

Class: 8	Subject: Mathematics	Topic: Mensuration
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SUMMARY SHEET		
Learner Previous Knowledge	Know what plane shapes, polygons and solid shapes are Classification of polygons; special polygons, plane shapes & solid shapes Formula for area of plane shapes like square, rectangle, triangle & circle	
Target Knowledge for this Topic	<i>Recapitulate the formula of area and perimeter of plane figures (rectangle, square, triangle, circle and parallelogram); Solve word problems involving area of compound figures Derive the formula to find the area of trapezium & rhombus; Use the formulae to solve real world problems Derive the formula to find surface area and volume of solid shapes (Cube, Cuboid & Cylinder); Use formulae to find volume and surface area of solid shapes</i>	
Learning Goals		
<i>More Complex Learning Goal- Students will be able to deduce the formulae to find area and volume of different shapes (plane & solid shapes)</i>		
<i>Target Learning Goal- Students will be able to solve the questions related to area of polygons, special polygons, solid shapes & plane shapes.</i>		
<i>Simpler Learning Goal- Students will be able to describe what plane shapes, polygons & solid shapes are and their types with examples</i>		
Period No.	Lesson Objectives	Teaching Learning Materials Required
1	- Recapitulate the formula of area and perimeter of plane figures (rectangle, square, triangle, circle and parallelogram) - Solve word problems involving area of compound figures	Pre assessment: Annexure 1A (1 per student) Discussion: projector (1 per class)
2	Understand how to derive formulae to calculate the area of trapezium and rhombus	Research work: Annexure 2A (1 per student); computer with internet connection (1 per group) Discussion: Projector (1 per class)

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3 and 4 <i>Note: This lesson requires 2 days</i>	• Know the properties of polygons • Derive the formula to compute the area of polygons	• <u>Brainstorm:</u> chalk Board • <u>Area of a polygon:</u> Annexure 3A (1 per student); projector (1 per class); audio visual aid (1 per class)
5 and 6 <i>Note: This lesson requires 2 days</i>	• Derive the formula to find surface area of solid shapes (Cube, Cuboid & Cylinder)	• <u>Surface area of solid shapes:</u> Annexure 5A (1 per student); projector (1 Per class); • <u>Discussion:</u> Annexure 5B-teacher's copy (1 per teacher)
7 and 8 <i>Note: This lesson requires 2 days</i>	• Derive the formulae to find the volume of solid shapes (Cube, cuboid & cylinder) • Use formulae to find volume of solid shapes • Difference between volume and capacity	• <u>Discussion of home assignment:</u> textbook & notebook (1 per student) • <u>Derive the formulae to find the volume of solid shapes:</u> Annexure 7A (1 per student);

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Period 1

Lesson objectives

At the end of this lesson students will be able to:

- Recapitulate the formula of area and perimeter of plane figures (rectangle, square, triangle, circle and parallelogram)
- Solve word problems involving area of compound figures.

Teaching Learning Materials required

- **Pre-assessment: Worksheet-1** (1 per student)
- **Discussion:** Projector (1 per class)

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 to 6

Lesson Beginning <u>Time:</u> 15 mins <u>Purpose:</u> Activate prior knowledge	<u>Pre-assessment /pairs</u> • Inform students that they are going to recap the concept of area and perimeter of plane figures, which they have covered in grade 7. • Give each student Worksheet-1. • Tell them to write the answers and match the entries of the table. <i>Note: They will recap the area and perimeter of plane figures while discussing with their pairs but will record their answers individually</i>
Lesson Middle <u>Time:</u> 15 mins <u>Purpose:</u>	<u>Whole class-discussion</u> • Project worksheet-1. • Discuss the answer of the questions. • At random call different students to do matching in table on the projected sheet. • Ask the reason behind a particular choice in the table. • Also, ask the following questions: ○ What is the value of pi? ○ What does 'r' stands for? ○ What is the name used for perimeter of circle? • Build consensus that perimeter is calculated by adding the length of entire boundary and area is calculated by finding the total space inside a figure. • Let the students' self-correct their work

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	<i>Note: Students may come up with incorrect answers and justification. In this case, ask other students who may have the correct explanation with justification. It is important to build consensus on all answers – this will help eradicate any errors.</i>
Lesson End <u>Time</u>: 10 mins <u>Purpose</u>: Consolidate learning	Tell students to practice questions on Pg170-Try These of NCERT Textbook. <u>Home Assignment</u> Let the students complete Exercise 11.1 on page 171 of the textbook

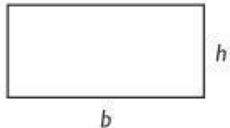
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Worksheet-1

