Exploring
Parallelograms with GSP

# Part A: Constructing a parallelogram

1. Construct $∠BAD$ using segments
2. Construct a line parallel to $\overbar{AB}$ through point D (Select $\overbar{AB}$ and point D, the go to [Construct]$\rightarrow $[Parallel Line] ).
3. Construct a line parallel to $\overbar{AD}$ through point B
4. Construct point $C$ at the intersection of these two parallel lines.
5. Hide the parallel lines by selecting them and going to [Display]→[Hide Lines]
6. Construct sides $\overbar{BC}$ and $\overbar{CD}$ so you now have a parallelogram without extra lines.
7. You should now have a parallelogram. Move each point one at a time to make sure it remains a parallelogram.

# Part B: Parallelogram Sides and Angles

1. Measure the length of each side of the parallelogram.
Use your observation to complete this theorem:

**The opposite sides of a parallelogram are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***Now move the vertices to see if this is always true.*
2. Measure all the angles of the parallelogram.
Use your observations to complete the following theorems:

**The opposite angles of a parallelogram are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***Now move the vertices to see if this is always true.*
3. Measure $∠BAD$ and $∠ABC$. Now go to [Number]$\rightarrow $[Calculate] and enter $m∠BAD+m∠ABC$ by clicking on the measurements on the main screen.
Use your observations to complete the following theorems:

**Consecutive angles of a parallelogram are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***Now move the vertices to see if this is always true.*

# Part C: Diagonals of a parallelogram

A **diagonal** of a polygon is a segment that connects two *non-consecutive* vertices.

1. Construct the two diagonals of your parallelogram.
2. Construct the point *M* at the intersection of the diagonals.

Measure the distances $AM, MD, BM$, and $MC$
How do these lengths relate to each other?

Complete the theorem based on your observations:

**The diagonals of a parallelogram \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ each other.***Now move the vertices to see if this is always true.*