

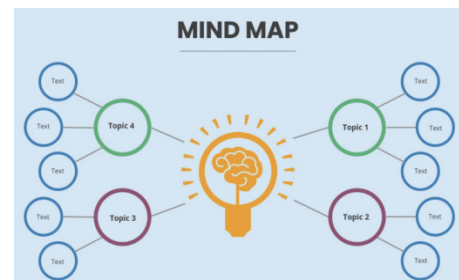
Our Dream House (Class 8)

Introduction	Learners will design and make a model of their dream house by using ideas of polygons, properties of different types of quadrilaterals, and properties of solid shapes. In Nagaland, houses come in many interesting shapes and styles from traditional Naga morung buildings with their distinctive rooflines and hexagonal or trapezoidal gable ends, to newer houses built on hilly slopes with rectangular and triangular structures. Learners will draw on these familiar shapes from their surroundings as they design their dream house.
Main Question	How can we make a model of our dream house while understanding the ideas of shapes?
Lesson(Number and Name)	Lesson 4 – Quadrilaterals
Expected Time	In class: 5 days, 40 minutes each day At home: 4 days, 10-20 minutes each day
Needed Materials	Chart paper, paper, ruler, pencil, glue, old cardboard or cardboard boxes, scissors. Optional locally available materials: bamboo strips, dried leaves, small stones or pebbles for decoration, cloth scraps.
Learning Outcomes	By the end of this project, learners will be able to: Knowledge-based Outcomes: ● Identify and classify polygons by counting their sides and vertices. ● Differentiate between regular and irregular polygons using properties of sides and angles. ● Solve problems related to angles of a quadrilateral by applying the property that the sum of interior angles is 360°. ● Verify and apply the properties of a parallelogram (opposite sides, opposite angles, diagonals) through reasoning and proof. ● Distinguish between special parallelograms (rectangle, square, rhombus) and other quadrilaterals (trapezium, kite) based on their properties. 21st Century Skill Outcomes: ● Design a house floor plan using at least 4 different flat shapes. ● Collaborate in groups to build and present a model of the dream house. ● Present the thinking, designing, and making process of the model to classmates. ● Evaluate and give structured feedback on another group's floor plan. [Critical
Suggestions for Teachers (To achieve the curriculum goals given under National Learning Standards)	1. All teachers should check the material and plan for each day before the class starts. 2. If the material for any day is not available in school, tell the learners one day before so that they can bring the material the next day. 3. Before starting the first day, divide all learners into groups so that they do group work, experiments, or any other activity in groups. Make sure that the groups are always mixed and inclusive (with learners of all genders and all levels). 4. Create a creative and cooperative environment for learning in the class. 6. After the project is completed, hold group discussions on the questions given in the textbook and ask learners to write their answers individually.

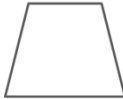
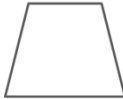
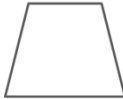
Day 1

Learners will start making the plan of their dream house and identify different polygons that they can use in the design.

