

Class: 8	Subject: Math	Topic: Understanding Quadrilaterals
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SUMMARY SHEET		
Learner Previous Knowledge	Recall that quadrilaterals are part of polygons	
	Study the attributes of quadrilaterals	
Target Knowledge for this Topic	Investigate different types of quadrilaterals- parallelogram, rectangle, rhombus, square, trapezium, kite	
	Types of quadrilaterals and their properties- parallelogram, rhombus, trapezium, kite	
Learning Goals	Exploring the vertices, sides, angles, adjacent sides, opposite sides, adjacent angles, opposite angles, diagonals, interior and exterior of a quadrilateral;	
	Properties of quadrilateral- angle sum property, sum of the measure of the exterior angles;	
Taxonomy Level	Types of quadrilaterals and their properties- parallelogram, rhombus, trapezium, kite	
<i>More Complex Learning Goal- Students will be able to classify the quadrilaterals as per their properties</i>		Classifying
<i>Target Learning Goal- Students will be able to use angle sum properties to find the missing angles of quadrilaterals</i>		Executing
<i>Simpler Learning Goal- Students will be able to describe what quadrilaterals are and their types with examples</i>		Recalling
Period No.	Lesson Objectives	Teaching Learning Materials Required
1	Explore the vertices, sides, angles, adjacent sides, opposite sides, adjacent angles, opposite angles, diagonals, interior and exterior of a quadrilateral	Worksheet-1 (1 per student); projector (1 per class);

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2	Know the properties of quadrilateral- angle sum property	<u>Worksheet-2</u>(1 per student); projector (1 per class) <u>Proof activity: Worksheet-3</u> (1 per group); colored sheets (4 per group); markers (3 to 4 per group)
3	Know the properties of quadrilateral- sum of the measure of the exterior angles	<u>Kinesthetic Activity: Worksheet-4</u> (1 per group); chalk piece (1 per group); projector (1 per class)
4 and 5 Note: this lesson requires 2 days	Know about the types of quadrilaterals and their properties- parallelogram, rhombus, trapezium, kite;	<u>Activity: Worksheet-5</u> (5A, 5B, 5C, 5D; 1 per group as mentioned in the sheet); <u>Worksheet-6</u> (1 per student)

Period 1

Lesson Objectives

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

- Explore the vertices, sides, angles, adjacent sides, opposite sides, adjacent angles, opposite angles, diagonals, interior and exterior of a quadrilateral.
- Define convex and concave polygons
- Differentiate between regular and irregular polygons.

Teaching Learning Materials required

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- **Worksheet-1** (1 per student); projector (1 per class);

Details of Teaching Learning Experience

Seating Arrangement: - In Pairs

Lesson Beginning <u>Time:</u> 15 mins <u>Purpose:</u> Activate prior knowledge	<u>Worksheet/pairs</u> • Inform students today they are going to work in pairs to know more about quadrilaterals. • Ask the following questions before beginning the activity: ○ What do they mean by quadrilaterals? ○ How many kinds of quadrilaterals they know? ○ Define convex and concave polygons. ○ Differentiate between regular and irregular polygons. • Accept their responses and identify the students who still face difficulty in recalling the answers of the above asked questions. • Clear their doubts by taking up a discussion and make them clear about the concept of quadrilaterals and their types. • Then, give each student Worksheet-1. • Tell them, to write the answers of the given questions while discussing within the respective partner. • Give them time to complete the task.
Lesson Middle <u>Time:</u> 15 mins <u>Purpose:</u> Activate prior knowledge	<u>Whole class-discussion</u> • Project Worksheet-1 • At random call groups to share the answers of the given questions. • Each time ask them to give justification for their answer. • Build consensus on all the answers. • They can exchange the sheets with their partner and then check the work done by the other partner. <i>Note: Students may come up with incorrect answers. In this case, ask other students who may have the correct figures and answers to explain and justify. It is important to build consensus on all answers – this will help eradicate any errors.</i>

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Lesson End <u>Time:</u> 10 mins <u>Purpose:</u> Consolidate students learning	<u>Home Assignment:</u> Tell the students to practice questions on Pg 41- Q1, 2, 3, 5-Exercise 3.1 of NCERT Textbook.
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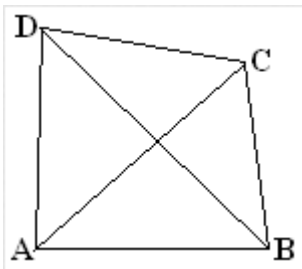
Worksheet-1

Skill: Logical

Reasoning

Topic- Sides, angles and diagonal of a Quadrilateral.

