BASIC EDUCATION ASSISTANCE FOR MINDANAO

THIRD YEAR - MATHEMATICS
PROPERTIES OF QUADRILATERALS
Module 12: Always Four-Sided

LEARNING GUIDE

DepED
DEPARTMENT OF EDUCATION

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INFORMATION ABOUT THIS LEARNING GUIDE

Recommended number of lessons for this Learning Guide: 5

Basic Education Curriculum Competencies

Year 3 Mathematics: Properties of Quadrilaterals

- Apply inductive and deductive skills to derive the properties of the diagonals of special quadrilaterals
  - rectangle
  - square
  - rhombus
- Manifest ability to solve practical problems involving types of quadrilaterals and their properties and the conditions that guarantee that a quadrilateral is a parallelogram
  - Apply inductive and deductive skills to derive certain properties of the trapezoid.
    - median of a trapezoid
    - base angles and diagonals of an isosceles trapezoid
  - Apply inductive and deductive skills to derive the properties of a parallelogram
    - each diagonal divides a parallelogram into two congruent triangles
    - opposite angles are congruent
    - non-opposite angles are supplementary
    - opposite sides are congruent
    - diagonals bisect each other

Objectives

At the end of this module, the students must be able to:

- define quadrilaterals
- name the different kinds of quadrilaterals
- determine the properties of the following quadrilaterals:
- parallelogram
- trapezoid
- rectangle
- rhombus
- square
- kite

Essential concepts, knowledge and understandings targeted

- A quadrilateral is a four-sided polygon. It is generally named by its vertices. Two sides with a common vertex are consecutive sides, otherwise they are opposite sides. Two angles with a common side are consecutive angles, otherwise they are opposite angles.
- Opposite angles of a parallelogram are congruent.
- The two nonopposite angles of a parallelogram are supplementary.
- A diagonal of a parallelogram divides the parallelogram into two congruent angles.
- Opposite sides of a parallelogram are congruent.
- The diagonals of a parallelogram bisect each other.
- In a rectangle/square, the diagonals are congruent.
- In a rhombus, each diagonal bisects opposite angles.
- In a rhombus, diagonals are perpendicular to each other.
- The sum of the measures of the angles of a quadrilateral is 360 degrees.

Specific vocabulary introduced

- quadrilateral - a polygon with four sides
- trapezoid - a quadrilateral with exactly one pair of parallel sides
- isosceles trapezoid - a quadrilateral whose legs are congruent, the base angles are congruent and the diagonals are congruent.
- parallelogram - a quadrilateral whose opposite sides are parallel and congruent
- diagonal - a line segment that joins two nonconsecutive vertices of a polygon (quadrilateral)
- rectangle - a quadrilateral with four right angles
- rhombus - a quadrilateral with four congruent sides
- square - a quadrilateral with four right angles and four congruent sides
- kite - a quadrilateral that has two pairs of congruent sides, but whose opposite sides are not congruent
- trapezium - a quadrilateral with no parallel sides

Suggested organizational strategies

- Have the classroom ready to accommodate groups of students to learn and explore the activities where they will feel at ease and comfortable to move and explore.
- Learners at various performance levels should be grouped and work together in small groups toward a common goal.
- Be prepared with the materials to be used by students in the different activities.
- Prepare enough and clear copies of the activity sheets prior to the lessons.

Activities in this Learning Guide

Activity 1: Figure, Picture, Quotation 'n One

Multiple Intelligences

- Interpersonal
- Visual/Spatial
- Body/Kinaesthetic
- Verbal/Linguistic
- Logical/Mathematical

Skills

- Understanding information
- Recognition of hidden meanings
- Organization of parts
- Grasp meaning
- Use information
- Predict, draw conclusions
- Observation and recall of information

Text Types

- Explanation
- Exposition
- Discussion

Activity 2: The Consensus

Multiple Intelligences

- Intrapersonal
- Verbal/Linguistic
- Logical/Mathematical

Skills

- Understanding information
- Use information
- Observation and recall of information

Text Types

- Review
- Discussion

Activity 3: Crossword Puzzle

Multiple Intelligences

- Interpersonal
- Verbal/Linguistic
- Logical/Mathematical

Skills

- Knowledge of major ideas
- Seeing patterns
- Use information
- Observation and recall of information

Text Types

- Exposition

Activity 4: The Properties

Multiple Intelligences

- Interpersonal
- Verbal/Linguistic
- Logical/Mathematical

Skills

- Understanding information
- Knowledge of major ideas
- Use information
- Observation and recall of information

Text Types

- Procedural Recount
- Discussion

Activity 5: What's My Measure?

Multiple Intelligences

- Interpersonal
- Logical/Mathematical

Skills

- Understanding information
- Organization of parts

- Knowledge of major ideas
- Seeing patterns
- Mastery of subject matter
- Solve problems using required skills or knowledge

Text Types

- Explanation
- Exposition
- Discussion

Activity 6: Find the Right Word

Multiple Intelligences

- Interpersonal
- Logical/Mathematical

Skills

- Understanding information
- Organization of parts
- Knowledge of major ideas
- Grasp meaning
- Mastery of subject matter
- Use information

Text Types

- Exposition
- Personal Response

Activity 7: Solve Perfectly

Multiple Intelligences

- Interpersonal
- Logical/Mathematical

Skills

- Understanding information
- Knowledge of major ideas
- Mastery of subject matter
- Solve problems using required skills or knowledge
- Identification of components

Text Types

- Explanation
- Discussion

Activity 8: "In or Out?"

Multiple Intelligences

- Interpersonal
- Verbal/Linguistic
- Logical/Mathematical

Skills

- Understanding information
- Organization of parts
- Generalize from given facts
- Knowledge of major ideas
- Seeing patterns
- Mastery of subject matter
- Use information
- Solve problems using required skills or knowledge
- Observation and recall of information
- Identification of components

Text Types

- Procedural Recount
- Discussion

Activity 9: The Final Consensus

Multiple Intelligences

- Intrapersonal
- Verbal/Linguistic
- Logical/Mathematical

Skills

- Understanding information
- Generalize from given facts
- Knowledge of major ideas
- Mastery of subject matter
- Predict, draw conclusions

Text Types

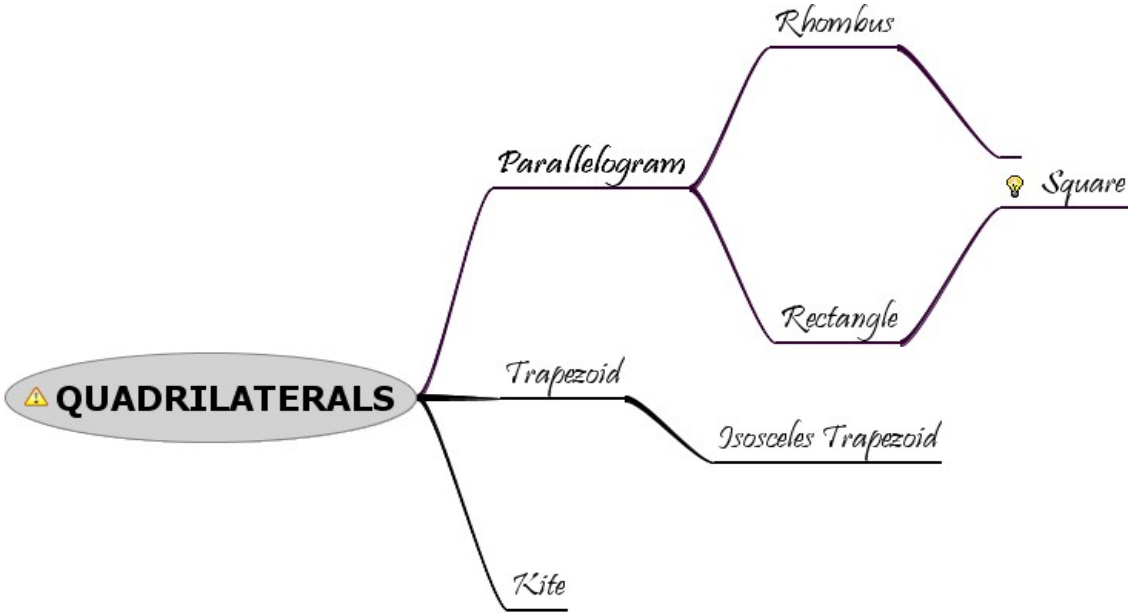
- Explanation

Key Assessment Strategies

- Puzzle
- Performance Test (Paper-pencil test)
- Games
- Integrated Learning

Mind Map

The Mind Map displays the organization and relationship between the concepts and activities in this Learning Guide in a visual form. It is included to provide visual clues on the structure of the guide and to provide an opportunity for you, the teacher, to reorganize the guide to suit your particular context.