Skill: Problem Solving

1. Compare area and perimeter. Explain with the help of an example

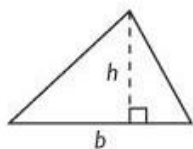
2. Match the shape with its area and perimeter formulae

Shape	Area	Perimeter
Square 	$A = b \times h$	$P = 2 \pi r$
Rectangle 	$A = \pi r^2$	$P = 4b$

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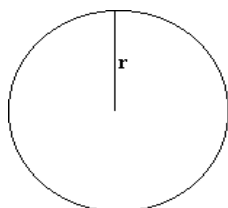
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$$A = b^2$$

$$P = 2(b + h)$$



$$A = \frac{1}{2} \times b \times h$$

Where A is the area (units²)

$$P = 3b$$

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Period 2

Lesson Objectives

At the end of this lesson students will be able to:

- Understand how to derive formulae to calculate the area of trapezium & rhombus

Teaching Learning Materials required

- **Research work:** Worksheet-2 (1 per student)
- **Discussion:** Projector (1 Per class)

Details of Teaching Learning Experience

Seating Arrangement: In groups of 4 or 6

Lesson Beginning <u>Time:</u> 20 mins <u>Purpose:</u> Activate the prior knowledge Introduce the topic Develop conceptual understanding	<u>Brainstorming/groups</u> • Ask the following questions to begin the class: ○ How can you find the area of trapezium and rhombus? • Tell them they are going to explore how to derive the formula to find the area of trapezium & rhombus today by doing a research work. <u>Research work/Groups/Activity</u> • Give them a recording Worksheet-2 in which they are going to write their findings. • Give them time to complete the task. • Instruct them to go library and use math books to find out more on trapezium and rhombus. • Also, do an activity given on Pg 172-‘Do This’ of NCERT Textbook. <i>Note: Though students will be doing a research work in groups make sure they record the findings in the individual sheets</i>
Lesson Middle <u>Time:</u> 20 mins <u>Purpose:</u> Develop conceptual understanding Consolidate students learning	<u>Whole Class – Discussion</u> • Project worksheet-2 and Activity. • At random call groups to share their findings on derivation of formulae • Ask the following questions: ○ What are the new smaller shapes that you divided the trapezium/ rhombus into? ○ How did you use the formula of triangle to find the area of trapezium/ rhombus? ○ How did you derive the formulae? ○ What are the formulae? ○ What can they conclude at last?

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	Build consensus on all the answers of the asked questions. <i>Note: Students may come up with incorrect answers. In this case, ask other students who may have the correct answers to explain and justify. It is important to build consensus on all answers – this will help eradicate any errors. The intent of this research work is to provide an opportunity to students to explore about derivation of formulae to find the area of trapezium & rhombus.</i>
Lesson End Time: NA Purpose:	<u>Home Assignment</u> Complete the question 1 - 6 from Exercise 11.2 of the textbook

Worksheet-2

Skill: Logical reasoning

Use different math books to do a research work and then record the data.

- Trapezium
- Rhombus

Research and make a note on derivation of formula to find area of trapezium and rhombus:

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Period 3 and 4

Lesson Objectives

At the end of this lesson students will be able to:

- Derive the formula to compute the area of polygons

Teaching Learning Materials required

- **Brainstorm:** chalk Board
- **Area of a polygon: Worksheet-3** (1 per student); projector (! Per class);

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 to 6

Lesson Beginning <u>Time:</u> 25 mins <u>Purpose:</u> Activate prior knowledge Generate interest to the topic Introduce the topic	<u>Brainstorm/whole class</u> • Ask the following questions to the entire class: ○ What did they get to know about polygons so far? <i>Note: This quick exercise is to help students to recall about polygons and its properties which are as follows:</i> ○ The number of sides of the shape. ○ The angles between the sides of the shape. ○ The length of the sides of the shape. ○ What are the properties of the polygons? • Give them time to think and discuss in pairs. • Then at random ask students to share their answers. <u>Area of a polygon/groups</u> • Inform students that they are going to derive the formula to find the area of polygons. • Ask the following questions: ○ What do they mean by area? ○ How do they find out the area of rectangle, square, triangle etc? • Write the formulas on the board using their responses. • Give them a Worksheet-3 and tell them to discuss and work in groups. • They will have to try answering the given questions to in order to reach to the formula of area of polygons.
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	<i>Note: Though students will be discussing in groups but will write the answers on their individual sheets.</i>
Lesson Middle <u>Time:</u> 25 mins <u>Purpose:</u> Develop conceptual understanding	<u>Whole class-discussion</u> • Project worksheet-3. • At random call different students to share the answers of the questions given in the sheet. • Also, ask the following questions while discussing the answers of the questions: ○ How did they use the area of triangle to derive the area of a polygon? ○ What do they get to know by apothem? ○ Why it's needed? Etc. • Build consensus on all the answers of the questions. <i>Note: Students may come up with incorrect answers and justification. In this case, ask other students who may have the correct explanation with justification. It is important to build consensus on all answers – this will help eradicate any errors. Make sure they are able to derive the formula to find the area of a polygon using the area of a triangle.</i>
Lesson End <u>Time:</u> 30 mins <u>Purpose:</u> Consolidate students learning	<u>NCERT Questions</u> • Tell the students to practice questions on Pg 176-‘Try These’ of NCERT Textbook • Discuss the questions and rectify the errors, if any <u>Home Assignment</u> Complete the question 7 - 11 from Exercise 11.2 of the textbook

