

Properties of Parallelograms Investigation

Standards:

- Students will be able to develop a logical conjecture
- Students will be able to verify a logical conjecture using appropriate geometric properties and theorems
- Students will be able to devise and implement strategies to correctly measure line segments and angles
- Students will be able to identify and apply properties of quadrilaterals

A parallelogram is one of the most basic and fundamental types of quadrilateral. By definition, a parallelogram is a shape with four sides where opposite sides are parallel. Today we are going to investigate the properties of a parallelogram. Follow the steps below and answer the following questions. You will turn in both the parallelogram you create and your answers to the following questions.

1. On a piece of notebook paper, trace 2 of the horizontal lines that are at least 6 cm apart.
2. Now, place your ruler so that it intersects the lines you just made at a diagonal. Trace along both sides of the ruler to create a parallelogram.
3. Label the vertices of the parallelogram A, B, C, and D.
4. Find the measures of the 4 interior angles of parallelogram ABCD and record them below.

$m\angle A =$ _____

$m\angle B =$ _____

$m\angle C =$ _____

$m\angle D =$ _____

5. Which pairs of angles are opposite angles?
6. Write an explanation of your observations about the opposite angles of a parallelogram, paying particular attention to how the measurements compare. Then, make a conjecture regarding how the opposite angles of a parallelogram are related.
7. Which pairs of angles are consecutive angles?
8. Write an explanation of your observations about the consecutive angles of a parallelogram, paying particular attention to how the measurements compare. Then, make a conjecture regarding how the consecutive angles of a parallelogram are related.

9. Use the conjectures you wrote in #6 and #8 on the front page. Recall that a parallelogram is a quadrilateral in which opposite sides are parallel. Use what you know about parallel lines to **explain why** you believe that your conjectures in #6 and #8 are true.

10. Measure the lengths of the four sides of parallelogram ABCD and record them below.

AB = _____

BC = _____

CD = _____

AD = _____

11. Which pairs of sides are opposite sides?

12. Compare the lengths of the opposite sides above and make a conjecture regarding how the opposite sides of a parallelogram are related.

13. Draw the two diagonals of your parallelogram. Label the point where they intersect point M.

14. Measure the interior segments of parallelogram ABCD and record them below.

AM = _____

BM = _____

CM = _____

DM = _____

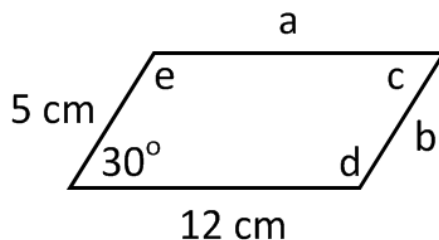
15. What do you notice about \overline{AM} and \overline{CM} ? How does point M relate to diagonal \overline{AC} ?

16. What do you notice about \overline{BM} and \overline{DM} ? How does point M relate to diagonal \overline{BD} ?

17. Use your answers for #14 and #15 and your geometric knowledge to fill in the missing word in the following sentence: If a quadrilateral is a parallelogram, then its diagonals _____ each other.

18. You find a parallelogram design on one of your mom’s quilts. A diagram is shown below.
Using the properties of a parallelogram, find the missing measures by solving for the variables.

- a =
- b =
- c =
- d =
- e =



Rubric for Properties of Parallelograms Investigation:

Total score: _____ / 25

	Poor	Good	Excellent
Measurements of angles and segments are correct for the student’s diagram	Measurements for both segments and angles are inaccurate (1 pt)	Measurements for segments or angles are accurate but one is inaccurate (2 pts)	All measurements for angles and segments are accurate (3 pts)
All questions were answered completely	Many questions were left blank or were not answered completely (1 pt)	Most questions were answered completely, but a few were missing (2 pts)	All questions were answered completely (3 pts)
Conjectures developed were well-informed and based on observations	Most conjectures were not based on observations and were not supported (1 pt)	Some conjectures were not based on quality observations or were not completely supported (3 pts)	All conjectures were well-supported and based on quality observations (5 pts)
Conjectures developed were accurate	One or none of the conjectures represent properties of a parallelogram (1 pt)	Two or three conjectures accurately represent properties of parallelograms (3 pts)	All four conjectures accurately represent a property of a parallelogram (5 pts)
Verification of conjectures was well-explained	Conjectures were inaccurately explained, and did not use parallel line properties (1 pts)	The explanations of the conjectures had some minor inaccuracies or were not completely supported with parallel line properties (3 pts)	Both conjectures were accurately and completely explained, and they were supported with parallel line properties (5 pts)
Accurately solves for variables in example problem	Accurately solves for between 0 and 2 variables (1 pt)	Accurately solves for 3 or 4 variables (3 pts)	Accurately solves for all 5 variables (4 pts)