Stages of Learning

The following stages have been identified as optimal in this unit. It should be noted that the stages do not represent individual lessons. Rather, they are a series of stages over one or more lessons and indicate the suggested steps in the development of the targeted competencies and in the achievement of the stated objectives.

Assessment

All six Stages of Learning in this Learning Guide may include some advice on possible formative assessment ideas to assist you in determining the effectiveness of that stage on student learning. It can also provide information about whether the learning goals set for that stage have been achieved. Where possible, and if needed, teachers can use the formative assessment tasks for summative assessment purposes i.e as measures of student performance. It is important that your students know what they will be assessed on.

1. Activating Prior Learning

This stage aims to engage or focus the learners by asking them to call to mind what they know about the topic and connect it with their past learning. Activities could involve making personal connections.

Background or purpose

This first stage activates what students have learned previously on polygons specifically on the classifications of quadrilaterals. Out of the jigsaw puzzle pieces, they will form a figure associated with a picture and a mathematics quotations. They will discuss about it in the class.

Strategy

JIGSAW PUZZLE. A puzzle that requires to reassemble a picture/figure that has been mounted on a stiff base and cut into interlocking pieces. This aims to tap students' visual/spatial intelligence.

Materials

6 different sets of jigsaw puzzle pieces found on pages 21-26, 6 sheets of $\frac{1}{4}$ sizes of manila paper paste/glue, masking tape

Activity 1: "Figure, Picture, Quotation 'n One"

Organize the class into six groups. Distribute to each group a set of jigsaw puzzle pieces to form a picture/figure. You can make this as a contest where every group must work fast to finish ahead from others. Expect them to form six different quadrilaterals as shown under **Teacher Resource Sheet 1, *Figure, Picture, Quotation 'n One*** on pages **21-26**. After forming the figure, let them paste it on a manila paper, describe the shape they have formed and explain briefly the Mathematics quotation found therein. Instruct each group to clap their hands if they finish the task. When all the groups are through, let them post their works on the board for discussions. Have each group a reporter to present their common understanding of the figure and the quotation.

Here are the figures and the corresponding Mathematics quotations.

Parallelogram - *"The highest form of pure thought is in Mathematics."*

Rectangle - *"Pure Mathematics is the poetry of logical ideas."*

Rhombus – *"Mathematics is the queen of the sciences."*

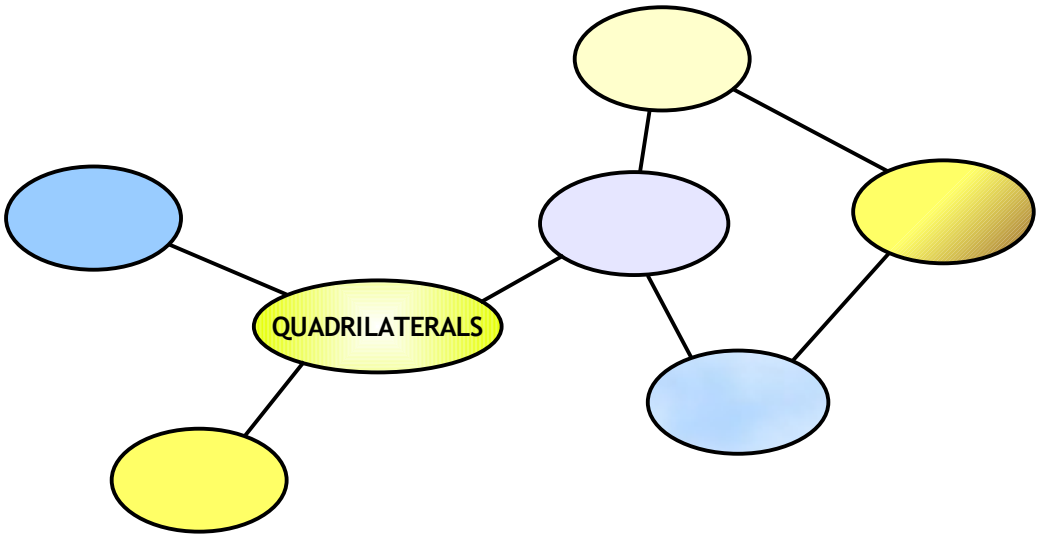
Square - *"The essence of Mathematics is not to make simple things complicated, but to make complicated things simple."*

Trapezoid - *"Math is like love - a simple idea but it can get complicated."*

Kite - *"Mathematics consists of providing the most obvious thing in a least obvious way."*

Formative Assessment

A. Ask students to complete the mind map on classifying quadrilaterals using the words from the Answer Bank.



ANSWER BANK:

square	parallelogram	rhombus
rectangle	kite	trapezoid

Roundup

Students had gained an initial understanding of a quadrilateral and its classifications according to the properties of the sides, angles and diagonals.

2. Setting the Context

This stage introduces the students to what will happen in the lessons. The teacher sets the objectives/expectations for the learning experience and an overview how the learning experience will fit into the larger scheme.

Background or purpose

In presenting the context of this lesson, students will be asked whether they agree or disagree on certain statements on the basic concepts of quadrilateral and its classifications using the Agree and Disagree Chart. This aims to measure how far they have gone through the basic properties of a quadrilateral.

Strategy

AGREE AND DISAGREE CHART. A strategy that elicits prior understanding of the students as to whether they agree or disagree certain statements and later give reasons for the in depth understanding of the stipulated concept.

Materials

Agree and Disagree Chart on page 27, marking pen, masking tape

Activity 2: "The Consensus"

Post the AGREE AND DISAGREE CHART on the board and ask students to raise their hands accordingly if they agree or disagree each statement. Tally their responses in the BEFORE columns.

Refer to **Teacher Resource Sheet 2, *The Consensus*,** on page 27 for the Agree and Disagree Chart.

Roundup

Students had gained understanding based on their analysis of the statements supported by their previous knowledge and experiences on the study of a quadrilateral.

3. Learning Activity Sequence

This stage provides the information about the topic and the activities for the students. Students should be encouraged to discover their own information.

Background or purpose

Students at this stage will explore on the different classifications of quadrilaterals and discover more facts and ideas on the properties of their sides, angles and diagonals through guided activities and discovery approaches.

Strategies

- **COOPERATIVE LEARNING**. A strategy incorporated by games, structures or group tasks used as basic tool for group work skills. The activities prepared have definite aims and purpose and should not be seen in isolation but as an overall part of the learning environment. This strategy intends to tap students' mathematical and interpersonal intelligences.
- **CROSSWORD PUZZLE**. A strategy that enhances the logical thinking of the students and aims to tap their interpersonal and mathematical intelligences.
- **BUZZ SESSIONS**. This strategy aims to maximize students' engagement and to tap their verbal/linguistic and mathematical intelligences through answering questions or solving problems and come up to some kind of conclusion.

Materials

Student Activity Sheet 3, Crossword Puzzle Worksheets on pages 28-29

Activity 3: "Crossword Puzzle"

To unlock the terms used in this lesson, begin this stage by providing your students in groups a Crossword Puzzle as a simple recall of the mathematical terms used to describe the basic concepts of polygons and of quadrilaterals. Refer to pages 28-29 of this learning guide for the puzzle.

These are the answers of the given puzzle.

DOWN:	**ACROSS:**
1. parallelogram	*2. rectangle*
2. rhombus	*4. trapezoid*
3. quadrilateral	*6. diagonal*
5. parallel	*7. square*
8. kite	*9. angle*
	10. vertex

When students are finished, check their answers and then provide a visual aid showing the definitions of the given terms above for their reference in the next activity.

Activity 4: "The Properties"

Let the same groups discuss this next activity and be able to come up with inferences on properties of quadrilaterals. Ask each group to report their results of their short discussions to the whole class using a table with the following options in preparing it:

Option 1: You may write this table in a manila paper and post on the board.

Option 2: You may provide worksheet to each group with this table.

WHAT TO DO:

Complete the table by answering *"yes"*, *"sometimes"*, or *"at least 1"*.

PROPERTY	Square	Rhombus	Rectangle	Parallelogram	Trapezoid	Kite
1. opposite sides parallel						
2. opposite sides equal						
3. opposite angles equal						
4. all sides equal						
5. all angles equal						
6. diagonals equal						
7. diagonals bisect each other						
8. diagonals meet at right angles						
9. diagonals bisect the angles at the vertices						

Adapted from: Core Skills Mathematics 10 from Haese & Harris Publications, Adelaide, SA

Process the inferences they have presented using the following key concepts.