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Worksheet-3

Skill: Procedural Fluency

Topic- Area of polygon

1. Draw a hexagon and find out how many triangles are there in a hexagon.

Number of sides in the hexagon: _____

Number of triangles _____

2. Write the process of getting the triangles in the hexagon. What kind of triangles you get? Explain it with the help of the property of triangles.

3. Calculate the area of one of the triangles.

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4. Using this area of one triangle can you find out the area of the entire polygon? How?

Hint: the base is the sides of the polygons and the height is called the apothem in the polygons. Apply the terms in the formula of the area of triangle to get the formula for area of polygon.

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Period 5 and 6

Lesson Objectives

At the end of this lesson students will be able to:

- Discuss about 3D shapes like cuboid, cube, cylinder and pyramid.
- Know about the faces, edges and vertices in 3D objects.
- Derive the formula to find surface area of solid shapes (Cube, Cuboid & Cylinder)

Teaching Learning Materials required

- **Surface area of solid shapes: Worksheet-4** (1 per student);
- **Discussion:** projector (1 Per class);

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 to 6

Lesson Beginning <u>Time:</u> 20 mins <u>Purpose:</u> Activate prior knowledge Generate interest to the topic Introduce the topic	<u>Brainstorming / Groups</u> • Ask the following questions to the entire class: ○ Discuss about 3D shapes like cuboid, cube, cylinder and pyramid. ○ Know about the faces, edges and vertices in 3D objects ○ How can you find the surface area of solid shapes? ○ Do you know of any formulae that can help you derive the formula of surface area of solid shapes (Cube / Cuboid / Cylinder)? • Give them time to think and discuss within groups. • Then at random ask students to share their answers. <i>Note: This quick exercise is to help students to recall about solid shapes and its properties which are as follows:</i> ○ The number of plane shapes (2D shapes) forming the solid shapes. ○ The formulae to find area of square, rectangle & circle. <u>Surface Area of solid shapes /groups</u> • Inform students that they are going to derive the formula to find the surface area of solid shapes. • Ask the following questions: ○ What do they mean by surface area? ○ How do they find out the area of rectangle, square & circle? • Write the formulas on the board using their responses.
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	- Give them Worksheet-4 and tell them to discuss and work in groups. - They will have to try answering the given questions to in order to reach to the formula of area of polygons. <i>Note: Though students will be discussing in groups but will write the answers on their individual sheets.</i>
Lesson Middle <u>Time</u>: 15 mins <u>Purpose</u>: Develop conceptual understanding	<u>Whole class-discussion</u> - Project worksheet-4. - At random call different students to share the answers of the questions given in the sheet. - Also, ask the following questions while discussing the answers of the questions: - How did they use the area of square/ rectangle/ Circle to derive the area of a Cube/ Cuboid / Cylinder? - Why have we taken the length of the rectangle as $2\pi rh$ in case of cylinder? Etc. - Build consensus on all the answers of the questions. <i>In this case, ask other students who may have the correct explanation with justification. It is important to build consensus on all answers – this will help eradicate any errors. Make sure they are able to derive the formula to find the area of a solid shapes using the area of plane shapes.</i>
Lesson End <u>Time</u>: 5 mins <u>Purpose</u>: assign the home assignment	<u>Home Assignment</u> Ask the students to attempt the Exercise 11.3 on page 186 of textbook Get your work tomorrow for discussion

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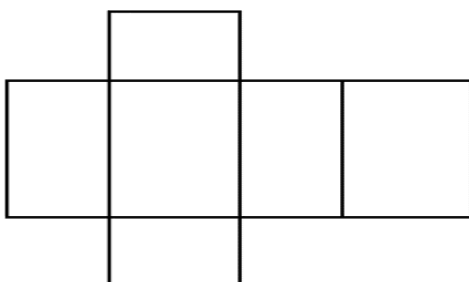
Topic- Surface Area of solid shapes

