

Class 8 Mensuration Worksheet

By Thinking Juggernaut

Class: 8th Standard

Subject: Mathematics

Total Questions: 24

Total Marks: 24

🎯 Understanding Mensuration

What is Mensuration?

Mensuration is the branch of mathematics that deals with the measurement of geometric figures - their length, area, volume, and surface area. It helps us calculate the space occupied by 2D and 3D objects.

Key Formulas for 3D Shapes:

1. CUBOID (Rectangular Box):

- Volume = length × breadth × height = $l \times b \times h$
- Total Surface Area (TSA) = $2(lb + bh + hl)$
- Lateral Surface Area (LSA) = $2h(l + b)$

2. CUBE:

- Volume = side³ = a^3
- Total Surface Area = $6a^2$
- Lateral Surface Area = $4a^2$

3. CYLINDER:

- Volume = $\pi r^2 h$
- Curved Surface Area = $2\pi r h$
- Total Surface Area = $2\pi r(r + h)$

4. CONE:

- Volume = $\frac{1}{3}\pi r^2 h$
- Curved Surface Area = $\pi r l$ (where l = slant height)
- Total Surface Area = $\pi r(r + l)$
- Slant Height: $l = \sqrt{r^2 + h^2}$

5. SPHERE:

- Volume = $4/3 \pi r^3$
- Surface Area = $4\pi r^2$

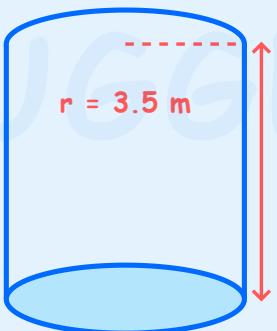
6. HEMISPHERE:

- Volume = $2/3 \pi r^3$
- Curved Surface Area = $2\pi r^2$
- Total Surface Area = $3\pi r^2$

Important Note: Use $\pi = 22/7$ or $\pi = 3.14$ as specified in the problem.

Sample Problem with Visual Explanation

Problem: A cylindrical water tank has a radius of 3.5 m and height of 6 m. Find the volume of water it can hold and the curved surface area. (Use $\pi = 22/7$)



SOLUTION

Given:

- Radius (r) = 3.5 m
- Height (h) = 6 m
- $\pi = 22/7$

Step 1: Volume

$$\begin{aligned} V &= \pi r^2 h \\ V &= 22/7 \times 3.5 \times 3.5 \times 6 \\ V &= 22/7 \times 12.25 \times 6 \\ V &= 231 \text{ m}^3 \end{aligned}$$

Step 2: Curved Surface Area

$$\begin{aligned} CSA &= 2\pi r h \\ CSA &= 2 \times 22/7 \times 3.5 \times 6 \\ CSA &= 132 \text{ m}^2 \end{aligned}$$

Understanding the Problem:

- A cylinder has two circular bases (top and bottom) and a curved surface
- Volume tells us how much water it can hold (in cubic meters)
- Curved surface area is the area of the side wall (useful for painting, etc.)
- Always write units: m^2 for area, m^3 for volume

Part A: Warm-up Practice

★ Easy Level - 8 Questions

Q1. Find the volume of a cube with side 5 cm.

Q2. A cuboid has dimensions: length = 8 cm, breadth = 6 cm, height = 4 cm. Find its volume.

Q3. The radius of a sphere is 7 cm. Find its surface area. (Use $\pi = 22/7$)

Q4. Find the lateral surface area of a cube with edge 10 cm.

Q5. Fill in the blank: The volume of a cylinder = $\pi \times \underline{\hspace{2cm}} \times \text{height}$

Q6. A cuboid-shaped box has length 12 cm, breadth 8 cm, and height 5 cm. Find its total surface area.

Q7. True or False: The volume of a cone is equal to one-third the volume of a cylinder with the same base and height.

Q8. Find the curved surface area of a cylinder with radius 7 cm and height 10 cm. (Use $\pi = 22/7$)

Part B: Practice Zone

★★ Medium Level - 10 Questions

Q9. A hemispherical bowl has a radius of 3.5 cm. Find the volume of the bowl. (Use $\pi = 22/7$)

Q10. Word Problem: Priya wants to paint the four walls and ceiling of her room. The room is 5 m long, 4 m wide, and 3 m high. Find the total area to be painted. (Ignore doors and windows)

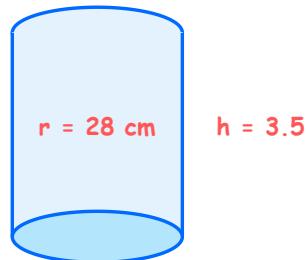
Q11. A cone has a radius of 5 cm and a slant height of 13 cm. Find its curved surface area. (Use $\pi = 3.14$)

Q12. Match the shapes with their volume formulas:

Column A	Column B
(i) Sphere	(a) $\frac{1}{3}\pi r^2 h$
(ii) Cone	(b) $\frac{4}{3}\pi r^3$
(iii) Hemisphere	(c) $\frac{2}{3}\pi r^3$

Write your answers: (i) → ___, (ii) → ___, (iii) → ___

Q13. Picture-based Problem: A cylindrical pillar has radius 28 cm and height 3.5 m. How much concrete is needed to build it? (Use $\pi = 22/7$, convert all to cm first)



Q14. The total surface area of a cube is 384 cm^2 . Find the length of its edge.