SQUARE

In any square:

- opposite sides are parallel
- all sides are equal in length
- all angles are right angles
- diagonals bisect each other at right angles
- diagonals bisect the angles at each vertex

RHOMBUS

In any rhombus:

- opposite sides are parallel
- opposite angles are equal in size
- diagonals bisect each other at right angles
- diagonals bisect the angles at each vertex

RECTANGLE

In any rectangle:

- opposite sides are equal in length
- diagonals are equal in length
- diagonals bisect each other

PARALLELOGRAM

In any parallelogram:

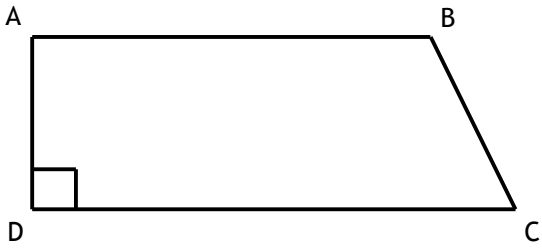
- opposite sides are equal in length
- opposite angles are equal in size
- diagonals bisect each other

TRAPEZOID

In any trapezoid:

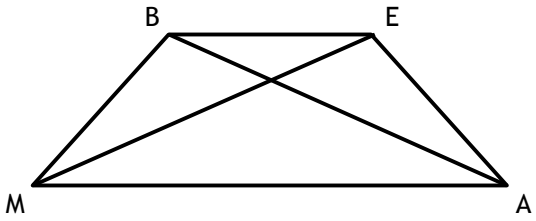
- one pair of opposite sides is parallel

Below is an example of a trapezoid.



$\overline{AB}$ || $\overline{DC}$ ("||" is read as "is parallel to"). $\overline{AD}$ and $\overline{BC}$ are the legs of trapezoid ABCD. One special kind of a trapezoid is an ***isosceles trapezoid***.

In an **isosceles trapezoid**, the legs are *congruent*, the base angles are *congruent* and the diagonals are *congruent*.



Isosceles Trapezoid **BEAM**

$\overline{BE}$ || $\overline{MA}$. $\overline{BM}$ and $\overline{EA}$ are the congruent legs; $\angle M$ and $\angle A$ are congruent; and the diagonals, ME and AB are congruent.

Given the trapezoid MATH and $\overline{EN}$ joining the midpoints of its legs.

$\overline{EA} \cong \overline{NT}$; $\overline{EM} \cong \overline{NH}$; and $\overline{EN}$ is the median of the trapezoid.

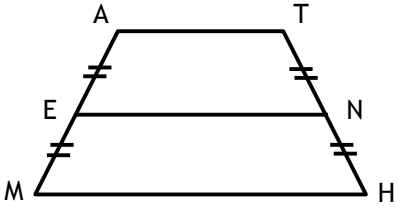


Figure 1

***Note**: The following key points will serve as an example for you to show the relationships of the bases of a trapezoid to its median. The given figure below is too small, so make similar isosceles trapezoid with larger lengths when you present these concepts.*

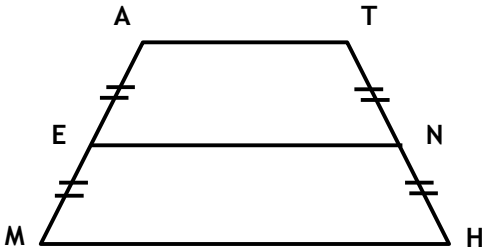


Figure 2

In figure 2, quadrilateral MATH is an isosceles trapezoid.

Questions:

1. Using a ruler, measure the lengths of the bases of the trapezoid and the median $\overline{EN}$.
2. Compare the length of the median $\overline{EN}$, to the sum of the bases, $\overline{AT}$ and $\overline{MH}$?
3. What relationship can you establish with the median of a trapezoid to its bases?

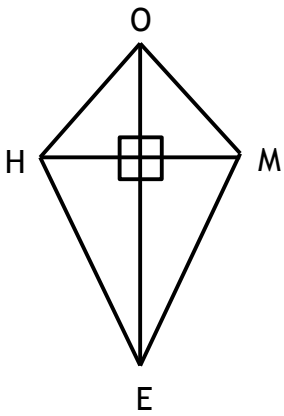
The above figure shows that the bases, $\overline{AT}$ and $\overline{MH}$, measure 3 cm and 9 cm respectively. The median $\overline{EN}$ = 6 cm which means that the length of the median of an isosceles trapezoid is equal to one-half of the sum of the lengths of its bases.

Another kind of a quadrilateral is a ***trapezium*** having no parallel sides. This needs to be emphasized that a **trapezium is not a trapezoid**; hence a trapezoid has one pair of opposite sides which is parallel.

KITE

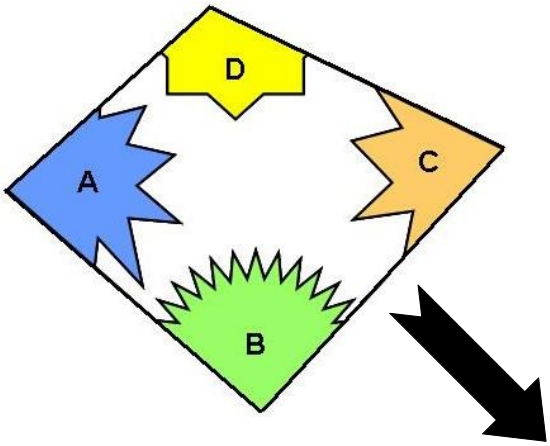
In any kite:

- diagonals are perpendicular to each other
- two pairs of distinct adjacent sides are equal in length



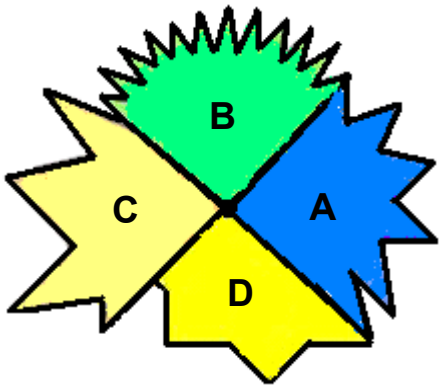
Quadrilateral HOME is a kite. Diagonals $\overline{HM}$ and $\overline{OE}$ are perpendicular to each other and form 90° angle. $\overline{HO}$ and $\overline{MO}$ and $\overline{HE}$ and $\overline{ME}$ are the two pairs of distinct adjacent sides which are equal in length.

A **quadrilateral** is a plane figure with four straight sides whose sum of the interior angles is 360 degrees.



A **quadrilateral** can be drawn accurately on a piece of paper. Ask students to get a sheet of paper to explore the angles of a quadrilateral.

If the four angles are torn off and reassembled at a point, we notice that the angle sum is 360°.



The above illustration shows us that the sum of the measures of the interior angles of a quadrilateral is exactly 360°.

Given the figure at the right. Find the value of x in the quadrilateral.

Formative Assessment

Ask students to solve on the board the exercises provided under **Teacher Resource Sheet 3, *What's my Measure?*,** on pages 30-31. You may print it in a manila paper and post on the board or prepare them as activity sheets.

Roundup

Students were able to determine and name the properties of quadrilaterals.

4. Check for Understanding of the Topic or Skill

This stage is for teachers to find out how much students have understood before they apply it to other learning experiences.

Background or purpose

To assess how far students have gained knowledge on the properties of quadrilaterals, they will respond the task provided in this stage and be able to arrive at the correct answers that satisfy the given information.

Strategy

QUIZZICALS. After a presentation, students working in pairs solve the tasks together that focus on the presentation of the concepts. These questions are based on the learning performance objectives provided to the students at the beginning of the topic.

Material

Student Activity Sheet 6 – page 32

Activity 6: "Find the Right Word"

Let the students work in pairs and complete the task given under **Student Activity 6, *Find the Right Word*,** on page 32. Provide each pair an activity sheet where they will write their answers.

Formative Assessment

Have the students solve individually the given exercises to check their complete understanding of the topic. Refer to **Student Activity 7, *Solve Perfectly*,** on page 33.

Roundup

Students have gained proficiency in solving problems involving the properties of quadrilaterals.

5. Practice and Application

In this stage, students consolidate their learning through independent or guided practice and transfer their learning to new or different situations.

Background for Teachers

The activity under this stage will set students to understand that many types of quadrilaterals exist and that these shapes have some properties in common. Refer to page 35 of this Learning Guide for some key points for you to consider/highlight as an additional input to avoid further misconceptions to students.