1. Observe the given image and fill in the blanks



- The four line segments AB, BC, CD and DA are called its _____.
- the four angles, Angle DAB, Angle BCD, Angle ABC and angle CDA are called its _____.
- a line segment joining two non-consecutive vertices is called a _____. AC and BD are the two _____ of the quad ABCD.

Adjacent sides and opposite sides

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Find out the adjacent and opposite sides of the quadrilaterals using the above image. Give reason behind your choice.

Adjacent angles and opposite angles

Similarly find out the adjacent and opposite angles of the quadrilaterals using the above image. Give reason behind your choice.

2. Differentiate between:

(i) Convex and concave polygons

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(ii) Regular and Irregular polygons

3. Draw the diagram for the following:

(i) Irregular polygon

(ii) Convex polygon

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Period 2

Lesson Objectives

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

- Know the properties of quadrilateral- angle sum property

Teaching Learning Materials required

- **Worksheet-2** (1 per student); projector (1 per class)
- **Proof activity: Worksheet-3** (1 per group); colored sheets (4 per group); markers (3 to 4 per group)

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>Worksheet/groups</u> • Inform students today they are going to work in groups to recall the angle sum property of a triangle and extend that idea to find the angle sum property for quadrilateral. • Give each student Worksheet-2. • Tell them to discuss the given questions within the group and answer them individually. • Give them 10 mins time to complete the task. <u>Whole class-discussion</u>
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Develop conceptual understanding	• Project worksheet-2. • At random call groups to share the answers of the given questions. • During the discussion ask the following questions: ○ What is the angle sum property of triangle? ○ How did they extend the idea of angle sum property of triangle to find the angle sum property of quadrilateral? Give justification • Each time ask them to give justification for their answer. • Build consensus on all the answers. <i>Note: Students may come up with incorrect answers. In this case, ask other students who may have the correct figures and answers to explain and justify. It is important to build consensus on all answers – this will help eradicate any errors.</i>
Lesson Middle <u>Time:</u> 15 mins <u>Purpose:</u> Develop conceptual understanding	<u>Proof Activity/groups</u> • Tell students that they are going to prove how the sum of all the angles of the quadrilateral is equal to 360 degree. • Provide the activity Worksheet-3 to each group along with 4 different colored sheets and markers. • Give them 10 to 15 mins of time to complete the activity by following the instructions mentioned in worksheet-3. <u>Whole class-discussion</u> • Project Worksheet-3. • At random call groups to share how they have arranged all different four quadrilaterals. • During the discussion ask the following questions: ○ What did they conclude with this activity? Give justification • Build consensus on all the answers and make them understand that when they join all small quadrilaterals at one point they figured out that It forms a complete angle of 360 degree. This shows that sum of all angles of quadrilateral is 360 degree.

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	<i>Note: Students may come up with incorrect answers. In this case, ask other students who may have the correct figures and answers to explain and justify. It is important to build consensus on all answers – this will help eradicate any errors.</i>
Lesson End <u>Time:</u> 5 mins <u>Purpose:</u> Consolidate students learning	<u>Home assignment</u> Tell the students to practice questions on Pg 41-42 Q4, 6-Exercise 3.1 of NCERT Textbook.

