Objective To provide opportunities to explore various types of quadrangles.

1 Teaching the Lesson

Key Concepts and Skills
- Identify right angles and parallel and intersecting sides of quadrangles. [Geometry Goal 1]
- Draw and name quadrangles. [Geometry Goal 2]
- Use straws and twist-ties to model and compare quadrangles. [Geometry Goal 2]
- Identify the sides, vertices, and adjacent sides of quadrangles. [Geometry Goal 2]
- Measure the sides of a quadrangle. [Measurement and Reference Frames Goal 2]

Key Activities
Children construct quadrangles and observe their properties. They measure the sides of a quadrangle to the nearest $\frac{1}{2}$ inch and estimate the perimeter.

Ongoing Assessment: Recognizing Student Achievement
Use journal page 136. [Geometry Goal 1]

Ongoing Assessment: Informing Instruction
See pages 428 and 429.

Key Vocabulary
- quadrangle
- square
- rhombus
- parallelogram
- rectangle
- trapezoid
- adjacent sides
- kite
- straightedge
- ruler

Materials
- Math Journal 1, p. 136
- Student Reference Book, pp. 108 and 109
- Home Link 6-4
- Differentiation Handbook, p. 139 (optional)
- straws and twist-ties
- straightedge
- ruler

Advance Preparation
Each child will need 16 twist-ties and 16 straws—4 straws each of the following four lengths: 2”, 4”, 6”, and 8”. Place these materials in 4 separate containers near the Math Message. For the optional Readiness activity in Part 3, make 2 copies of Math Masters, page 467 on cardstock paper. Cut out the shapes and place one set in a paper bag.

2 Ongoing Learning & Practice

Playing Name That Number
Student Reference Book, pp. 299 and 300
per partnership: 4 each of number cards 0–10 and 1 each of number cards 11–20 (from the Everything Math Deck, if available)
Children practice finding equivalent names for numbers.

Math Boxes 6-5
Math Journal 1, p. 137
Children practice and maintain skills through Math Box problems.

Home Link 6-5
Math Masters, p. 177
Children practice and maintain skills through Home Link activities.

3 Differentiation Options

REACHINESS
Playing Touch-and-Match Quadrangles
Math Masters, p. 467 (copied onto cardstock or cardboard)
paper bag or box
Children identify similarities and differences among quadrangles.

ENRICHMENT
Playing Shading Shapes
Math Masters, pp. 457 and 458
Children explore the properties of quadrangles.

ELL SUPPORT
Adding to the Vocabulary Chart
Differentiation Handbook, p. 133 (optional);
2 copies per child
Vocabulary Chart (from Part 3, Lesson 6+1)
Children add the terms rectangle, rhombus, square, trapezoid, and kite to the Vocabulary Chart.
Getting Started

Math Message Follow-Up
(Math Journal 1, p. 136)
Discuss Part 1 on journal page 136.
Draw and label a quadrangle on the board. Label it EFGH.
Point out that another name for quadrangle is quadrilateral.
Referring to the diagram on the board, review the characteristics of quadrangles.

- All quadrangles are 2-dimensional.
- All quadrangles have 4 vertices.
- All quadrangles have 4 sides.
- All quadrangles have 4 angles.

Math Message
Take 4 straws of each size and 16 twist-ties.
Complete Part 1 on page 136 of your journal.

Home Link 6-4 Follow-Up
Ask partners to explain how they found the right angle in Problem 4.

1 Teaching the Lesson

Math Message Follow-Up
(Math Journal 1, p. 136)
Discuss Part 1 on journal page 136.
Draw and label a quadrangle on the board. Label it EFGH.
Point out that another name for quadrangle is quadrilateral.
Referring to the diagram on the board, review the characteristics of quadrangles.

- All quadrangles are 2-dimensional.
- All quadrangles have 4 vertices.
- All quadrangles have 4 sides.
- All quadrangles have 4 angles.

Math Message
Take 4 straws of each size and 16 twist-ties.
Complete Part 1 on page 136 of your journal.

Home Link 6-4 Follow-Up
Ask partners to explain how they found the right angle in Problem 4.

Student Page

Exploring Quadrangles
Part 1
Draw or show pictures of a few of the objects children might suggest that have the prefix quad.

- Quadruplets, quadruple, quadrupled, quadrant, and quadrilateral (as another name for quadrangle) Draw or show pictures of a few of the objects children might suggest that have the prefix quad.

Math Message
Take 4 straws of each size and 16 twist-ties.
Complete Part 1 on page 136 of your journal.

Home Link 6-4 Follow-Up
Ask partners to explain how they found the right angle in Problem 4.
Naming Quadrangles

(Math Journal 1, p. 136)

Explain that the name of a quadrangle can begin with the letter at any vertex and can be read either clockwise or counterclockwise. Vertices must be named consecutively. For example, the quadrangle on the board can be named HEFG, EFGH, FGHE, and so on—but not HFGE.

Have children complete Part 2 on journal page 136.

Ongoing Assessment: Informing Instruction

Watch for children who have difficulty naming the quadrangle. Emphasize the importance of naming the vertices in order. Suggest that children trace the quadrangle with their fingers in order to determine the correct sequences.

Constructing Quadrangles

(Math Journal 1, p. 136; Student Reference Book, pp. 108 and 109)

Children construct the quadrangles listed in Part 3 on journal page 136. Have children make their constructions on flat surfaces and keep them (approximately) in a plane as they pick them up to show them.