Strategy

VENN DIAGRAM. This is a diagram that illustrates the relationship between and among two or more sets. This helps to make thinking visible which is useful for finding similarities and differences.

Materials

A set of quadrilaterals, pages 36-37

Manila paper, marking pen, pair of scissors, masking tape

Activity 8: "In or Out?"

Ask students this time to go back to their original group. Provide each group a set of quadrilaterals found under **Teacher Resource Sheet 4**, ***In or Out?*,** on pages 36-37 , manila paper, marking pen, pair of scissors and masking tape. You may give immediately the sheets and ask them to cut the figures. Before starting the activity, provide a short discussion to students about **Venn Diagram** and how it will be used. Refer this on page 34 of this Learning Guide.

When all groups are ready, let them perform the following tasks.

TASKS:

1. Let them name each of the given quadrilaterals.
2. Distribute **Student Activity 8, *Where They Belong?*,** found on page 38 and ask them to complete the table by following the given directions.
3. Let them determine and write the appropriate name of each category in the third row under each column as ***Trapezoids***, ***Parallelograms*** or ***Trapeziums***.
4. Finally, instruct them to construct one **Venn Diagram** in each of the following relationships using the set of quadrilaterals. Indicate the names of these quadrilaterals (if any) inside the rings, its similarities in the ***inner ring*** and their differences in two ***outer rings***. You may show to them the completed **Venn Diagram** on page 39 as an example.

RELATIONSHIP	LEFT RING	RIGHT RING
1	*All angles are congruent*	*All sides are of equal lengths*
2	*No right angles*	*One pair of opposite angles is equal*
3	*All sides have the same lengths*	*At least one acute angle*
4	*At least one pair of parallel sides*	*At least one obtuse angle*

Let each group present and discuss their output with the whole class. Facilitate the discussion and always check their responses to the tasks.

Formative Assessment

After presenting their output, encourage each group to make a **Quadrilateral Family Tree**. Lead them to use the different properties of quadrilaterals in presenting this diagram. The **Quadrilateral Family Tree** may look like the ones shown on page 40 of this Learning Guide.

Roundup

With the activities provided in this stage, students had gained knowledge and mastery of the concepts on properties of quadrilaterals. These skills will be very useful for the next learning stage when they respond to the Agree and Disagree Chart – After columns.

6. Closure

This stage brings the series of lessons to a formal conclusion. Teachers may refocus the objectives and summarize the learning gained. Teachers can also foreshadow the next set of learning experiences and make the relevant links.

Background or purpose

Students will revisit the Agree and Disagree Chart and check appropriately as to whether they agree or disagree the statements after they understood the properties of quadrilaterals.

Strategy

AGREE AND DISAGREE CHART REVISIT. A strategy that elicits actual understanding of the students from the topic discussed as to whether they agree or disagree with certain issues/statements. Later, they will prove their reasons in a convincing manner based from the stipulated concept.

Materials

Agree and Disagree Chart on page 27, marking pen, masking tape

Activity 9: "The Final Consensus"

Post again the **Agree and Disagree Chart** and let the students answer each statement in the table. Ask them to raise their hands whether they agree or disagree each statement. Tally this time the results under **AFTER** columns and later, let them compare their previous answers under **BEFORE** columns. You may ask volunteers to explain and give proofs in the given statements. Refer again to page 27 of this Learning Guide for the chart.

Roundup

Students now have clearer understanding on the properties of quadrilaterals and ready for the next course of study in Geometry.

Teacher Evaluation

(To be completed by the teacher using this Teacher's Guide)

The ways I will evaluate the success of my teaching this unit are:

1.

2.

3.

TEACHER RESOURCE SHEET 1
"Figure, Picture, Quotation 'n One"

Directions: Given the puzzle, carefully cut the figure along the lines to have puzzle pieces. Place these in a cellophane.

PARALLELOGRAM

TEACHER RESOURCE SHEET 1
"Figure, Picture, Quotation 'n One"

Directions: Given the puzzle, carefully cut the figure along the lines to have puzzle pieces. Place these in a cellophane.

RECTANGLE

TEACHER RESOURCE SHEET 1
"Figure, Picture, Quotation 'n One"

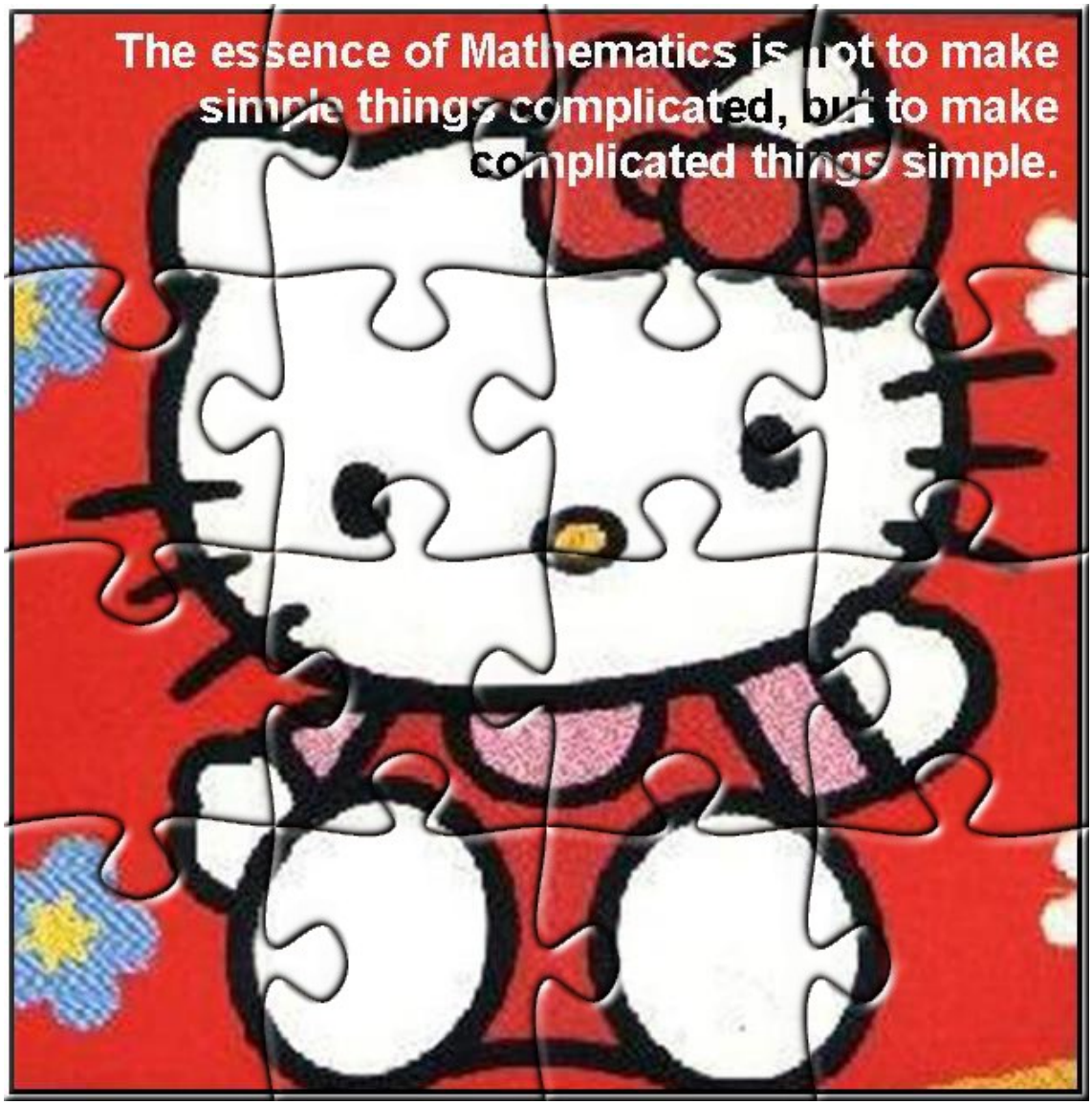
Directions: Given the puzzle, carefully cut the figure along the lines to have puzzle pieces. Place these in a cellophane.

RHOMBUS

TEACHER RESOURCE SHEET 1
"Figure, Picture, Quotation 'n One"

Directions: Given the puzzle, carefully cut the figure along the lines to have puzzle pieces. Place these in a cellophane.

