Problem 1 – Properties of Parallelograms

In this problem, you will look at the definition of a parallelogram and several properties of parallelograms. Open the Cabri™ Jr. application by pressing enter and selecting **Cabri™Jr**.

1. Define parallelogram.

2. Open the file *PAR1* by pressing y=, selecting **Open…**and selecting the file. *PAR1* shows parallelogram *QUAD*. Grab and drag point *Q* to two different positions and record the lengths of the segments in the table (rows 1 and 2). Then, grab and drag point *U* to two different positions and record the data in the table (rows 3 and 4).

Position	$\overline{QU}$	$\overline{UA}$	$\overline{AD}$	$\overline{DQ}$
1				
2				
3				
4				

3. What do you notice about the lengths of opposite sides of a parallelogram?

Angles of a polygon that share a side are consecutive angles. Angles that do not share a side are called opposite angles.

4. Open the file *PAR2*, which shows parallelogram *QUAD*. Grab and drag point *Q* to four different positions and record the measurement of the angles in the table.

Position	$\angle Q$	$\angle U$	$\angle A$	$\angle D$
1				
2				
3				
4				

5. What do you notice about consecutive angles of a parallelogram?

6. What do you notice about opposite angles of a parallelogram?

Problem 2 – Diagonals of Parallelograms

For this problem, you will look at the properties of the diagonals of parallelograms.

7. Open the file *PAR3*, which shows parallelogram *QUAD*. Record the lengths of the segments in the table (row 1). Then, grab and drag point *U* to three different positions and record the data in the table (rows 2, 3, and 4).

Position	$\overline{QR}$	$\overline{RA}$	$\overline{DR}$	$\overline{RU}$
1				
2				
3				
4				

8. What do you notice about the diagonals of the parallelogram?

Problem 3 – Extension: Proving Parallelograms

In this problem, you will explore various properties and determine if they guarantee that a quadrilateral is a parallelogram.

9. Does having both pairs of opposite sides congruent guarantee that the quadrilateral is a parallelogram? Draw an example or counterexample.

10. Does having one pair of opposite sides congruent and one pair of opposite sides parallel guarantee that the quadrilateral is a parallelogram? Draw an example or counterexample.

11. Does having one pair of opposite sides parallel and one pair of opposite angles congruent guarantee that the quadrilateral is a parallelogram? Draw an example or counterexample.

Problem 4 – Extension: Extending the Properties

For this problem,

- Create any quadrilateral and name it *GEAR*.
- Find the midpoint of each side.
- Connect the midpoints to form a quadrilateral.

12. What type of quadrilateral is formed after you connected the midpoints of *GEAR*?

13. How can you prove what type of figure is created by connecting the midpoints?