PROBLEM SOLVING · Classify Plane Figures

Essential Question How can you use the strategy draw a diagram to classify plane figures?





Go DIGITAL Lesson Opener

Making Connections

Invite students to tell you what they know about figures.

What figures do you know? (Answers will vary.) What everyday things are quadrilaterals? (Answers will vary.) What everyday things are not quadrilaterals? (Answers will vary.)

Using the Digital Lesson

Model different figures with objects in the room. Have students identify the quadrilaterals.

Learning Task

What is the problem the students are trying to solve? Connect the story to the problem.

- What is the problem asking you to find? (the differences between guadrilaterals and other polygons)
- How many sides does a guadrilateral have? (4)
- What are other closed figures that do not have four sides called? (polygons) •

Literacy and Mathematics

View the lesson opener with the students. Then, choose one or more of the following activities.

- Have students write a short story about a road trip that they took or would like to take. Have them mention different figures in their story.
- Write the word sort on the board. Explain the different meanings of the word and have students write a sentence for each meaning of the word.

Texas Essential Knowledge and Skills

TEKS Geometry and Measurement—3.6.A

Classify and sort two- and three-dimensional solids, including cones, cylinders, spheres, triangular and rectangular prisms, and cubes, based on attributes using formal geometric language Also 3.6.B

MATHEMATICAL PROCESSES

3.1.B Use a problem-solving model 3.1.D Communicate mathematical ideas and reasoning

Are You Ready?

Access Prior Knowledge

Use the Are You Ready? 15.3 in the Assessment Guide to assess students' understanding of the prerequisite skills for this lesson.

Vocabulary Venn diagram



Multimedia eGlossary at DIGITAL thinkcentral.com



For the student



Student Edition provides students with an interactive learning environment!

For the teacher

Digital Management Center organizes program resources by TEKS!







Online Assessment System



Soar to Success Math **Online Intervention**



Unlock the Problem

Make sure students understand how to use a Venn diagram. This Venn diagram shows how sets of things, in this case, rectangles and rhombuses, are related. Discuss the attributes of rectangles: four right angles, two pairs of opposite sides that are parallel, and two pairs of sides of equal length.

- Which of these characteristics are also characteristics of rhombuses? 4 sides of equal length, 2 pairs of opposite sides that are parallel
- What are some characteristics of rhombuses that do not apply to all rectangles? Possible answer: rectangles do not always have 4 sides of equal length.
- Why do squares fit in both categories? Squares have all the characteristics of both rhombuses and rectangles: 4 sides of equal length, 2 pairs of opposite sides that are parallel, and 4 right angles.

Go Deeper

Draw a different quadrilateral, such as a trapezoid, on the board. Ask students to discuss whether it fits into either side of the Venn diagram. Responses should include that a trapezoid has only 1 pair of opposite sides that are parallel and sides of different lengths. So it cannot be a rectangle or a rhombus.



Beginning: Activity 39	4.C.3, 4.F.3, 4.G.3
Intermediate: Activity 26	3.G.1, 4.D, 4.F.2
Advanced: Activity 27	2.I.3, 3.B.3, 4.D
Advanced High: Activity 6	2.I.5, 3.G.2, 4.G.2
Go to <i>thinkcentral.com</i> for the ELL Activity Guide containing these leveled activities.	



Differentiated Instruction

ELL Language Support

Visual Small Group

ELPS 2.C.4, 4.C.3, 4.D

Strategy: Model Language

- Teachers model language to teach pronunciation.
- Write *Venn diagram* on the board. Read the words and have students repeat.
- Draw a Venn diagram and label the circles *Quadrilaterals* and *Polygons* with Parallel Sides. Read the headings aloud and have students repeat.
- Work together to draw figures in each section. Have students name each figure aloud as it is entered.
- Discuss which figures might go in the section where the circles overlap. Possible answer: rectangle, square, rhombus, parallelogram, trapezoid

Try Another Problem

The Venn diagram at the right shows the figures Abbie used to make a picture. Where would the figure shown below be placed in the Venn diagram?



Read	Solve
What do I need to find? where the figure shown would be placed in the Venn diagram	What is true about all quadrilaterals? They all have 4 sides and 4 angles. What is true about all polygons? They are closed figures made up of line segments.
What information am I given? the circles labeled Quadrilaterals and Polygons with Right Angles	How can you describe the figures in the section where the circles overlap? They are all quadrilaterals with right angles. Does the figure shown have right angles?
Plan	Yes
What is my plan or strategy? I will use what I know about two-dimensional figures to find where the figure should be placed.	Does the figure have 4 sides? Yes So, the figure goes in the section where the circles overlap.

1. How many figures do not have right angles?

3 figures

2. How many red figures have right angles but are

not quadrilaterals? <u>1 red figure</u>

3. Analyze What is a different way to sort the figures? Possible answer: Polygons with Parallel Sides and

Visual / Individual

Polygons with Right Angles

494



are closed.

polygons; Possible explanation: all the figures are made up of line segments; all the figures

Polygons with

Right Angles

Quadrilaterals

Enrich Partners

Materials: paper, markers

- Draw a large Venn diagram on paper. Label the circles Polygons with Equal Side Lengths and Polygons with Parallel Sides.
- Each student should use a marker to draw in a shape in one section at his turn.
- Challenge students to find as many shapes as possible to fit each section, and to explain why those in the overlapping section are correctly placed.
- If a student cannot think of a shape that fits any category, it is the next student's turn.
- Have students draw a new diagram with new labels and repeat the activity.



