \frac{100}{7} \text{ cm}^3
\]

\[
= 22 \times \frac{100}{7} \times 1000 \text{ liters}
\]

\[
= \frac{11}{35} \text{ liters}
\]
EVALUATION

Ques: The radius and height of a right circular cone are 3 cm and 7 cm respectively, find the volume of a right circular cone.
HOME WORK

- Ques: The radius and height of a right circular cone are 3 cm and 7 cm respectively, find the volume of a right circular cone.

- Ques: Find the capacity in litres of a conica; vessel with radius 7 cm, slant height 25 cm.
Problem based on the volume of a right circular cone

Exercise 13.7

(Ques : 3,4,5)
Q 3. The height of a cone is 15 cm. If its volume is 1570 cm$^3$, find the radius of the base. (Use π = 3.14)

Ans  \[ h = 15 \text{ cm} \]

Volume = 1570 cm$^3$

\[
\frac{1}{3} \pi r^2 h = 1570
\]

\[
\frac{1}{3} \times (3.14) \times r^2 \times 15 = 1570 \rightarrow r^2 = \frac{1570}{15.70} \]

= 100

\[ r = 10 \text{ cm} \]
Q 4. If the volume of a right circular cone of height 9 cm is $48 \pi \text{ cm}^3$, find the diameter of its base.

Ans.

$h = 9 \text{ cm}$,

Volume $= 48 \pi \text{ cm}^3$

$$\frac{1}{3}( \pi r^2 \times h ) = 48 \pi$$

$\rightarrow$ $(1/3) r^2 \times 9 = 48$

$\rightarrow$ $r^2 = 16$

$\rightarrow$ $r = 4 \text{ cm}$

Diameter $= 2r = 2 \times 4$

$= 8 \text{ cm}$
Q 5. A conical pit of top diameter 3.5 m is 12 m deep. What is its capacity in kiloliters?

Ans.

\[ r = \frac{7}{4} \text{ m} \]
\[ h = 12 \text{ m} \]

Capacity = \[\frac{1}{3} \times \frac{22}{7} \times \left(\frac{7}{4}\right)^2 \times 12 \text{ m}^3\]

\[= \frac{1}{3} \times \frac{22}{7} \times \frac{49}{16} \times 12 \text{ m}^3\]

\[= 11 \times \frac{7}{2} \text{ m}^3\]

\[= 38.5 \text{ m}^3\]

\[= 38.5 \text{ kl.}\]
Ques:

A conical tent has the area of its base as 154 cm² and that of its curved surface as 550 m². Find the volume of the tent.
Ques:
The base radii of two right circular cones of the same height are in the ratio 3:5. Find the ratio of their volumes.
Problem based on the volume of a right circular cone

Exercise 13.7

(Ques : 6,7,8, 9)
Q 6. The volume of a right circular cone is 9856 cm$^3$. If the diameter of the base is 28 cm, find

(i) height of the cone

(ii) slant height of the cone

(iii) curved surface area of the cone.

Ans. (i) Volume = 9856 cm$^3$,

$r = 14$ cm

$\frac{1}{3} \times \left(\frac{22}{7}\right) \times (14)^2 \times h = 9856$

$h = \frac{9856 \times 3}{22 \times 28}$

$h = 48$ cm
Q 6. The volume of a right circular cone is 9856 cm$^3$. If the diameter of the base is 28 cm, find

(i) height of the cone

(ii) slant height of the cone

(iii) curved surface area of the cone.

\[ l^2 = h^2 + r^2 = (48)^2 + (14)^2 \]

\[ = 2500 \]

\[ \rightarrow l = 50 \text{ cm} \]

(iii) Curved surface area

\[ = \frac{22}{7} \times 14 \times 50 \text{ cm}^3 \]

\[ = 2200 \text{ cm}^3 \]
Q 7. A right triangle ABC with sides 5 cm, 12 cm and 13 cm is revolved about the side 12 cm. Find the volume of the solid so obtained.

Ans.

\[ r = 5 \text{ cm}, \]
\[ h = 12 \text{ cm}, \]
\[ l = 13 \text{ cm} \]

Volume of solid cone =

\[ \frac{1}{3} \pi r^2 \times h \]
\[ \frac{1}{3} \pi \times (5)^2 \times 12 \text{ cm}^3 \]
\[ = 100 \pi \text{ cm}^3 \]
Q 8. If the triangle ABC in the Question 7 above is revolved about the side 5 cm, then find the volume of the solid so obtained. Find also the ratio of the volumes of the two solids obtained in Question 7 and 8.

Ans.

\[ r = 12 \text{ cm}, \]
\[ h = 5 \text{ cm}, \]
\[ l = 13 \text{ cm} \]

Volume \[ = \frac{1}{3} \pi \times (12)^2 \times 5 \text{ cm}^3 \]
\[ = 240 \pi \text{ cm}^3 \]

Required ratio \[ = \frac{100 \pi}{240 \pi} \]
\[ = \frac{5}{12}, \]
i.e., 5:12
Q 9. A heap of wheat is in the form of a cone whose diameter is 10.5 m and height is 3 m. Find its volume. The heap is to be covered by canvas to protect it from rain. Find the area of the canvas required.

Ans. \( r = 5.25 \text{ m}, \)
\( h = 3 \text{ m} \)

Volume = \( \frac{1}{3} \times \frac{22}{7} \times 5.25 \times 5.25 \times 3 \text{ m}^3 = \frac{22}{7} \times 21/4 \times 21/4 \text{ m}^3 = 86.625 \text{ m}^3 \)

Area of canvas = \( \pi \times r \times l = \frac{22}{7} \times 21/4 \text{ m}^2 \)
\( = \frac{33}{2} \times 6.046 \text{ m}^2 = 33 \times 3.023 \text{ m}^2 \)

\( = 99.759 \text{ m}^2 \)
A heap of wheat is in the form of a cone whose diameter is 21 m and height is 6 cm. Find its volume. The heap is to be covered by canvas to protect it from rain. Find the area of the canvas required.
HOME WORK

Ques: A right triangle ABC with sides 3 cm, 4 cm and 5 cm is revolved round the side 4 cm.

Find the volume of the solid so obtained.

Ques: If the triangle ABC in the part (a) above is revolved about the side 3 cm, then find the volume of the solid so obtained. Also find the ratio of the volumes of the two solids obtained in parts (a) and (b).
THANK YOU