WAMC Lab Template

Math Concept(s): Properties of Quadrilaterals

Source / Text:

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Attach the following documents:

- Lab Instructions
- Student Handout(s) X
- Rubric and/or Assessment Tool

Short Description (Be sure to include where in your instruction this lab takes place):

Students will work in cooperative teams to measure the angles, sides, and diagonals of quadrilaterals. They will discover the properties for parallelograms, special parallelograms (rectangle, rhombus, and square), trapezoids, isosceles trapezoids, and kites.

Lab Plan

Lab Title: Quadrilateral Property Discovery

Prerequisite skills: Students must understand the concepts of parallel, perpendicular, and opposite and consecutive sides and angles. Students must be able to use a ruler and a protractor to measure sides and angles.

Lab objective: Discover the properties of different quadrilaterals. Reinforce the meaning of such properties with hands-on measurement.

Standards: *(Note SPECIFIC relationship to Science, Technology, and/or Engineering)*

Mathematics K–12 Learning Standards:

- G.3.F Know, prove, and apply basic theorems about parallelograms.
- G.3.G Know, prove, and apply theorems about properties of quadrilaterals and other polygons.

Standards for Mathematical Practice:

- 1 Make sense of problems and persevere in solving them.
- 5 Use appropriate tools strategically.
- 6 Attend to precision.
- 7 Look for and make use of structure.

K-12 Learning Standards-ELA (Reading, Writing, Speaking & Listening):

- RST: 9-10.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- RST: 9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

- RST: 9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

K-12 Science Standards

Technology

Engineering

Leadership/21st Century Skills:

- 3B.1 Demonstrate ability to work effectively and respectfully with diverse teams
- 4A.2 Evaluate information critically and competently
- 11A.1 Use interpersonal and problem-solving skills to influence and guide others toward a goal

21st Century Interdisciplinary themes (Check those that apply to the above activity.)

☐ Global Awareness ☐ Financial/Economic/Business/Entrepreneurial Literacy ☐ Civic Literacy
☐ Health/Safety Literacy ☐ Environmental Literacy

21st Century Skills (Check those that students will demonstrate in the above activity.)

LEARNING AND INNOVATION

Creativity and Innovation
☐ Think Creatively
☐ Work Creatively with Others
☐ Implement Innovations

Critical Thinking and Problem Solving
☒ Reason Effectively
☐ Use Systems Thinking
☒ Make Judgments and Decisions
☒ Solve Problems

Communication and Collaboration
☒ Communicate Clearly
☒ Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS

Information Literacy
☐ Access and Evaluate Information
☐ Use and manage Information

Media Literacy
☐ Analyze Media
☐ Create Media Products

Information, Communications and Technology (ICT Literacy)
☐ Apply Technology Effectively

LIFE & CAREER SKILLS

Flexibility and Adaptability
☐ Adapt to Change
☐ Be Flexible

Initiative and Self-Direction
☒ Manage Goals and Time
☒ Work Independently
☒ Be Self-Directed Learners

Social and Cross-Cultural
☒ Interact Effectively with Others
☒ Work Effectively in Diverse Teams

Productivity and Accountability
☒ Manage Projects
☒ Produce Results

Leadership and Responsibility
☐ Guide and Lead Others
☒ Be Responsible to Others

Teacher Preparation: (What materials and set-up are required for this lab?)

Materials

- 6.1 Quadrilateral graphic organizer
- 6.1 Quadrilateral Cut-Outs – Parallelogram, Rectangle, Rhombus, Square, Trapezoid, Isosceles Trapezoid, Kite. 2 per group.
- 6.1 Properties of Quadrilateral Data Sheet
- 4 Rulers, Scissors, and Protractors for each group

Set-Up Required:

- Set up each table with 2 of each type of quadrilateral, 1 Quadrilateral graphic organizer per student, 1 Properties of Quad Data Sheet per student, 1 ruler, 1 pair of scissors, and 1 protractor per student.
- Assign students to groups of 4.
    - Spokesperson – Asks questions if needed and shares answers
    - Recorder – Writes down answers on the master data sheet. Shares with the group so that each student can complete a data sheet.
    - Clean Up Crew – Throws cut and unused paper in recycle bin. Puts away scissors, ruler, and protractors.
    - Quality Control – Checks for completeness and accuracy.