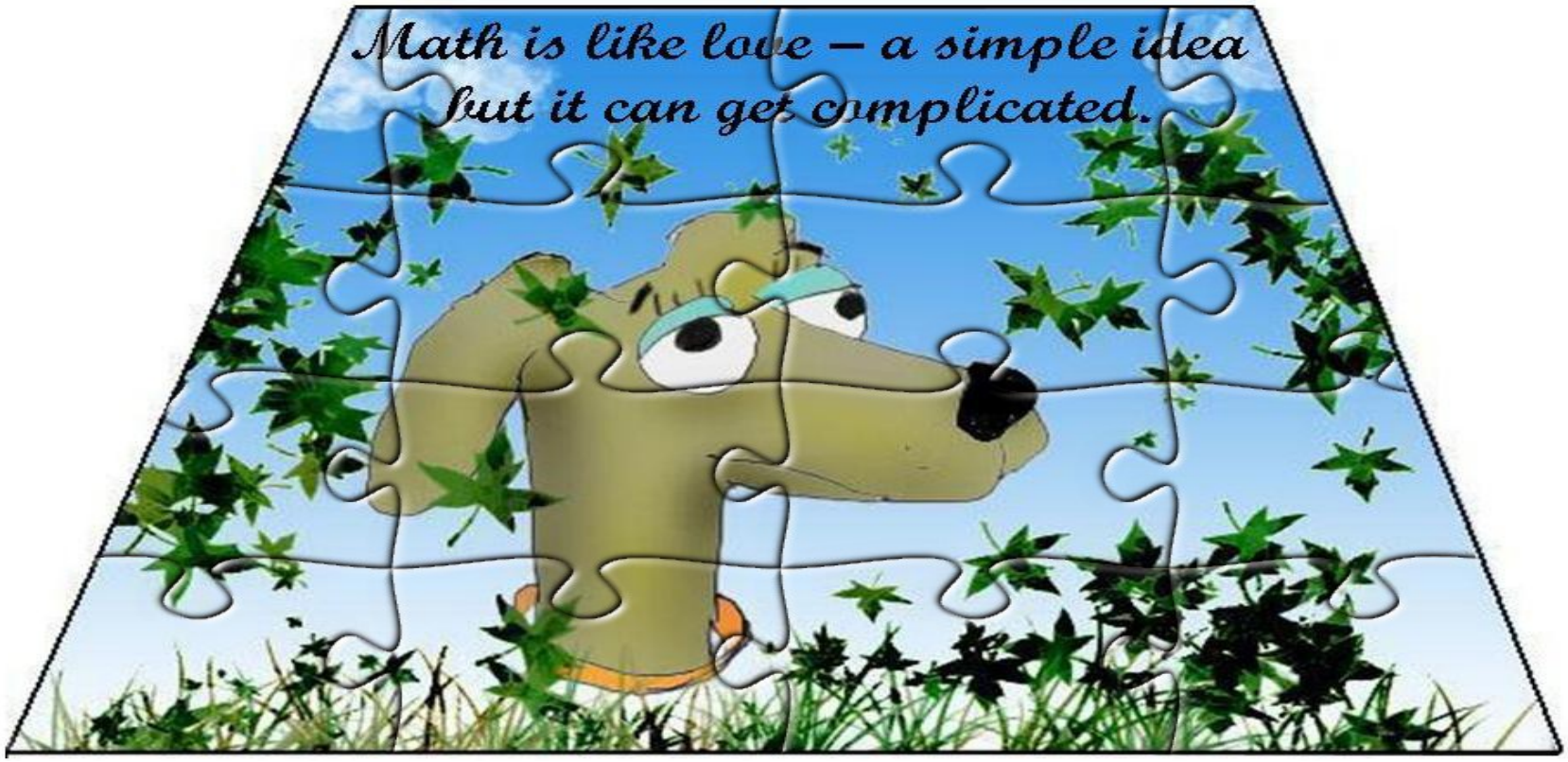
SQUARE



TEACHER RESOURCE SHEET 1
"Figure, Picture, Quotation 'n One"

Directions: Given the puzzle, carefully cut the figure along the lines to have puzzle pieces. Place these in a cellophane.

TRAPEZOID



TEACHER RESOURCE SHEET 1
"Figure, Picture, Quotation 'n One"

Directions: Given the puzzle, carefully cut the figure along the lines to have puzzle pieces. Place these in a cellophane.

KITE

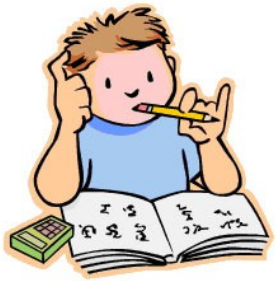
TEACHER RESOURCE SHEET 2
"The Consensus"

Directions: Prepare a bigger chart similar to what is given below.

AGREE AND DISAGREE CHART

STATEMENT	BEFORE		AFTER	
	Agree	Disagree	Agree	Disagree
1. A square is not a rectangle.				
2. The sum of the measures of the angles of a quadrilateral is equal to the sum of the measures of the angles of two triangles.				
3. A square is both a rectangle and a rhombus.				
4. A rectangle is a square.				
5. The sum of the exterior angles of a quadrilateral is 360°.				
6. In any rhombus, diagonals bisect each other at right angles.				
7. The consecutive angles of a rhombus are supplementary.				
8. All rectangles that have the same area are congruent.				
9. Changing the shape of a plane figure by rearranging its parts also changes its area.				
10. Problems about areas can be solved only by using the appropriate formulas.				

STUDENT ACTIVITY 3
Crossword Puzzle
Worksheet 1



Directions: Complete the Crossword Puzzle below by writing the empty boxes with a correct word.

1	■	2								■	3
	■		■	■	■	■	■	■	■	■	
	■		■	■	■	■	■	■	■	■	
	■		■	4			5				
	■		■	■	■	■		■	■	■	
	■		■	■	■	■		■	■	■	
	■		■	■	6						
	■	■	■	■	■	■		■	■	■	
	■	■	■	■	■	■		■	■	■	
	■	7						■	8	■	
	■	■	■	■	■	■		■		■	
9					■	■	■	■		■	
	■	■	■	■	10					■	

STUDENT ACTIVITY 3
Crossword Puzzle
Worksheet 2

DOWN

1. A quadrilateral whose opposite sides are parallel and congruent
2. A quadrilateral with four congruent sides
3. A polygon having four sides
5. A condition where lines do not intersect and are equidistant to each other
8. A quadrilateral that has two pairs of congruent sides, but whose opposite sides are not congruent

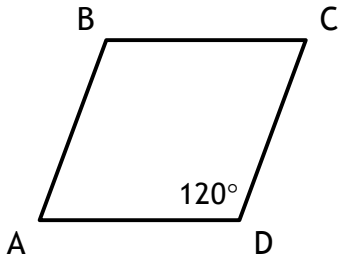
ACROSS

2. A quadrilateral with four right angles
4. A quadrilateral with exactly two parallel sides
6. A line segment that joins two nonconsecutive vertices of a polygon
7. A quadrilateral with four right angles and four congruent sides
9. A figure formed by two noncollinear rays/segments that have the same endpoint
10. The point of intersection of the two consecutive sides of a polygon

TEACHER RESOURCE SHEET 3
What's My Measure?

Directions: Find the measures of the missing angles. Write them in the figures.

1.



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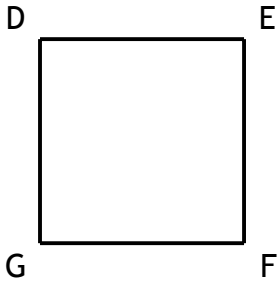

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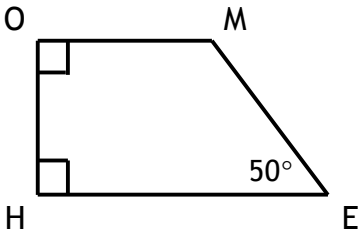

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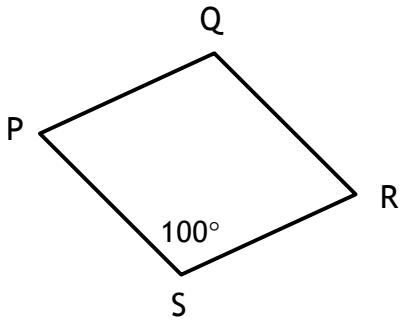

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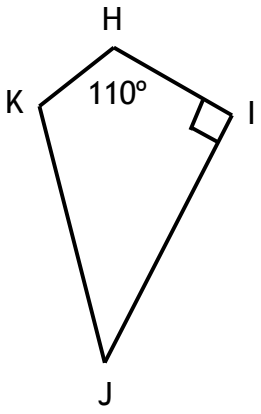