Q15. Word Problem: A cylindrical water tank has a diameter of 1.4 m and height of 2 m. How many liters of water can it hold? ($1 \text{ m}^3 = 1000 \text{ liters}$, use $\pi = 22/7$)

Q16. Find the height of a cylinder whose volume is 1540 cm^3 and radius of base is 7 cm. (Use $\pi = 22/7$)

Q17. Real-life Problem: A metallic sphere of radius 4.2 cm is melted and recast into a cylinder of radius 6 cm. Find the height of the cylinder. (Use $\pi = 22/7$)

Q18. The curved surface area of a cone is 4070 cm^2 and its diameter is 70 cm. Find its slant height. (Use $\pi = 22/7$)

Part C: Challenge Yourself!

★★★ Hard Level - 6 Questions

Q19. A tent is in the shape of a cylinder surmounted by a conical top. The height of the cylindrical part is 2.1 m and the total height is 4.2 m. The diameter of the base is 4 m. Find the total canvas required for the tent. (Use $\pi = 22/7$)

Q20. Complex Problem: A hemispherical bowl of internal radius 9 cm is full of liquid. The liquid is to be filled into cylindrical bottles of diameter 3 cm and height 4 cm. How many bottles are needed to empty the bowl?

Q21. The ratio of the total surface area of a sphere and a hemisphere of the same radius is: (a) 2 : 1 (b) 3 : 2 (c) 4 : 3 (d) 4 : 1

Show your work by finding both surface areas in terms of r .

Q22. Application Problem: A road roller has a cylindrical roller of diameter 84 cm and length 1 m. How much area will it press in 500 complete revolutions? Express your answer in m^2 . (Use $\pi = 22/7$)

Q23. A solid toy is in the form of a hemisphere surmounted by a right circular cone. The height of the cone is 2 cm and the diameter of the base is 4 cm.

Determine the volume of the toy. (Use $\pi = 3.14$)

Q24. Challenge Problem: A well with inner radius 4 m is dug 14 m deep. Earth taken out of it is spread all around it to a width of 3 m to form an embankment.

Find the height of the embankment. (Use $\pi = 22/7$)



Answer Key

Part A: Warm-up Practice (Easy)

Q1. Volume = $a^3 = 5^3 = 125 \text{ cm}^3$

Q2. Volume = $l \times b \times h = 8 \times 6 \times 4 = 192 \text{ cm}^3$

Q3. Surface Area = $4\pi r^2 = 4 \times 22/7 \times 7 \times 7 = 616 \text{ cm}^2$

Q4. Lateral Surface Area = $4a^2 = 4 \times 10^2 = 400 \text{ cm}^2$

Q5. radius² (or r²)

Q6. TSA = $2(lb + bh + hl) = 2(12 \times 8 + 8 \times 5 + 5 \times 12) = 2(96 + 40 + 60) = 392 \text{ cm}^2$

Q7. True

Q8. CSA = $2\pi rh = 2 \times 22/7 \times 7 \times 10 = 440 \text{ cm}^2$

Part B: Practice Zone (Medium)

Q9. Volume = $2/3 \pi r^3 = 2/3 \times 22/7 \times 3.5 \times 3.5 \times 3.5 = 89.83 \text{ cm}^3$

Q10. Area = $2h(l + b) + lb = 2 \times 3(5 + 4) + 5 \times 4 = 54 + 20 = 74 \text{ m}^2$ [4 walls + ceiling]

Q11. CSA = $\pi rl = 3.14 \times 5 \times 13 = 204.1 \text{ cm}^2$

Q12. (i) → (b), (ii) → (a), (iii) → (c)

Q13. Height = 3.5 m = 350 cm; Volume = $\pi r^2 h = 22/7 \times 28 \times 28 \times 350 = 862,400 \text{ cm}^3 = 0.8624 \text{ m}^3$

Q14. $6a^2 = 384, a^2 = 64, a = 8 \text{ cm}$

Q15. Radius = 0.7 m; Volume = $22/7 \times 0.7 \times 0.7 \times 2 = 3.08 \text{ m}^3 = 3,080 \text{ liters}$

Q16. $\pi r^2 h = 1540; 22/7 \times 7 \times 7 \times h = 1540; h = 10 \text{ cm}$