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected):

- Students will solve problems by working together as a team to develop and analyze their results.

Cooperative Learning:

- Students will assist each other with calculations and compare results.

Expectations:

- Each student will record quadrilateral names and definitions on one side of their graphic organizer.
- Each group of students will measure and record the properties of 2 of each type of quadrilateral. 2 of each type are necessary for comparison and validation of results.
- Each student will compete a quadrilateral data sheet summarizing the results for each quadrilateral.

Timeline:

- This lab can be completed in one 55 minute class periods. The measurements can be completed in one day and the discussion and conclusions will be verified the 2nd day. For large classes, if time is an issue, only assign each group of students 2 different shapes instead of all 7. The results can be shared from other groups.

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab

- Discuss construction application, square construction, and stability.

Career Applications

- Construction, Architecture, and Art.

Optional or Extension Activities

- Identify buildings with unique quadrilateral construction.

Washington Applied Math Council

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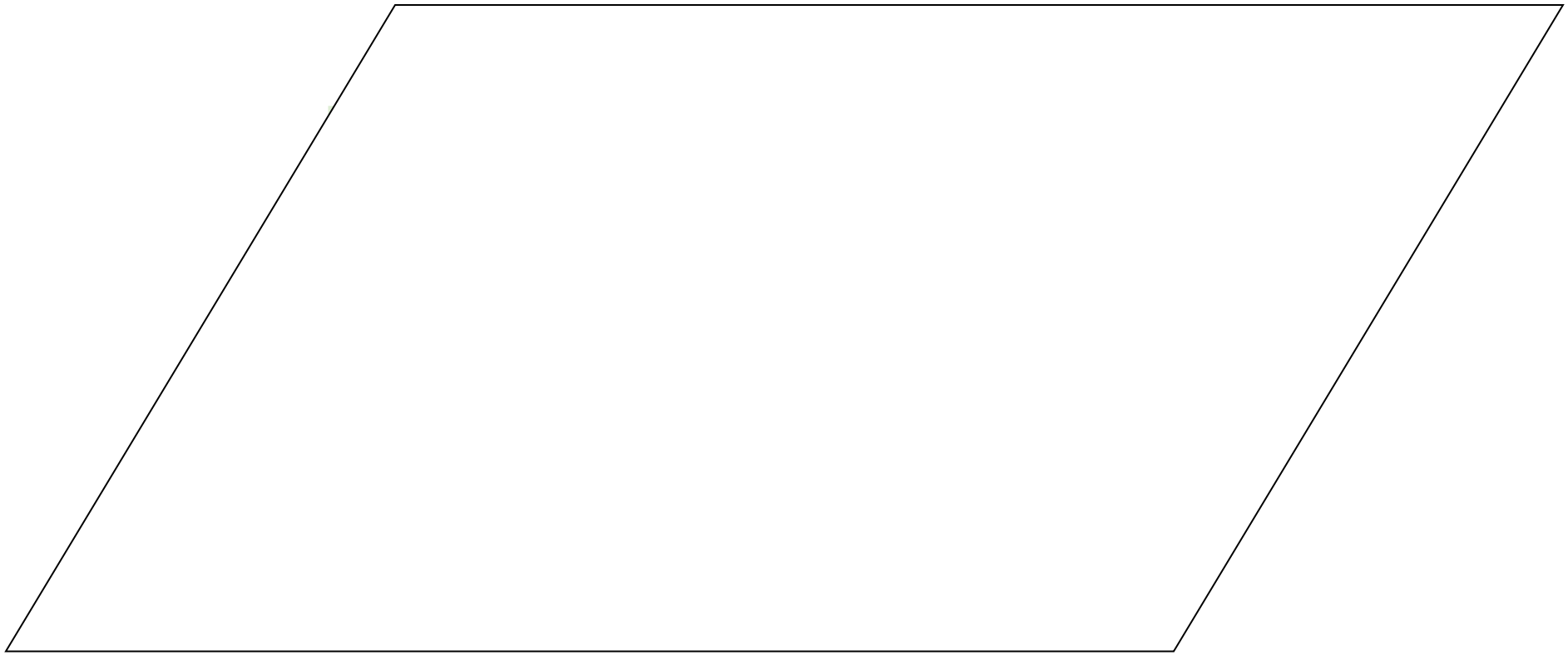
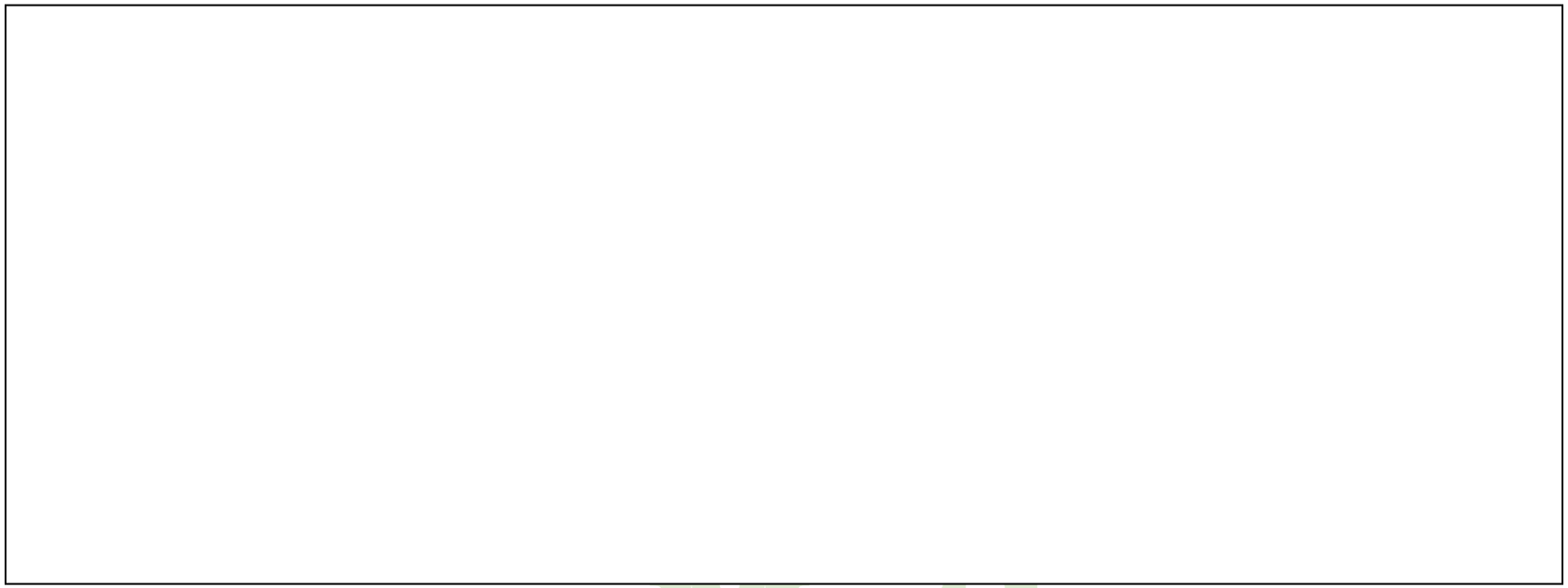
6.2 Properties of Quadrilaterals Data Sheet