Time	Activity and Description
10 minutes	<u>Introduction:</u> Teacher says: <i>Close your eyes! We are all going to step into the future. You have all grown up and are doing well in your jobs. Like many other people, now you also want to build your dream house! You want your family to like the house made by you! What kind of house do you imagine? Think about the hills and valleys around your village. Will your house be on a slope? Will it have a wooden frame like a traditional Naga house? Will it be made of bamboo and timber, or cement? Will it have a veranda with a view of the hills? Now open your eyes and tell us about the house you imagined! (Listen to answers from some learners.)</i> Teacher says: <i>In this project, you will work in groups to design and make a model of your dream house!</i> The main question of this project is: How can we make a model of our dream house while understanding the ideas of shapes? • To answer this question, you will work in groups to prepare plans of your dream house and make their models! • Your group will work as your “family members” who should feel happy in the house! • To design and make the models, you will use different types of flat shapes that we will learn about in the coming days. • On the fifth and last day of the project, you will present the model of your dream house in front of other Learners. Everyone will vote and choose the best model! Note : Divide Learners into groups of 3 or 4. Tell them that they will work in the same groups throughout the project. - Write the criteria for the final product on a piece of paper, share it with the learners, and stick it on the classroom wall so that learners can see it during the whole project. - The idea of the house should include the following: - At least 4 different types of areas - The plan should include at least 4 different flat shapes. - The presentation should include thinking, designing, and making process of the model.
15 minutes	<u>Ideas for House Design:</u> Teacher instructs: In your groups, discuss the features you would like to include in your dream house. While doing this, remember that: - You follow the criteria and include at least 4 different areas. For example, a kitchen, a sitting area, a bedroom, and a toilet. - Every member should try to suggest at least 1 extra facility they want to include! Like a firewood storage area, a weaving corner for the women of the family, a prayer room, a granary for storing rice, a room for drying meat, or a garden space. Note : If needed, ask learners to discuss these questions to help them think about facilities: - What different areas or facilities do you need in the house? (Like toilet and kitchen)

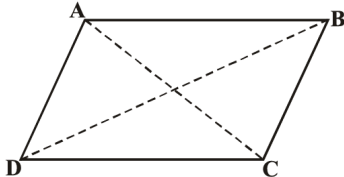


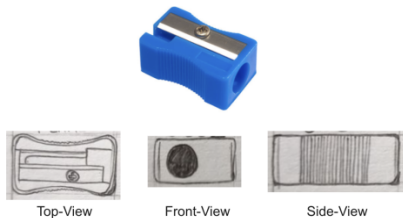
	- What different areas or facilities do you want but may not need? (Wishes are things we can live without, like a TV room) - What will be the purpose of each of these? - How will the purpose decide the size of the areas? (For example, the sitting room should be big enough so that all family members can sit or there should be enough space for everyone to sleep.) Based on the purpose, what things do they want to include in each of these areas? (Like comfortable chairs or a table in the sitting room, or a loom in the weaving corner) To help learners organise their ideas, ask them to use a mind map (see Appendix 1 for format and sample by the teacher).																								
15 minutes	<u>Finding Polygons in the Classroom:</u> Teacher says: • <i>To think how we can design our dream house, let us first look at the design of our own classroom!</i> • <i>What features can you see in our classroom? (Walls, door, table, chair, floor and ceiling, blackboard, chalk, duster, fan, window etc.)</i> • <i>What is common in the walls, furniture, floor and ceiling? (They are all made of different types of shapes joined together!)</i> • <i>With your partner, identify and draw at least 3 shapes that you can see in our classroom! Also try to name these shapes. Hint: also look at the weave pattern on a Naga shawl if one is visible, or the shape of a dao handle, the triangular roof visible from outside, how many polygons can you spot?</i> After taking responses from learners, the teacher says: Polygons are flat shapes that have more than two sides and have no curves. Use the example of a triangle to teach what sides and vertices are in a polygon. Polygons are of two types – Regular and Irregular polygons. A regular polygon has equal sides and equal angles. For example, a square has sides and angles of equal measure. Therefore, it is a regular polygon. A rectangle is equiangular but not equilateral. Learners can look at the concept given on page 22 of Lesson 3 for reference. Ask them to copy the table given below, classify the given polygons (whether it is a regular polygon or not), count and fill the number of sides and vertices of each (answers are included in the table). <table><tr><th>Polygon</th><th>Triangle</th><th>Quadrilateral</th><th>Pentagon</th><th>Hexagon</th><th>Septagon</th></tr><tr><td>Regular Polygon(Yes / No)</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Sides</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Vertices</td><td></td><td></td><td></td><td></td><td></td></tr></table> Ask Learners if they can see any quadrilateral in the classroom and tell them to name some! Based on their answers, share the different types of quadrilaterals with them as shown below:	Polygon	Triangle	Quadrilateral	Pentagon	Hexagon	Septagon	Regular Polygon(Yes / No)						Sides						Vertices					
Polygon	Triangle	Quadrilateral	Pentagon	Hexagon	Septagon																				
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Square	Rectangle	Parallelogram	Rhombus	Trapezium	Kite								
													