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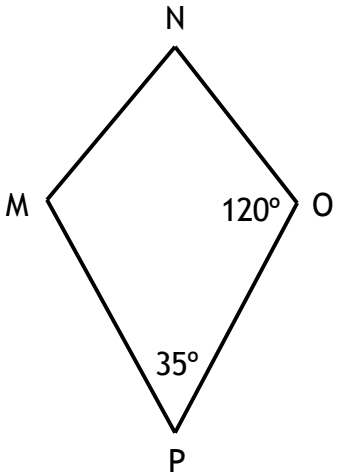

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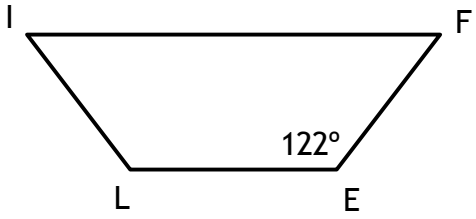

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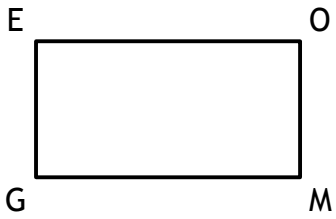

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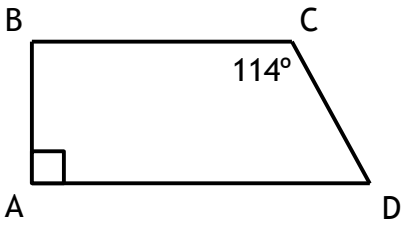

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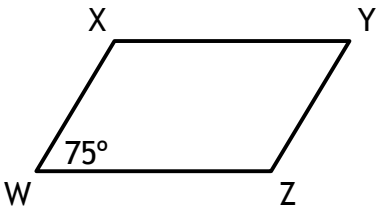

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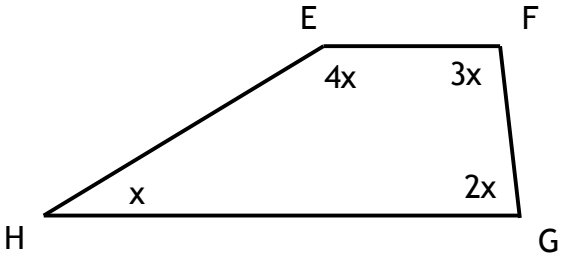

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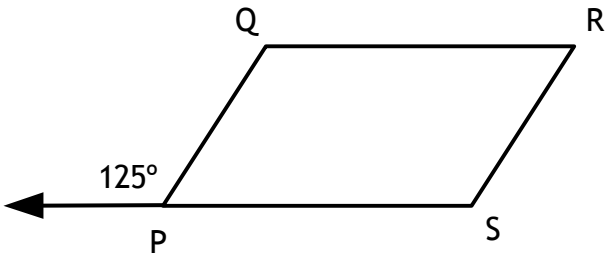


STUDENT ACTIVITY 6
Find the Right Word

Objective:

To identify the appropriate word/s that best describe the properties of quadrilaterals.

Directions:

Use the words from the **Answer Bank** below to complete the story about *Genamie* and her lessons on Geometry. One word may be used several times.

Genamie's Geometry teacher announced that the class would have a quiz on quadrilaterals the next day. That night Genamie began to study.

She noted that there are six classifications of quadrilaterals and they are named according to their properties. When all angles of a quadrilateral are right angles, it is a _____. In any _____, _____, or _____, diagonals are perpendicular to each other. _____ are line segments that joins two nonconsecutive vertices of a quadrilateral. She remembered what her teacher said that a square is a parallelogram with four _____ and four _____. From this definition, she understood that a square is either a _____ or a _____. If all sides of a parallelogram are congruent, then the parallelogram is a _____. Besides the general properties of quadrilaterals, the parallelogram has some properties of its own. Its opposite _____ and _____ are congruent.

When a quadrilateral has exactly one pair of parallel sides, it is a _____. A trapezoid is said to be an _____ when the legs are congruent, the base angles are congruent and the diagonals are congruent. A quadrilateral with no parallel sides is called _____.

There is one more quadrilateral that Genamie noted. A _____ is a quadrilateral with two distinct pairs of adjacent, congruent sides. Like a rhombus, the diagonals of a kite are _____ to each other. Finally, she kept in her mind that the sum of the _____ interior angles of every quadrilateral is _____.

The next day, Genamie felt confident when taking the quiz.

ANSWER BANK

rhombus	rectangle	square
diagonals	congruent sides	kite
trapezoid	angles	congruent angles
perpendicular	four	sides
360°	isosceles	trapezium

STUDENT ACTIVITY 7
Solve Perfectly

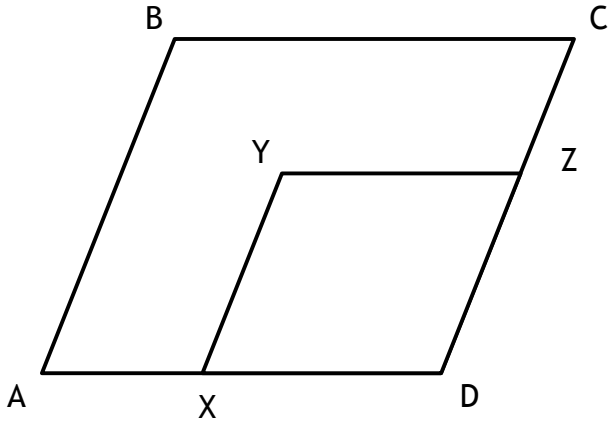
Directions:

Given the following figures, solve what are being asked.

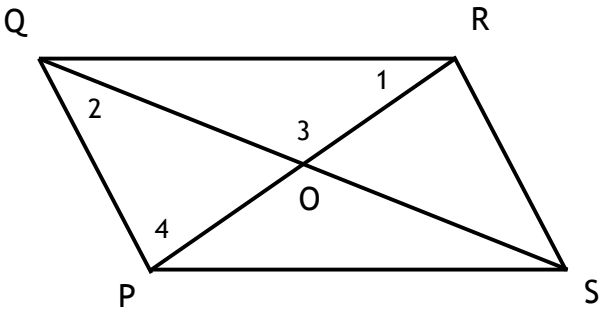
A. Given:ABCD and XYZD are rhombi. m∠D = 105°

Give the measures of the following angles:

1. ∠C
2. ∠B
3. ∠A
4. ∠Z
5. ∠Y
6. ∠DXY
7. ∠CZY
8. ∠AXY



B. $\overline{PR}$ and $\overline{QS}$ are diagonals of parallelogram PQRS.



1. If ∠1 = 35° and ∠2 = 40°, what is the measure of ∠3?
2. If m∠4 = 82, what is the measure ∠QRS?

WHAT IS VENN DIAGRAM?
Background for Teachers

VENN DIAGRAM

What Is It?

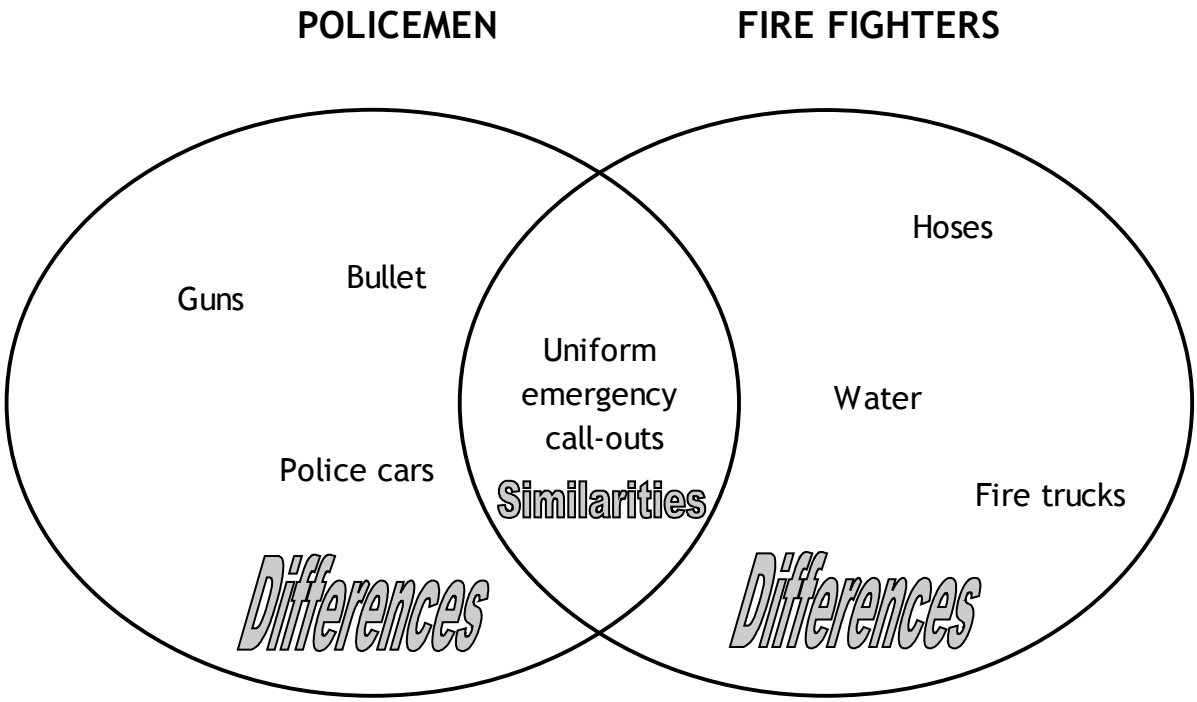
It is a diagram that illustrate the relationship between and among two or more sets.