Go to thinkcentral.com for additional enrichment DIGITAL activities in the Enrich Activity Guide.

EXPLAIN

Try Another Problem

Make a table on the board. List the attributes of quadrilaterals in one column and the attributes of polygons with right angles in another column.

 Describe some differences between guadrilaterals and polygons with right angles. Possible answer: not all polygons with right angles will have 4 sides.

Discuss the characteristics of trapezoids that occur in both lists, and explain that they belong in the overlapping section of the Venn diagram.



Use Math Talk to focus on students' understanding of polygon attributes.

Go Deeper

Demonstrate to students that Venn diagrams can be used to compare more than two sets of objects. Ask students to identify each category, and discuss why each figure fits the section it is in.



COMMON ERRORS

Error Students may not look for all the correct attributes.

Example Students may forget to exclude the figures that do not share all the attributes of the labeled circle.

Springboard to Learning Remind students that they have to check for each attribute required in the problem. Encourage students to cross off figures as they are excluded and to check off each required attribute when they have met it.

ELABORATE

Share and Show

The first problem connects to the learning model. Have students use the MathBoard to explain their thinking.

Use the checked exercises for **Quick Check**. Students should show their answers for the Quick Check on the MathBoard.





Problem 3 requires students to apply their knowledge of the attributes of figures to label the Venn diagram.

Problem 4 requires students to draw a Venn diagram and show one way a parallelogram, a rectangle, a square, a trapezoid, and a rhombus can be sorted.



Math on the Spot **Video Tutor**

Through the *Math on the Spot Video Tutor*, students will be guided through an interactive solving of this type of H.O.T. problem. Use this video to also help students solve the H.O.T. problem in the Interactive Student Edition. With these videos and the H.O.T. problems, students will build skills needed in the TEXAS assessment.



(CO) Math on the Spot videos are in the DIGITAL Interactive Student Edition and at thinkcentral.com.

Name _



Use the Venn diagram for 1-2.

✓ 1. Jordan is sorting the figures at the right in a Venn diagram. Where does the $\langle \rangle$ go?

First, look at the sides and angles of the polygons.

Next, draw the polygons in the Venn diagram below.

The figure above has <u>4</u> sides of equal length and ______ right angles.

So, the figure goes in the circle labeled

Polygons with All Sides Equal in Length

✓ 2. Where in the Venn diagram would you place a ? only in the

circle labeled Polygons with Right Angles

Problem Solving

3. Multi-Step Use Math Language Eva drew the Venn diagram at the right. What labels could she have used for the diagram? Where would each label go?

Possible answer: Left circle: Quadrilaterals with

Parallel Sides; Right circle: Polygons with Right Angles

4. H.O.T. Multi-Step Display Draw and label a Venn diagram to show one way you can sort a parallelogram, a rectangle, a square, a trapezoid, and a rhombus. Check students' drawings.



Module 15 • Lesson 3 495

Differentiated Instruction

RtI RtI Tier I Lesson 73 Problem Solving • Classify Plane Figures A Venn diagram shows how sets of thing A Venn diagram shows how sets of things are related. This Venn diagram shows how quadrilaterals and polygons with all sides of equal length are related. The figures in the section where the circles overlap show figures that belong to both groups. ([]/ What types of polygons are in both circles Read Solve What do I need to find? What is true about all polygons in the ircle labeled Quadrilaterals? what types of polygons are They all have 4 sides in both circles What is true about all polygons in the other circle? What information am I given? The circles are labeled They all have sides of equal length. Quadrilaterals and Polygons Which polygons are in the section where the circles overlap? with All Sides of Equal Length figures that are quadrilaterals and that Plan have 4 sides that are of equal length What is my plan or strategy? So, <u>a square</u> and <u>a rhombus</u> in the section where the circles over I will describe the figures in the section where the circles overla Brad drew the Venn diagram at the right. What type of figures are in the section where the circles overlap? triangles that have 1 right angle

Geometry and Meas

Enrich 71 Name Enrich 7I Triple Trouble Some Venn diagrams have three overlapping circles. Look at the figures in each circle of the Venn diagram below 1. Label for circle A: Possible answer: Polygons with Right Angles 2. Label for circle B: Possible answer: Polygons with All Sides of Equal Length a. Label for circle C: Possible answer: Polygons with More Than 3 Sides Write Math >> Is there a plane figure that belongs in the section where circles A and B overlap, but not circle C? Explain. No; a figure that belongs in that section would have to have 3 sides of the same length AND a right angle. No triangle can have both a right angle and all sides equal. Enrich E71





with

Right Angles

All Sides Equal

in Length





Differentiated Centers Kit



Activities Classification Act

Students complete orange Activity Card 18 by classifying two-dimensional figures based on their attributes.



Activities What Figure?

Students complete purple Activity Card 18 by identifying and defining two-dimensional figures by playing a game.





TEXAS Test Prep Coach

Test Prep Coach helps teachers to identify common errors that students can make.

In the Test Prep exercise, if students selected:

- **A** They overlooked the polygons with no right angles in Circle *A*.
- **B** and **C** They overlooked the triangle and pentagon in Circle *A*.



How can you use the strategy *draw* a *diagram* to classify plane figures? Possible answer: I can draw a Venn diagram to sort figures based on their side lengths, types of angles, and number of pairs of parallel sides. If a figure fits both categories, it goes in the section where the circles overlap.

Lesson 15.3 496



Homework and Practice

Use the Homework and Practice pages to provide students with more practice on the concepts and skills of this lesson.