	Tell them that knowledge of shapes will help you in designing your dream house!												
Homework	Give the answer of Question 2 in Exercise 3.1 on page 22 of the textbook. Discuss with your family members or neighbours in your village about what facilities or rooms they think are most important in a Naga house. Note down their ideas to share with your group the next day!												

Day 2

Learners will practise making a floor plan based on polygons.

Time	Activity and Description
5 minutes	<u>Start the lesson like this:</u> Remind Learners of the main question: - How can we make a model of our dream house while understanding the ideas of shapes? - Final project criteria (stuck on the wall) - Ask Learners to exchange their notebooks with a partner and check each other's answers of the homework questions. - Give a summary of the interior part of a polygon (the part inside the boundary of its sides) and the exterior part of a polygon (the part outside its sides). Tell the learners that today they will learn about the properties of parallelograms and use them to make design practice. This practice will help them in designing their dream house.
25 minutes	<u>Properties of Parallelogram:</u> (Group Work) Teacher explains the following properties of a parallelogram to the learners. • A parallelogram is a quadrilateral whose opposite sides are equal ($AB = CD$, $AD = BC$) and parallel. • Its opposite angles are equal ($\angle A = \angle C$, $\angle D = \angle B$) • It has two unequal diagonals (line segments joining non-adjacent vertices - AC and BD). • The sum of all interior angles is 360°. Consecutive angles are supplementary. Each group is asked to understand any one of the properties given below of a parallelogram and take reference from the textbook to prove it. (Lesson - 3, Pages - 26 to 31) Property 1 : Opposite sides of a parallelogram are of equal length. Property 2 : Opposite angles of a parallelogram are of equal measure. Property 3 : Adjacent angles of a parallelogram are supplementary. Property 4: The diagonals of a parallelogram bisect each other. 

	All groups will present their understanding in front of the whole class through chart paper / poster. Each group will get 2 minutes for presentation.
10 minutes	<u>Practice of Making Floor Plan:</u> Teacher says: • Now, as practice for designing your dream house, you will prepare a plan for your own classroom! • For this we need to learn how an object looks when seen from different positions. • Take a few minutes to make how your sharpener or eraser (rubber) will look when seen from the top, front and side (allow some Learners to show their sketches and correct them using images if needed). • The top view of any area is called its floor plan. Floor plans show how the floor of a place will look after construction. • For example, if you were a bird flying above a traditional Naga morung and you looked down, what shapes would you see? The rectangular floor, the triangular shape of the roof from above, the square windows — that top view is the floor plan! • Now, make the floor plan of your classroom! Also, label all the types of polygons and quadrilaterals that appear in your practice floor plan.  Top-View Front-View Side-View Note : If needed, show learners the floor plan example in Appendix 2.
Homework :	If Learners could not complete this work in class, work on it at home. Give answers of Question 1 and 2 in Exercise 3.3 on page 32 of the textbook.

Day 3

Learners will make the plan of their dream house and improve it based on feedback received from their classmates.

Materials	
Time	Activity and Description
5 minutes	<u>Start the lesson like this:</u> Remind Learners of the main question: - How can we make a model of our dream house while understanding the ideas of shapes? - Final project criteria (stuck on the wall) - Ask Learners to exchange their notebooks with a partner and check each other's answers of the homework questions. - Give a summary of the interior part of a polygon (the part inside the boundary of its sides) and the exterior part of a polygon (the part outside its sides). Tell the Learners that today they will make a floor plan for their dream house and learn about the shapes that they can use to make their model!
20 minutes	<u>Floor Plan of Dream Houses:</u> Teacher says:

	<i>Let us start working on our floor plan!</i> <i>First, look at the list of ideas that you prepared on the first day and discuss with your friends. Add other features if needed.</i> <i>After that, if you have included more than one floor in your house, make a separate floor plan for each floor. You can divide the floor plan among the group members.</i> <i>Then, based on the list of ideas, first draw the walls and outline of different areas.</i> <i>On that, draw other features and things like windows, skylights etc.</i> <i>Think about the shape of your roof! Many Naga traditional houses have a triangular roof (a triangle is a polygon!). Will your dream house also have a sloped roof to let the rainwater run off during heavy Nagaland monsoons? Add this to your floor plan or side view.</i> Remind Learners of the criteria for the floor plan (at least 4 different flat shapes should be included). Tell them that if they cannot complete their floor plan in class, one or two members of the group can voluntarily complete it at home.
15 minutes	<u>Feedback in Groups:</u> Pair two groups together. Ask them to present their floor plans to each other one by one and take feedback. They can give feedback using the following questions: • Is the floor plan the top view of the dream house? • Does it include at least 4 flat shapes? • Does it include ideas of every member of the group? • What is the most interesting part of the model? • What more improvements can be made in the plan? Remind Learners to be polite and respectful while giving and receiving feedback. Once they get the feedback, they will work in their groups to make their floor plan better.
Homework	Show the floor plan of your dream house to family members or neighbours in your village with whom you discussed your ideas on Day 1. Take their opinion and note it down to discuss with your group members the next day. Learners should decide among themselves what material each person will bring for making the model the next day (like old cardboard, glue, scissors, bamboo strips, etc.). If they do not have any material, the teacher should arrange it from his/her side or from the school, or get the model made on paper.

Day 4

Learners will identify the properties of some special parallelograms and start making the model of their dream house.

Time	Activity and Description
5 minutes	<u>Review:</u> Remind Learners of the main question: - How can we make a model of our dream house while understanding the ideas of shapes? - Ask them what they learned in class in the previous days. - Ask them how far their work has reached till now. - Ask Learners to share the different types of polygons and quadrilaterals they identified in the plan of their dream house. Tell the Learners that today they will learn about some special parallelograms and start making the model of their dream house.

20 minutes	<u>Understanding some special parallelograms:</u> Yesterday the learners understood the properties of a parallelogram. Today they will do group work again to understand some special parallelograms. Give instructions to the Learners to find out the properties of other types of quadrilaterals in their groups. Assign different quadrilaterals to each group. Ask the groups to discuss and write the properties of the given quadrilateral on the basis of sides, angles, and diagonals. After they finish, ask them to check the listed properties for the given quadrilateral in the Mathematics textbook on pages 33 - 36. At the end, ask the groups to share the properties they have listed. Present the summary of properties as shown below. <table><tr><td><i>Rectangle</i> </td><td><i>Square</i> </td><td><i>Rhombus</i> </td><td><i>(Trapezium</i> </td><td><i>Kite</i> </td></tr><tr><td>- A parallelogram whose every angle is equal to 90° - Equal diagonals</td><td>- A rectangle with equal adjacent sides - Equal diagonals</td><td>- A parallelogram with equal adjacent sides - Unequal diagonals</td><td>- One pair of opposite sides is equal - Adjacent angles are equal- Equal diagonals</td><td>- Adjacent sides equal- One pair of opposite angles equal - Unequal diagonals</td></tr></table>	<i>Rectangle</i> 	<i>Square</i> 	<i>Rhombus</i> 	<i>(Trapezium</i> 	<i>Kite</i> 	- A parallelogram whose every angle is equal to 90° - Equal diagonals	- A rectangle with equal adjacent sides - Equal diagonals	- A parallelogram with equal adjacent sides - Unequal diagonals	- One pair of opposite sides is equal - Adjacent angles are equal- Equal diagonals	- Adjacent sides equal- One pair of opposite angles equal - Unequal diagonals
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15 minutes	<u>Making parts of the model (Group Work):</u> Note: The teacher should keep some materials ready like cardboard boxes, chart paper, thermocol, glue, colours, and scissors for those groups who could not bring materials. If thermocol is not available, thick cardboard, folded paper, or bamboo strips can be used to make walls and roof structures. Learners will work in their groups to make their model! To do this: • They will take out all the materials needed to make the model and keep them in the centre. • Look at the floor plan of their dream house and divide responsibilities among different members for which part of the house they will make. • Every member of the group will think and plan how they will build the assigned parts of the model. Then they will discuss their ideas turn by turn in their groups. • Each student will make the part of the model given to them. • While they work on the models, remind them of the criteria (at least 4 different solid shapes should be included). Suggestion: To help the Learners, use Appendix 3 to guide them about ways to make solid shapes using paper for use in their models.										
Homework	Complete the construction of any unfinished parts of the model.										