How Can I Use It?

- Helps to make thinking visible.
- Useful for finding similarities and differences.

Example:

Show using a Venn Diagram the similarities and differences between Policemen and Fire Fighters.



BACKGROUND FOR TEACHERS

A common activity involving Geometry is for students to recognize and name various polygons. Their experiences with four-sided polygons may lack depth or may draw some misconceptions. For example, students are often taught to categorize rectangles and squares separately. Typically, a polygon with four equal sides is referred to as rectangle. We hear students refer to rectangles as being "long or "tall". Their system for differentiating between squares and rectangles is based on narrow experiences with few specific examples.

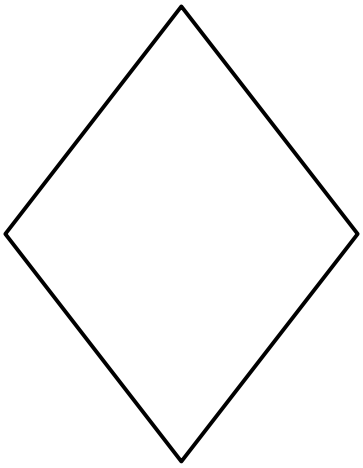
These constructions may cause confusion later as students learn that squares also fit the description of rectangles. This new information does not fit logically to what we have already learned, and it does not allow for growth in understanding that a square is a more specific classification of a parallelogram; and that a parallelogram is a specific classification of a quadrilateral. These shapes all fit in the quadrilateral "family".

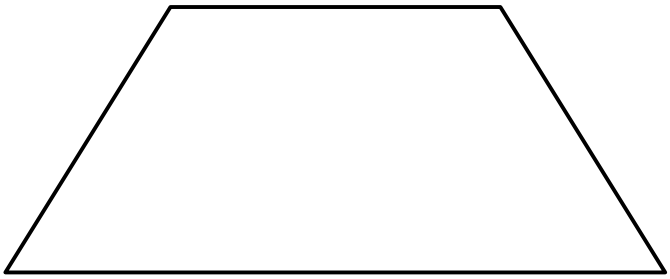
To aid understanding, teach quadrilaterals as a whole. Define quadrilateral as a four-sided figure and give students the opportunity to create a variety of quadrilaterals. They look for similarities and differences and sort them into several different categories according to their attributes. The sorting activity offers insight into the mathematical hierarchy used in classifying quadrilaterals. It will become clear that every quadrilateral falls into three categories:

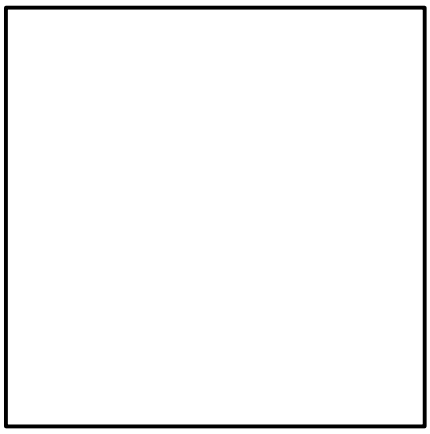
- those with two pairs of parallel sides,
- those with only one pair of parallel sides, and
- those with no parallel sides.

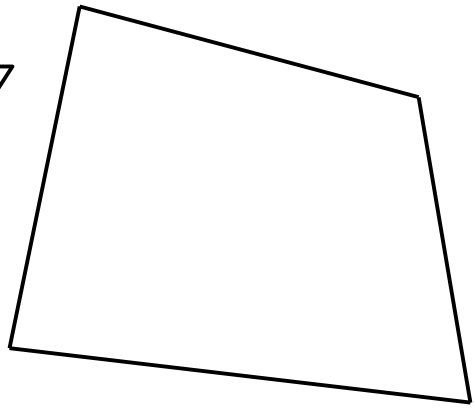
Source: http://www.uen.org/Lessonplan/preview.cgi?LPid=11235

TEACHER RESOURCE SHEET 4
"In or Out?"

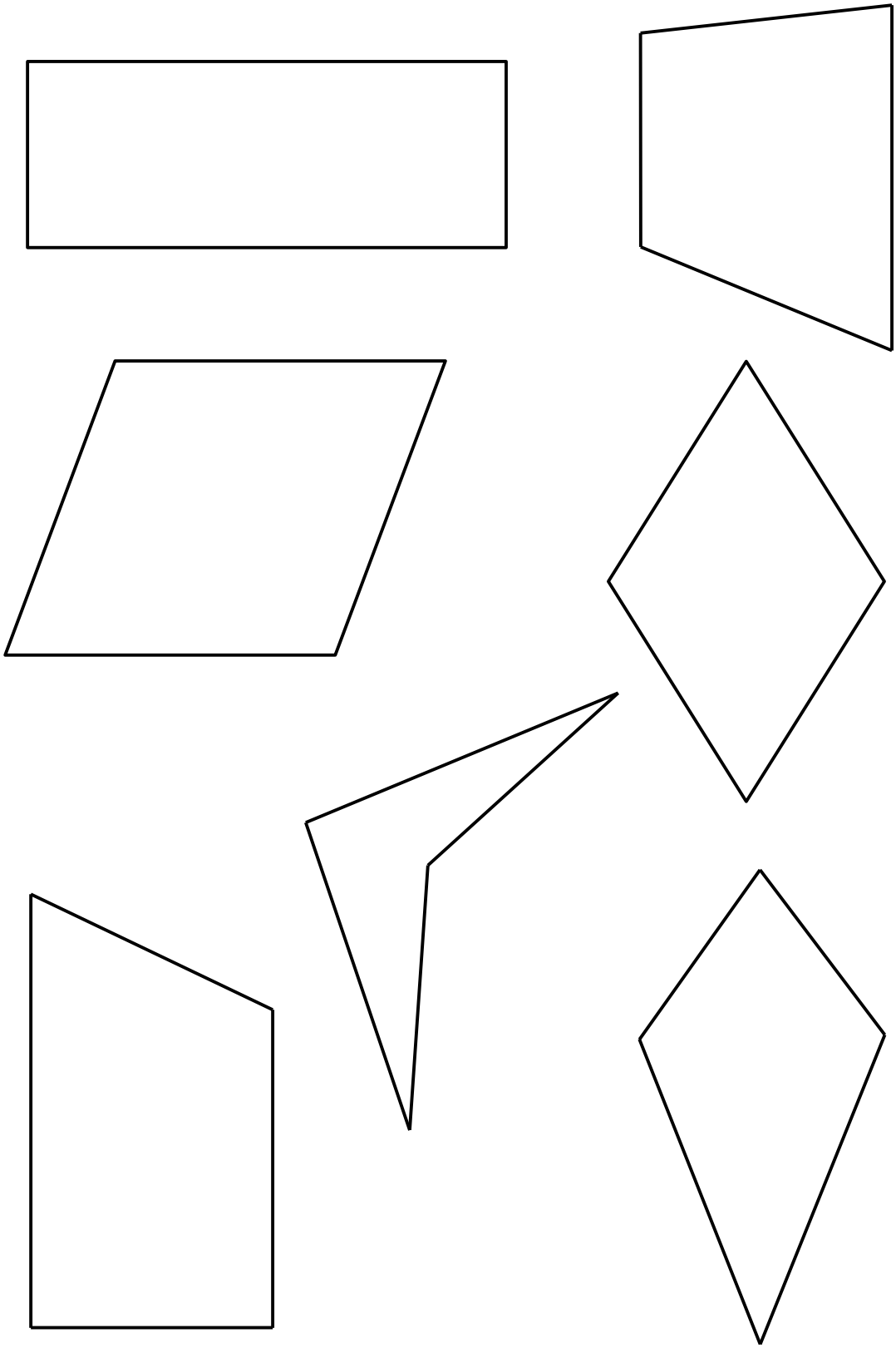








"In or Out?"