Name: _____

Worksheet-2

Skill: Logical

Reasoning

Topic- Angle sum property

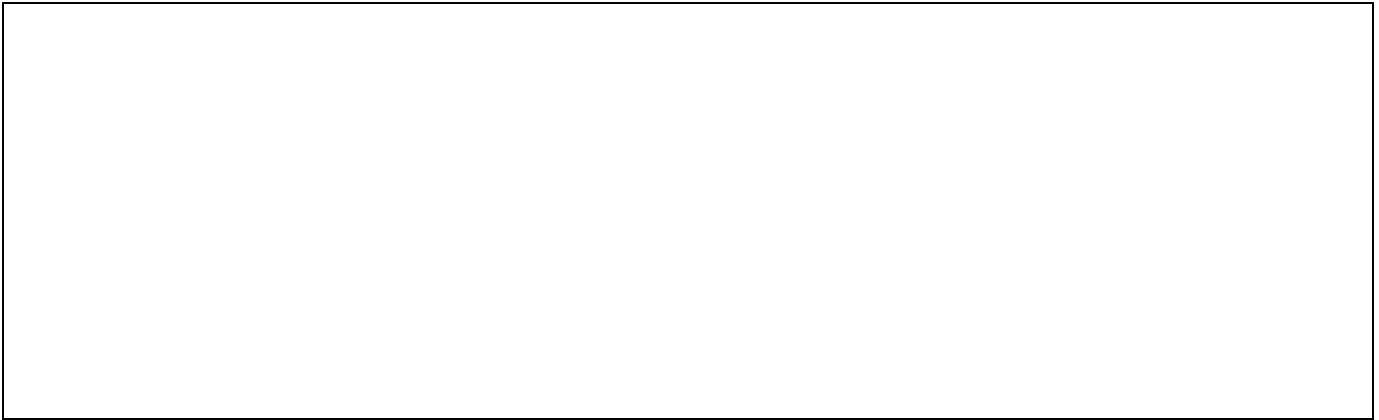
Do you remember the angle-sum property of a triangle? Yes/no

Explain it.

Let's extend these ideas to a quadrilateral.

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Draw any quadrilateral, say ABCD. Divide it into two triangles, by drawing a diagonal.



How many angles do you get? _____

Name all the angles.

You get six angles 1, 2, 3, 4, 5 and 6. Use the angle-sum property of a triangle and argue how the sum of the measures of $\angle A$, $\angle B$, $\angle C$ and $\angle D$ amounts to 360° .

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Name: _____

Worksheet-3

Skill: Procedural

Fluency

Topic- Proof of Angle sum property

Procedure:

- Draw a Quadrilateral ABCD on colour chart sheet.
- Cut such three more Quadrilaterals on three different colored sheets.
- Mark each angles as 1,2,3 and 4 on each quadrilaterals as shown in fig.



- Arrange all four angles of quadrilateral one from each colour at one point as



shown in the figure.

- What do you observe?

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Period 3

Lesson Objectives

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

- Know the properties of quadrilateral- sum of the measure of the exterior angles

Teaching Learning Materials required

- **Kinesthetic Activity: Worksheet-4** (1 per group); chalk piece (1 per group); projector (1 per class)

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 to 6

Lesson Beginning <u>Time:</u> 10 mins	<u>Home assignment review/Whole class</u> • Ask students about the home assignment. • At random call students to share the answers of the given questions.
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<u>Purpose:</u> Activate prior knowledge	- During the discussion ask the following question: - How did they arrive at an answer? Give justification for the same. - Build consensus on all the answers. <i>Note: Students may come up with incorrect answers. In this case, ask other students who may have the correct figures and answers to explain and justify. It is important to build consensus on all answers – this will help eradicate any errors.</i>
Lesson Middle <u>Time:</u> 20 mins <u>Purpose:</u> Generate interest to the topic Introduce the topic Develop conceptual understanding	<u>Kinesthetic activity/groups</u> - Tell students that they are going to find another property related to the sum of the exterior angles. - They will have to work in groups and remove the furniture of the class for this activity. - Each group will sit on a floor with some space to draw. - Give each group a chalk piece and a Worksheet-4 of instruction. - Give them 10 to 15 mins of time to complete the activity by following the instructions mentioned in worksheet-4. - Let them discover their findings related to the sum of exterior angles. <u>Whole class-discussion</u> - Project worksheet-4. - At random call groups to share how they have followed the instructions and what they discovered through this activity. - Build consensus that when they completed one turn, then $\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5 = 360^\circ$. This is true whatever be the number of sides of the polygon be, the sum of the measures of the external angles of any polygon is 360°. - After the discussion tell the students to attempt the last question given in worksheet-4 - Held a discussion how they figured out the solution. - Ask them to explain the steps used by them.

