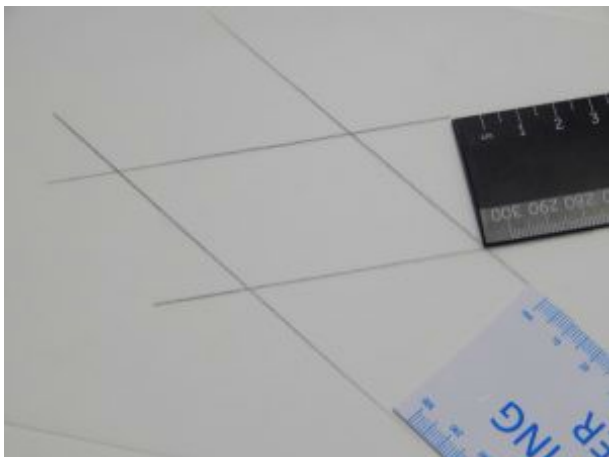


PROPERTIES OF PARALLELOGRAMS



We start from this definition:

A parallelogram is a quadrilateral with both pairs of opposite edges parallel.

In this investigation you will discover some other properties of parallelograms.

Step 1: Use two rulers with different widths to draw a parallelogram on tracing paper or baking paper. Make sure that it is not a rhombus and that the adjacent edges are not equal in length.



Step 2: Place a second piece of tracing paper over the first and copy the parallelogram.

Step 3: Slide the second tracing paper over the first to compare the lengths of the opposite edges of the parallelogram.

How do the lengths of the opposite edges compare?

What did you discover? Call this Conjecture 1: Both pairs of opposite edges of a parallelogram are ...

Step 4: Rotate or flip the second paper to compare the sizes of the opposite angles of the parallelogram.

How do the sizes of the opposite angles compare?

What did you discover? Call this Conjecture 2: Both pairs of opposite angles of a parallelogram are ...

Step 5: What can you discover about the point of intersection of the diagonals? Draw or fold the two diagonals of the parallelogram. Place a dot on their intersection.

Fold to compare the lengths of the two segments on each diagonal.

What did you discover? Call this Conjecture 3. It could be: The point of intersection of the diagonals of a parallelogram ...

Step 6: Now fold the diagonals of one of the sheets and compare angles between the diagonals. Are the angles equal in size?

Do the diagonals bisect the angles? Justify your answer.

Step 8: Use the paper with the folded diagonal, rotate it and see if the area of the triangle formed by the diagonal fits on to the triangles of the second paper.

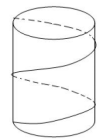
What did you discover? Call this Conjecture 4. It could be: The diagonal of a parallelogram ...

(Idea taken from: Michael Serra, "Patty Paper Geometry", Key Curriculum Press, 1994, pp 88 – 89)

HELP



This is a parallelogram made from the core of a toilet roll. It has been pulled apart very carefully, making the curved surface of the cylinder flat, so that the spiral (a helix) became two parallel edges of the parallelogram. To make it stay flat it was stuck down on the top of a desk. Try this for yourself.



If the opposite edges are parallel, which angles are equal?

If the opposite edges are parallel, which angles add up to 180?

You have the original parallelogram that you drew and a copy on tracing paper.

By matching lengths and angles in the copy to lengths and angles in the original, try to discover which lengths and angles in a parallelogram are equal.

What can you discover this way about the diagonals of a parallelogram and the angles they form?

What can you discover about the opposite edges or angles of a parallelogram?

NEXT

You started with this definition:

A parallelogram is a quadrilateral with both pairs of opposite edges parallel.

Draw one of the diagonals so that the parallelogram is split into two triangles.

Knowing that the opposite edges are parallel, what can you say about the angles?

Look for congruent triangles.

Can you prove your conjectures?