Day 5

Learners will complete their models and present them in front of their classmates. After that, all will vote for the best model.

Time	Activity and Description
5 minutes	<u>Review:</u> Remind the learners of the main question: - How can we make a model of our dream house while understanding the ideas of shapes? - Ask them what they learned in class in the previous days. - Ask them how far their work has reached till now. - Ask Learners to share the different types of polygons and quadrilaterals they identified in the plan of their dream house. Tell the Learners that today they will learn about the properties of solid shapes and start making the model of their dream house.
15 minutes	<u>Assembling the models:</u> Learners will join different parts of the model in their groups to complete the model of their dream house! After completing the joining of their models, suggest to the groups to decorate their models. Groups may decorate using locally available materials: small pebbles, dried grass or leaves, strips of cloth, coloured paper. Encourage them to add details like a small morung-style rooftop, a veranda, or a garden space.
20 minutes	<u>Presentation:</u> Note: If possible, the teacher should arrange a big space for the presentation. At the end of each presentation, count the votes by asking the audience to raise their hands. Declare the winner at the end! Learners will present their ideas, floor plan, and model one by one. Remind them: Divide the presentation into different parts among themselves. Take some minutes to discuss who will present what. Remember the criteria for presentation (it should include the process of thinking, designing, and making the model). In their presentations, they must also show the 4 plane shapes (types of polygons and quadrilaterals) they used in their floor plan that are included in the model. The winner should be declared in such a way that no one feels discouraged.
5 minutes	<u>Discussion on the presentation:</u> After all the presentations are over, ask the Learners to think about the process of working on this project using the following questions: - What did they enjoy the most? - What did they find most challenging? Why? - Do they think they made practical models? Why or why not? - Which shapes from Nagaland life — like a morung roof, a shawl pattern, or a field boundary, helped them think about their house design?

Additional enrichment activities	- Learners who finish early can design a second version of their dream house using only irregular polygons and compare it with their original design. They write one sentence explaining how the shapes change the look and feel of the house. - Learners can go on a shape walk around their school or village, sketch shapes they find in walls, rooftops, windows, fences, and paddy field boundaries. They label each shape and write whether it is a regular or irregular polygon. - Learners can measure the actual angles of a quadrilateral in their floor plan using a protractor and verify that the four angles add up to 360 degrees. They record their findings in a table. - Learners who want an extra challenge can calculate the perimeter of each room in their floor plan by measuring the sides and applying the properties of the quadrilateral that room uses.
Modifications for simplification	- If chart paper or cardboard is not available, learners can build the model using folded notebook paper. Walls can be made from strips of paper folded at the base and glued down. The roof can be a folded triangle. The core learning outcomes about polygons and quadrilaterals remain fully covered. - If groups struggle to draw a floor plan independently, the teacher can draw a simple sample floor plan on the blackboard using a rectangle divided into four parts and label it as a house with a bedroom, kitchen, sitting area, and toilet. Groups then use this as a starting point and add their own shapes and details. - If time is short on any day, the properties' activity on Day 2 and Day 4 can be reduced to two properties instead of four. Each group selects one property, proves it using the textbook, and shares it in one minute. The model-making activity must not be shortened as it is the core physical making task of the project.