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	<i>Note: Students may come up with incorrect answer and steps. In this case, ask other students who may have the correct answer and steps to explain and justify. It is important to build consensus on all answers – this will help eradicate any errors.</i>
Lesson End <u>Time:</u> 5 mins <u>Purpose:</u> Consolidate students learning	<u>Home assignment</u> Tell the students to practice questions on Pg 44-Exercise 3.2 of NCERT Textbook.

Name: _____

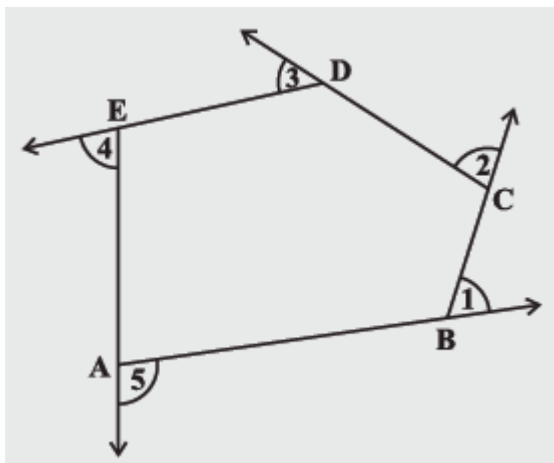
Worksheet-4

Skill: Procedural

Fluency

Topic- Sum of the measure of the exterior angles

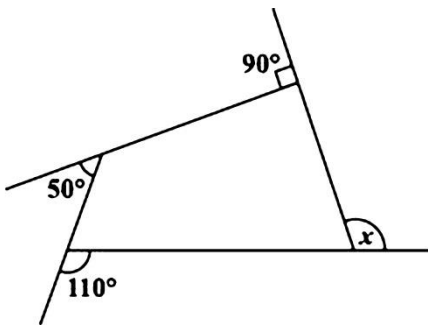
Draw a polygon on the floor, using a piece of chalk as shown here



Find the total measure of angles, i.e, $\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5$

[illegible]

Find measure x in the given figure.



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Period 4 and 5

Lesson Objectives

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

- Know about the types of quadrilaterals and their properties- parallelogram, rhombus, trapezium, kite;

Teaching Learning Materials required

- **Activity: Worksheet-5 (5A,5B,5C,5D;** 1 per group as mentioned in the sheet);
- **Worksheet-6** (1 per student)

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>Home assignment review/Whole class</u> • Tell students to take out their respective home assignment work. • At random call students to share the answers of the given questions. • During the discussion ask the following question: ○ How did they arrive at an answer? Give justification for the same. • Build consensus on all the answers. <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.</i>
Lesson Middle <u>Time:</u> 40 mins <u>Purpose:</u> Generate interest to the topic Introduce the topic Develop conceptual understanding	<u>Activity/groups</u> • Tell students that they are going to do an activity in four bigger groups. • Form 4 bigger groups. • Provide an instruction Worksheet-5 to each group as mentioned in the annexure. • Make a volunteer in each group to arrange the materials for the activity. • And another volunteer to give instructions to others to do the activity and make sure that all the students are involved in the activity.

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	• Give them time to do the activity. <u>Whole class-discussion</u> • Project Worksheet-5 respective to the presenting group. • One by one call the groups to share how they have followed the instructions and what they discovered through this activity. • Ask the following questions: ○ Which shape you get with the paper folding activity? ○ What are the elements/attributes/properties of this shape related to angles, sides, diagonals of the shape? • Make sure students cover all the necessary properties of all the shapes and make others understand about that. • In case they have shared the incorrect information ask them questions to reflect so that they can self-correct their error, rather than telling them their error and rectifying by you. • For example if they share, a quadrilateral having exactly two pair of parallel sides is called a trapezium. Then ask, are they sure that there is 2 pair of parallel lines? What do they mean by parallel lines? Etc. • Ask each group to check the work done by them by referring the information given there. • For this you can make them sit in groups and you can project on the big screen so that each group can see the information related to the respective quadrilaterals.
Lesson End <u>Time</u>: 25 mins <u>Purpose</u>: Consolidate students learning	<u>worksheet/groups</u> • Give them a Worksheet-6 and tell them to recall and fill in the table. • They need to discuss the properties of all kinds of quadrilateral in their respective groups and then fill in the information in their individual sheets. <u>Peer checking</u> • Tell students to exchange their sheets with their elbow partner or some other partner in the group.