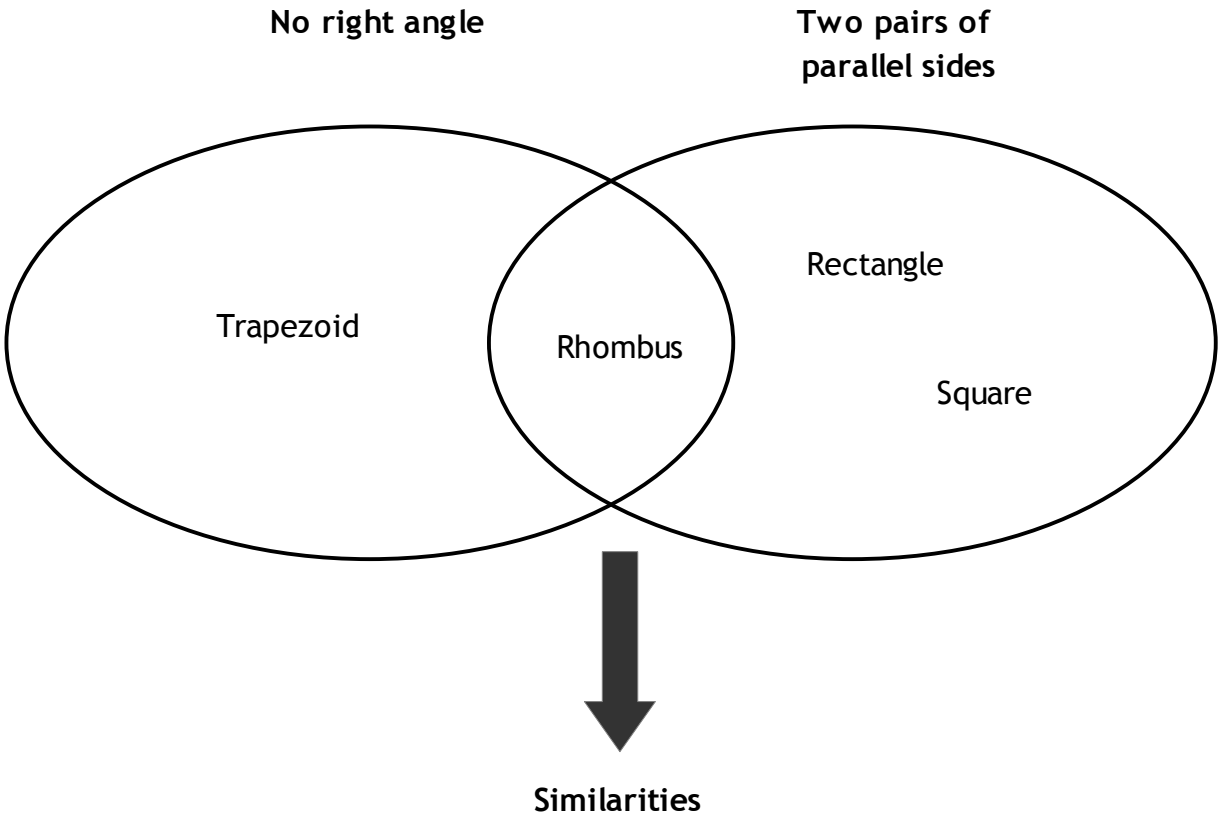
STUDENT ACTIVITY 8
Where They Belong?
Worksheet

Directions: Write the kind of quadrilaterals that can be classified under each category in every column. In the third row, write ***Trapezoids***, ***Parallelograms*** or ***Trapeziums*** on the appropriate column if each category describes the properties of these quadrilaterals.

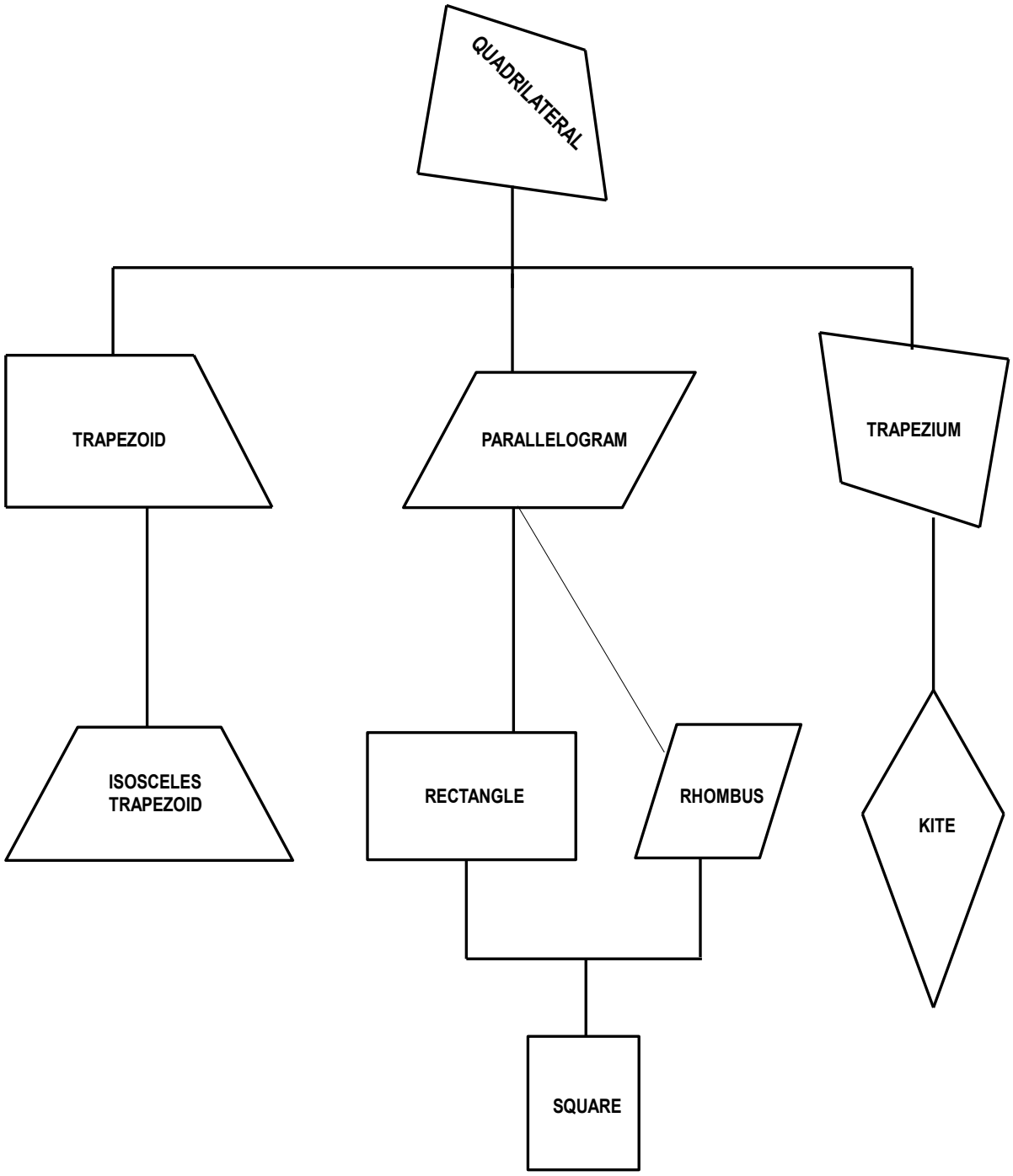
Quadrilaterals with one pair of parallel sides	Quadrilaterals with two pairs of parallel sides	Quadrilaterals with no parallel sides

COMPLETED VENN DIAGRAM
A Sample

LEFT RING	RIGHT RING
No right angle	Two sets of parallel sides



TEACHER RESOURCE SHEET 5
Quadrilateral Family Tree



For the Teacher: Translate the information in this Learning Guide into the following matrix to help you prepare your lesson plans.

Stage	1. Activating Prior Learning	2. Setting the Context	3. Learning Activity Sequence	4. Check for Understanding	5. Practice and Application	6. Closure
Strategies						
Activities from the Learning Guide						
Extra activities you may wish to include						
Materials and planning needed						
Estimated time for this Stage						

Total time for the Learning Guide | | Total number of lessons needed for this Learning Guide | |