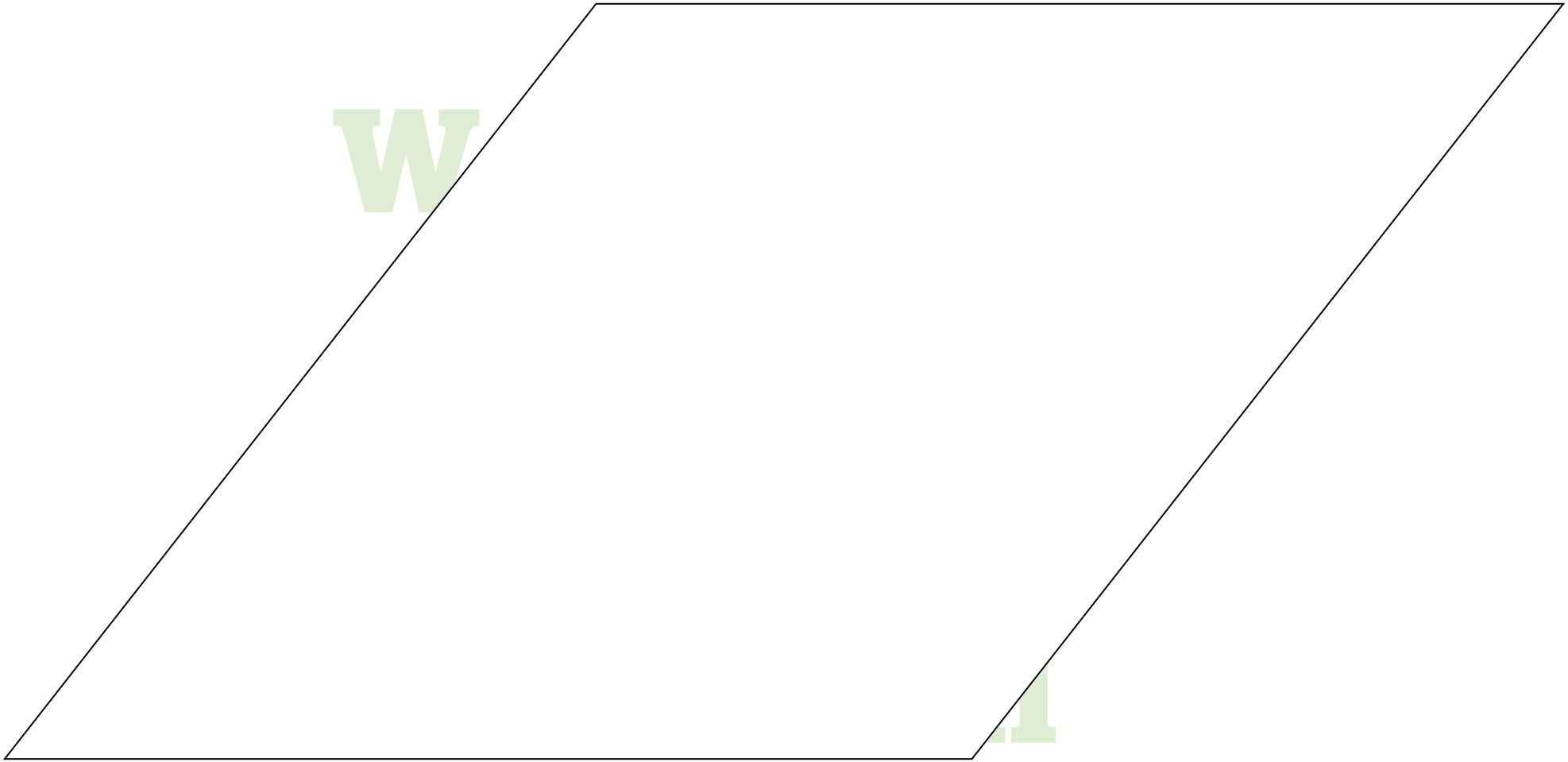
	Parallelogram	Rectangle	Rhombus	Square	Kite	Trapezoid	Isosceles Trapezoid
opposite sides parallel							
opposite sides congruent							
adjacent sides congruent							
four congruent sides							
opposite angles congruent							
consecutive angles supplementary							
base angles are congruent							
four right angles							
diagonals bisect each other							
diagonals congruent							
diagonals							
diagonals angle bisector							