1. Complete the given table

Solid Shape	Number of Squares	Number of Rectangles	Number of Circles
Cube			
Cuboid			
Cylinder			

2. Derive the formulae to find the surface area of Cube

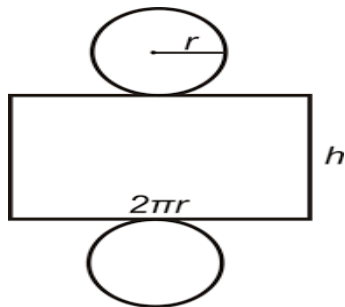
3. Mark the length, breadth & height in the net diagram and derive the formulae to find the surface area of Cuboid



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4. Observe the net diagram and derive the formulae to find the surface area of Cylinder

(Hint- Take length of the rectangle = circumference of the circle= $2\pi r$)



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Period 7 and 8

Lesson Objectives

At the end of this lesson students will be able to:

- Derive the formulae to find the volume of solid shapes (Cube, cuboid & cylinder)
- Use formulae to find volume of solid shapes.
- Difference between volume and capacity

Teaching Learning Materials required

- **Discussion of home assignment**: textbook & notebook (1 per student)
- **Derive the formulae to find the volume of solid shapes**: **Worksheet-5** (1 per student);

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 to 6

Lesson Beginning <u>Time</u> : 20 mins <u>Purpose</u> : Activate prior knowledge Introduce the topic	<u>Discussion of home assignment/whole class</u> • Ask the students to come up with their doubts & queries • Tell the student who knows the correct answer to share it on board • Ask the students following questions: ○ What do you understand by lateral surface area? ○ What is the lateral surface area of Cube/ Cuboid/ Cylinder? <i>Note: The intent of this activity is to allow students to clear their doubts and consolidate their learning of implementation of formulae.</i> <u>Introduction / Whole class</u> • Ask the following questions: ○ What do you understand by volume? ○ What is the unit of volume? ○ Is there any difference between volume & capacity? Discuss all the answers to activate the previous learning.
Lesson Middle <u>Time</u> : 25 mins <u>Purpose</u> : Develop conceptual understanding	<u>Derive the formulae for volume of solid shapes /Groups</u> • Tell the students to complete the worksheet-5 • They can discuss in groups but do the writing task individually. Give students 10 - 12 minutes to solve the worksheet
Lesson End	<u>Discussion/Groups</u>

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Time: 30 mins

Purpose: Consolidate students learning

- Project worksheet-5.
- At random call groups to share the entries in the table.
- While they are sharing their entries ask the following questions:
 - How did you derive the formulae for volume of Cube? Cuboid /Cylinder?
 - What is the formula for area of the base of the cylinder?
 - How did you calculate the volume of cube/ cuboid/ Cylinder?
- Build consensus on every answer of the questions.

Note: Students may come up with incorrect answers and equations. In this case, ask other students who may have the correct answers to explain and justify. It is important to build consensus on all answers – this will help eradicate any errors.

Home Assignment

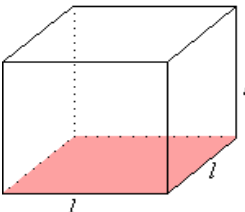
- Ask the students to attempt the Exercise 11.4 on page 191-192 of textbook

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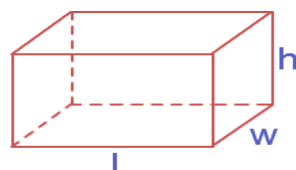
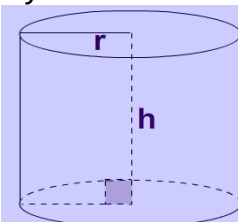
Worksheet-5

Skill: Problem Solving

1. Observe the solid shapes and fill in the chart below:

Solid Shapes	Formula for volume	Values	Volume (in cubic meters)
Cube 		Length = 5 m	

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Cuboid 		Length = 4 m Breadth = 5m Height = 6 m	
Cylinder 		Radius = 2 m Height = 10 m	

(Hint- The base of the cylinder is a circle. For volume we need

2. Find the height of a cuboid whose volume is 275 cm^3 and base area is 25 cm^2 .

3. A godown is in the form of a cuboid of measures $60 \text{ m} \times 40 \text{ m} \times 30 \text{ m}$. how many cuboidal boxes can be stored in it if the volume of one box is 0.8 m^3 .

4. A rectangular piece of paper of width 14 cm is rolled along its width and a cylinder of radius 20 cm is formed. Find the volume of the cylinder. (take $\pi = 22/7$)

[illegible]

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