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	• Project worksheet-6 • Discuss the answers provided by students • Later collect their sheets for review. <u>Home assignment</u> • Tell the students to practice questions on Pg 50 & Pg 55- Exercise 3.3& Exercise 3.4 of NCERT Textbook.
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Name: _____

Worksheet-5A

Topic: Trapezium

Group A

Materials required

- A4 sheets
- Markers
- Scissor

Procedure:

1. Make 3 identical congruent triangles of sides 3 cm, 4 cm, 5 cm.
2. Cut them out and arrange them in order to get a trapezium.
3. You get a trapezium. (Check it!)
4. Which are the parallel sides here? Should the non-parallel sides be equal?

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You can get two more trapeziums using the same set of triangles. Find them out and discuss their shapes.

What did you explore about the properties of trapezium.

Name: _____

Worksheet-5B

Topic: Kite

Group B

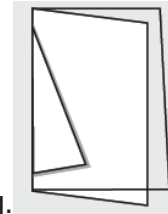
Materials required

- Thick white sheet
- Markers
- Geometrical tools

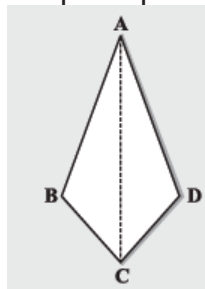
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Procedure:

1. Take a thick white sheet.
2. Fold the paper once.



3. Draw two line segments of different lengths as shown in Fig.
4. Cut along the line segments and open up.



5. You have the shape of a kite.
6. Has the kite any line symmetry?

7. Fold both the diagonals of the kite. Use the set-square to check if they cut at right angles. Are the diagonals equal in length?
8. Verify (by paper-folding or measurement) if the diagonals bisect each other.
9. By folding an angle of the kite on its opposite, check for angles of equal measure.
10. Observe the diagonal folds; do they indicate any diagonal being an angle bisector?
11. Share your findings with others and list them.

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Name: _____

Worksheet-5C

Topic: Parallelogram

Group C

Materials required

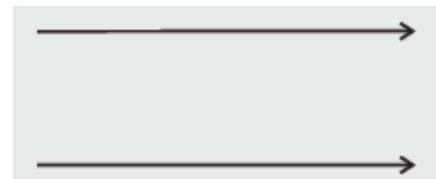
- Cardboard strips
- Paper
- Markers
- Scissor
- Geometrical tools

Procedure:

1. Take two different rectangular cardboard strips of different widths as shown in the figure:

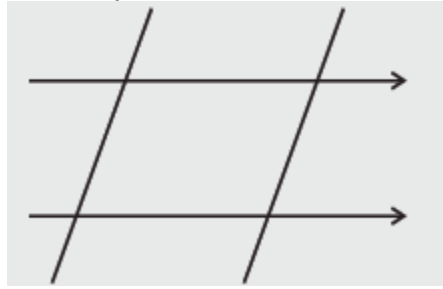


2. Place one strip horizontally and draw lines along its edge as drawn in the figure.



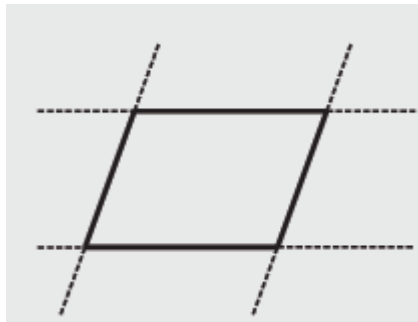
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3. Now place the other strip in a slant position over the lines drawn and use this



to draw two more lines as shown.

4. These four lines enclose a quadrilateral. This is made up of two pairs of



parallel lines.

5. What it is called and why?

6. Observe the sides and angles of a parallelogram and make a note of it. You can measure the length and angles before making the notes.



10. What can you conclude with the property of diagonals of a rhombus?

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper appears to be a standard notebook page or a sheet of stationery designed for writing.

Name: _____

Worksheet-6

Topic: Properties of different kinds of quadrilaterals

Fill in the given table:

Name of the quadrilateral with an image	Properties
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