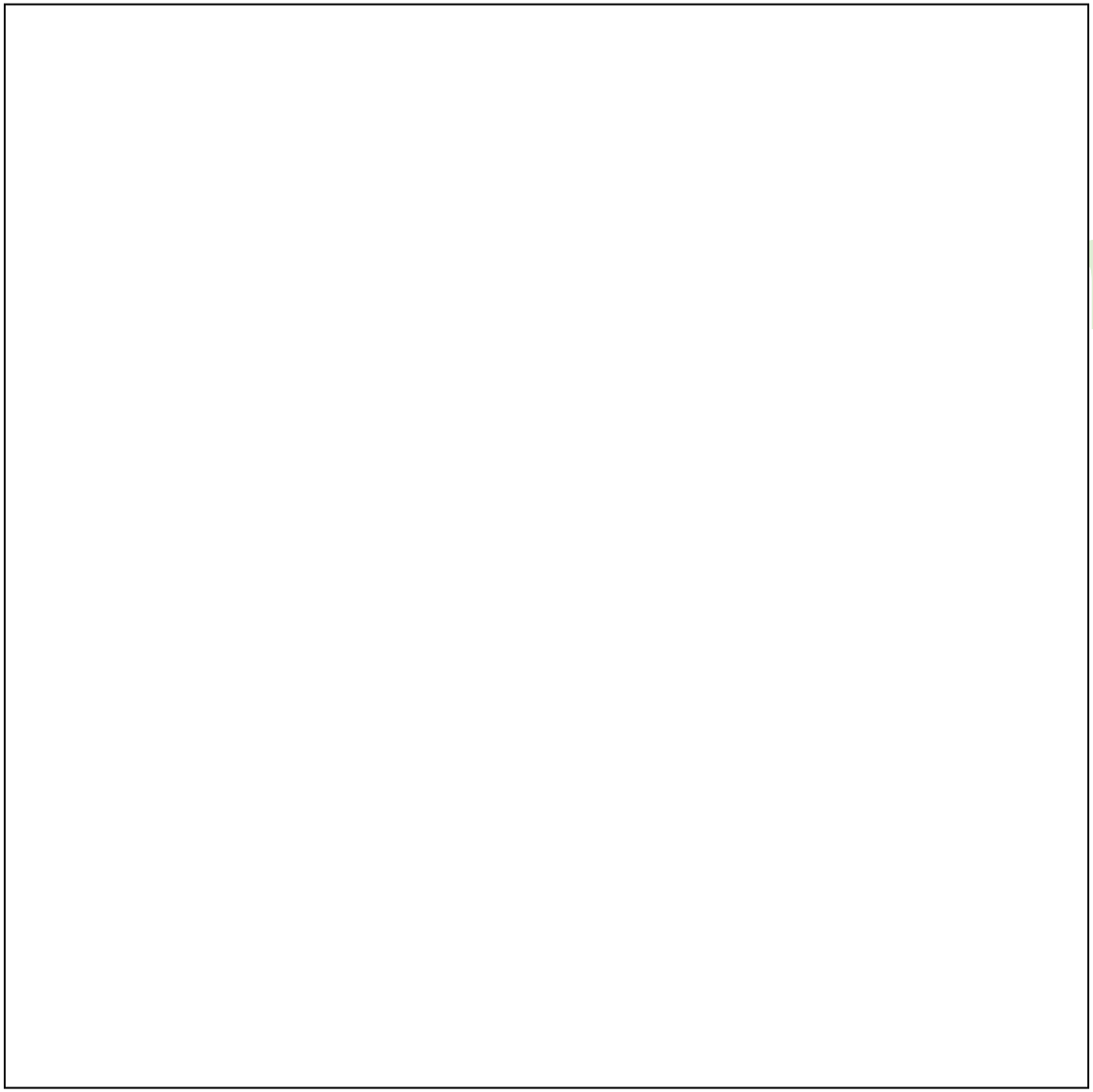
Properties of Quadrilaterals Data Sheet

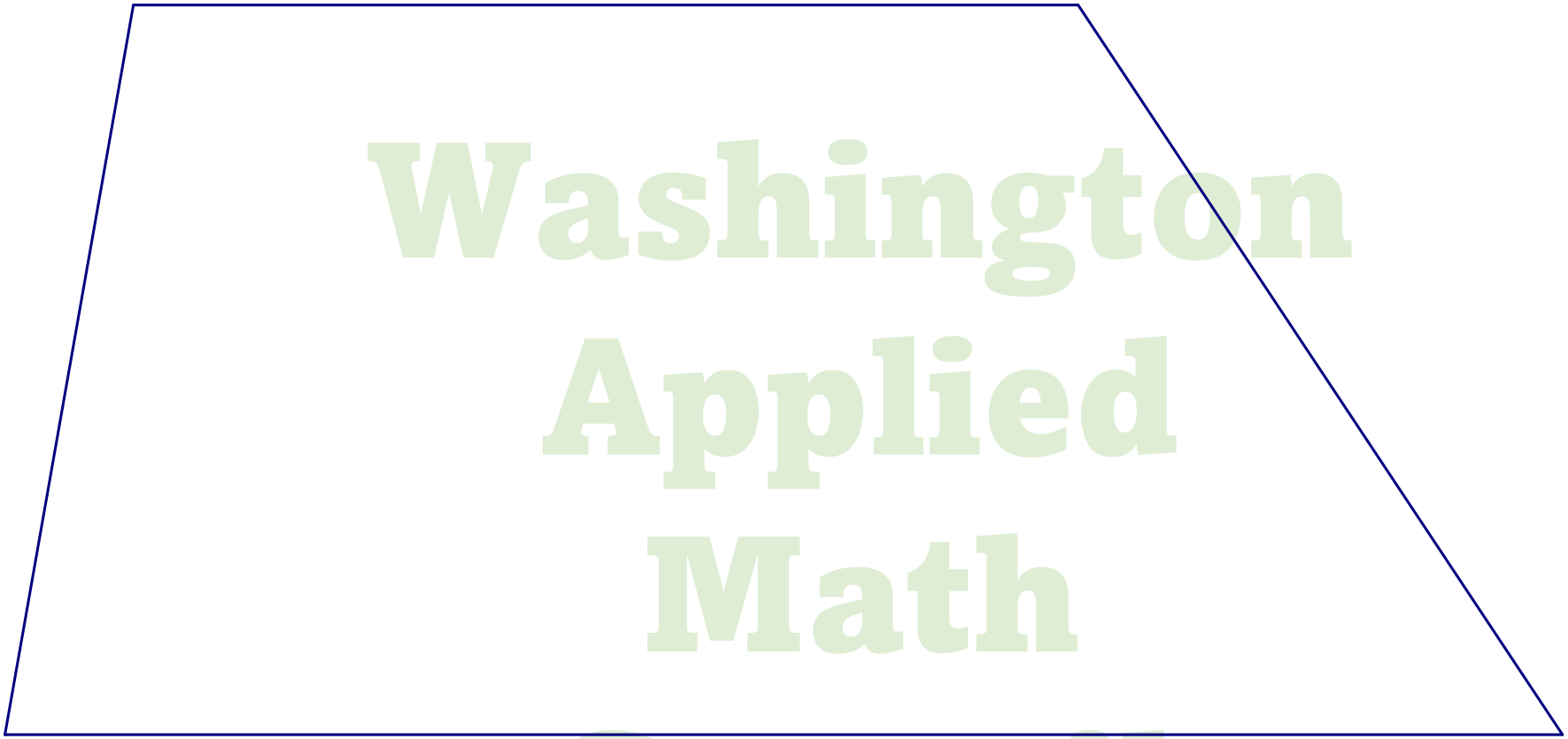
	Parallelogram	Rectangle	Rhombus	Square	Kite	Trapezoid
opposite sides parallel					NO	Only 1 Pair
opposite sides congruent					NO	NO
adjacent sides congruent	NO	NO				NO
four congruent sides	NO	NO			NO	NO
opposite angles congruent					NO	NO
consecutive angles supplementary					NO	
base angles are congruent	NO		NO		NO	Only if isosceles
four right angles	NO		NO		NO	NO
diagonals bisect each other					NO	NO
diagonals congruent	NO		NO		NO	NO
diagonals	NO	NO				NO
diagonals angle bisector	NO	NO			only vertex angles	NO











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