When most of the groups have completed their constructions, bring them together to share observations about quadrangles. Children hold up quadrangles in each category as you and the class discuss their properties. To support English language learners as the geometric terms are introduced, write the terms on the board next to a picture or a straw model. Suggestions for discussion:

- Ask one person in each group to hold up any quadrangle with four sides of equal length and four right angles. Ask: How are all these quadrangles alike? They are all squares; their angles are all right angles. How are they different? They are not all the same size.

- Have children tug gently on two corners opposite each other. Ask: What happens when you do this? The shape and area change; the angles are not right angles, but the opposite sides are still parallel. Does the perimeter change? No What is the name of this shape? rhombus

- Have children make one angle a right angle. Ask: What happens when you do this? All angles become right angles. What is the name of this kind of shape? square

Note that squares and rhombuses are examples of parallelograms.
Have children hold up quadrangles having two pairs of equal sides. Kites and rectangles From those quadrangles, find the ones that have right angles. Rectangles The quadrangles with two pairs of equal sides and 4 right angles are called rectangles.

Have children hold up quadrangles having only two parallel opposite sides. Trapezoids, which include those with one pair of equal-length sides Those quadrangles are called trapezoids.

- Can you make a trapezoid that has a right angle? Yes
- Can you make a trapezoid with exactly one right angle? Try it. No. If a trapezoid has one right angle, it must have a second right angle as well because opposite sides must be parallel.
- Can you make a trapezoid with four right angles? No. If a trapezoid had four right angles, it would be a rectangle. There would be two pairs of parallel sides instead of one.

Sides that meet at a vertex are called adjacent sides. Have children hold up one of their quadrangles and trace its adjacent sides with their fingers. To support English language learners, write adjacent sides and draw some pictures illustrating adjacent sides on the board. Ask children in each group to hold up all quadrangles in which some or all adjacent sides are the same length. Have them set aside all the quadrangles in which all sides are the same length. Next, have them hold up any quadrangles in which there are just two pairs of equal adjacent sides. Such quadrangles are called kites. A kite is a quadrangle that has two pairs of equal adjacent sides and opposite sides that are not equal.

To support English language learners, discuss the everyday meaning of the word kite as well as its meaning in this context.

Finally, have children hold up straw constructions that do not have four right angles or two pairs of parallel sides. Trapezoids and kites Add one straw construction of each kind of quadrangle and its description to the Polygon Museum. Children can read more about quadrangles on pages 108 and 109 of the Student Reference Book.

Finding the Perimeter of a Quadrangle

(Math Journal 1, p. 136)

Children complete Part 4 on journal page 136.
The grid is ONE. Shade 0.41 of the grid.

Write the fraction that shows how much is shaded.

1. 

2. 

3. 

4. 

5. 

6. 

Math Journal 1, p. 137

---

**Playing Name That Number**

*(Student Reference Book, pp. 299 and 300)*

Children play *Name That Number*. See pages 299 and 300 in the *Student Reference Book* or Lesson 1-6 for directions. Encourage children to use as many cards and operations as they can to name the target number.

---

**Math Boxes 6-5**

*(Math Journal 1, p. 137)*

---

**Home Link 6-5**

*(Math Masters, p. 177)*

---

**Differentiation Options**

---

**Playing Touch-and-Match Quadrangles**

*(Math Masters, p. 467)*

To provide experience with identifying similarities and differences among quadrangles, make two copies of *Math Masters*, page 467 on cardboard or cardstock paper. Cut out all of the quadrangles and place one set in full view on a table. Without children seeing, place one of the quadrangles from the other set in a bag or box. A child reaches inside the container, feels the shape without looking, and tries to find the matching shape from those on the table.

Ask children to explain how they made their matches. Expect responses like the following: “The shape I was holding had four square corners, but I knew it was the square and not the rectangle because all of the sides were the same length.”
**Playing Shading Shapes**

*(Math Masters, pp. 457 and 458)*

To further explore properties of quadrangles, have children play *Shading Shapes*. Directions are on *Math Masters*, page 457. When children have finished, have them share their strategies.

**Adding to the Vocabulary Chart**

*(Differentiation Handbook, p. 133)*

To provide language support for geometry terms, have children add the terms rectangle, rhombus, square, trapezoid, and kite to the Vocabulary Chart. Children may also add the terms to their Math Word Banks using the template on *Differentiation Handbook*, page 133. See the *Differentiation Handbook* for more information.

**Quadrangles (Quadrilaterals)**

<table>
<thead>
<tr>
<th>Quadrilateral</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>parallelogram</td>
<td>2 pairs of parallel sides</td>
</tr>
<tr>
<td>rectangle</td>
<td>2 pairs of equal sides; 4 right angles</td>
</tr>
<tr>
<td>rhombus</td>
<td>4 equal sides; opposite sides parallel</td>
</tr>
<tr>
<td>square</td>
<td>4 equal sides; 4 right angles</td>
</tr>
<tr>
<td>trapezoid</td>
<td>only 2 sides parallel; parallel sides not equal</td>
</tr>
<tr>
<td>kite</td>
<td>2 pairs of adjacent equal sides; opposite sides not equal</td>
</tr>
</tbody>
</table>

**Game Master**

*Shading Shapes Reference Page*

Shade triangles on the gameboard to make the following quadrangles:

- Rectangle
- Square
- Parallelogram
- Trapezoid
- Kite