Q17. Volume of sphere = $4/3 \pi r^3 = 4/3 \times 22/7 \times 4.2^3 = 310.464 \text{ cm}^3$

Volume of cylinder = $\pi r^2 h; 310.464 = 22/7 \times 6^2 \times h; h = 2.744 \text{ cm}$

Q18. Radius = 35 cm; CSA = $\pi r l; 4070 = 22/7 \times 35 \times l; l = 37 \text{ cm}$

Part C: Challenge Questions (Hard)

Q19. Radius = 2 m; Cone height = 2.1 m

Slant height of cone: $l = \sqrt{2^2 + 2.1^2} = \sqrt{8.41} = 2.9 \text{ m}$

CSA of cylinder = $2\pi r h = 2 \times 22/7 \times 2 \times 2.1 = 26.4 \text{ m}^2$

CSA of cone = $\pi r l = 22/7 \times 2 \times 2.9 = 18.23 \text{ m}^2$

Total canvas = $26.4 + 18.23 = 44.63 \text{ m}^2$

Q20. Volume of bowl = $2/3 \pi r^3 = 2/3 \times 22/7 \times 9^3 = 1527.43 \text{ cm}^3$

Volume of one bottle = $\pi r^2 h = 22/7 \times 1.5^2 \times 4 = 28.29 \text{ cm}^3$

Number of bottles = $1527.43 \div 28.29 = 54 \text{ bottles}$

Q21. (c) 4 : 3

Sphere TSA = $4\pi r^2$; Hemisphere TSA = $3\pi r^2$; Ratio = $4\pi r^2 : 3\pi r^2 = 4 : 3$

Q22. Radius = 42 cm = 0.42 m; Length = 1 m

CSA = $2\pi r h = 2 \times 22/7 \times 0.42 \times 1 = 2.64 \text{ m}^2$

Area in 500 revolutions = $2.64 \times 500 = 1,320 \text{ m}^2$

Q23. Radius = 2 cm

Volume = Volume of cone + Volume of hemisphere

= $\frac{1}{3}\pi r^2 h + 2/3 \pi r^3 = \frac{1}{3} \times 3.14 \times 4 \times 2 + 2/3 \times 3.14 \times 8$

= $8.37 + 16.75 = 25.12 \text{ cm}^3$

Q24. Volume of earth = $\pi r^2 h = 22/7 \times 4^2 \times 14 = 704 \text{ m}^3$

Embankment area (ring): $\pi(R^2 - r^2)$ where $R = 4 + 3 = 7 \text{ m}$

Area = $22/7(49 - 16) = 22/7 \times 33 = 103.71 \text{ m}^2$

Height = Volume ÷ Area = $704 \div 103.71 = 6.79 \text{ m} \approx 6.8 \text{ m}$

Scoring Guide

Total Questions: 24 | Total Marks: 24

Score Range	Performance Level	What to Do Next
20-24	 Excellent!	Outstanding! You've mastered mensuration. Move on to compound shapes, surface area of revolution, and coordinate geometry applications.
15-19	 Very Good!	Great work! Practice more complex word problems involving combined shapes. Focus on conversion problems (sphere to cylinder, etc.).
10-14	 Good Effort!	Keep practicing! Memorize all formulas on flashcards. Practice 10 problems daily, starting with basic shapes before combined shapes.
0-9	Keep Trying!	Review formulas carefully. Start with cube and cuboid, then move to cylinder. Practice finding volume and surface area separately before mixing them.

Tips for Improvement:

- Create a formula sheet:** Write all formulas on one page and keep it visible while studying
- Visualize shapes:** Draw diagrams for every problem - it helps understand what's being asked
- Unit conversion:** Always convert all measurements to the same unit before calculating
- Check units in answer:** Area is always in square units (cm^2, m^2), volume in cubic units (cm^3, m^3)
- Use π wisely:** Use $22/7$ for exact answers, 3.14 when specified
- Word problems strategy:** Identify the shape → Write given values → Choose correct formula → Calculate

- **Combined shapes:** Break them into simpler shapes and add/subtract volumes or areas

⌚ Common Mistakes to Avoid:

- ✗ Using diameter instead of radius (remember: radius = diameter \div 2)
- ✗ Forgetting to square or cube when required (r^2 means $r \times r$, not $2 \times r$)
- ✗ Mixing up TSA, LSA, and CSA - read questions carefully
- ✗ Not converting units (mixing cm and m in same calculation)
- ✗ Confusing volume formulas (especially cone = $\frac{1}{3} \times$ cylinder)
- ✗ Forgetting to multiply by π in circular shapes
- ✗ Wrong formula for hemisphere (it's $\frac{2}{3} \pi r^3$, not $\frac{1}{3}$ or $\frac{4}{3}$)
- ✗ In combined shapes, counting the common base twice in surface area

✨ Great Job Completing This Worksheet! ✨

Keep practicing mensuration and you'll master it in no time!

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