ASSESSMENT CRITERIA

A majority of my learners were able to:

- ☐ Identify and name at least 4 different polygons used in their dream house floor plan, correctly counting sides and vertices for each.
- ☐ Classify the polygons in their floor plan as regular or irregular and give a reason for their classification.
- ☐ State at least 2 properties of a parallelogram and apply the property that the sum of interior angles of a quadrilateral is 360 degrees when solving a related problem.
- ☐ Distinguish between at least 3 special parallelograms (rectangle, square, rhombus) and other quadrilaterals (trapezium, kite) based on their properties of sides, angles, and diagonals.
- ☐ Build a 3D model of their dream house that includes at least 4 different flat shapes in the floor plan and present the thinking, designing, and making process to classmates.

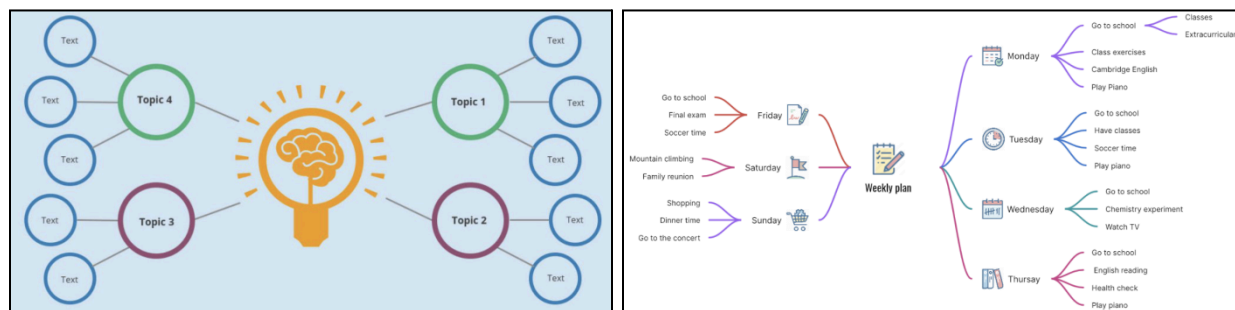
CHAPTER-PROJECT MAPPING

Corresponding Chapter: Lesson 4 - Quadrilaterals (Class 8 Mathematics)

Chapter Topic	Chapter Sub-Topic	Coverage
Lesson 3 - Polygons	Identifying and naming polygons	Yes
Lesson 3 - Polygons	Regular and irregular polygons	Yes
Lesson 3 - Polygons	Sides and vertices of polygons	Yes
Lesson 4 - Quadrilaterals	Interior and exterior of a polygon	Yes
Lesson 4 - Quadrilaterals	Properties of a parallelogram (opposite sides, opposite angles, diagonals, angle sum)	Yes

Lesson 4 - Quadrilaterals	Rectangle - properties	Yes
Lesson 4 - Quadrilaterals	Square - properties	Yes
Lesson 4 - Quadrilaterals	Rhombus - properties	Yes
Lesson 4 - Quadrilaterals	Trapezium - properties	Yes
Lesson 4 - Quadrilaterals	Kite - properties	Yes
Lesson 4 - Quadrilaterals	Floor plan and top view of shapes	Yes
Lesson 4 - Quadrilaterals	Solid shapes and 3D construction	Partial - covered through model-making; formal solid shapes chapter not fully covered
Lesson 4 - Quadrilaterals	Formal written geometric proofs beyond Exercise 3.3	No
Lesson 4 - Quadrilaterals	Solid shapes as a standalone topic - 3D nets and surface area	No

Appendix 1: Mind Map - Format and Sample



Appendix 2: Sample Floor Plan of a Class

