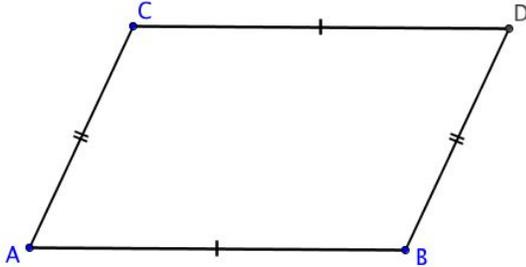


Construction 06: Constructing Parallelograms

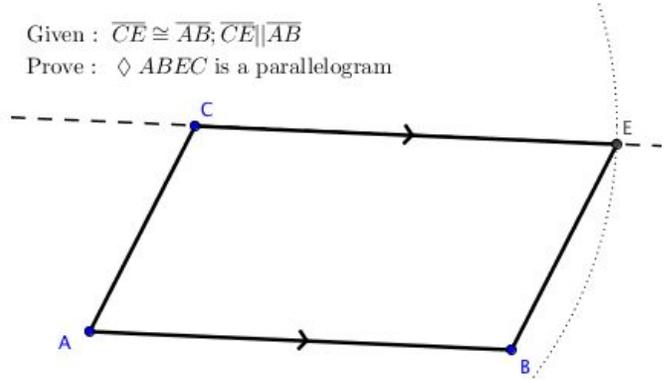
Objective: Construct a parallelogram and prove that your construction is a parallelogram.

Given : $\overline{AB} \cong \overline{CD}$; $\overline{AC} \cong \overline{BD}$
 Prove : $ABDC$ is a parallelogram.



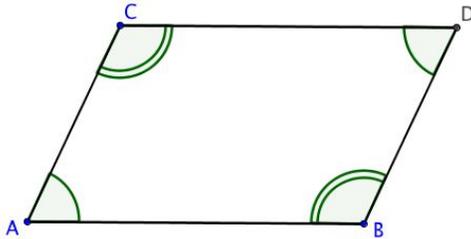
Theorem 5-4: *If opposite sides of a quadrilateral are congruent then it is a parallelogram.* [Hint: add an auxiliary line to demonstrate that sides are parallel by showing alternate interior angles are congruent.]

Given : $\overline{CE} \cong \overline{AB}$; $\overline{CE} \parallel \overline{AB}$
 Prove : $\square ABEC$ is a parallelogram



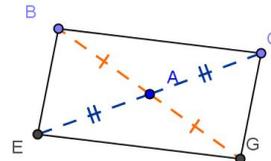
Theorem 5-5: *If one pair of opposite sides are congruent and parallel then it is a parallelogram.* [Hint: Draw an auxiliary line and consider the alternate interior angles formed.]

Given : $\overline{AB} \cong \overline{CD}$; $\overline{AC} \cong \overline{BD}$
 Prove : $ABDC$ is a parallelogram.



Theorem 5-6: *If both pairs of opposite angles of a quadrilateral are congruent, the quadrilateral is a parallelogram.* [Hint: How do you prove opposite sides parallel? Consider the sum of the angles of a quadrilateral is 360° . Can you describe the situation below using an equation? What might then be able to prove about the non-congruent pairs of angles?]

Given: \overline{BG} bisects \overline{CE} ; \overline{CE} bisects \overline{BG}
 Prove: $BCGE$ is a parallelogram.



Theorem 5-7: *If the diagonals of a quadrilateral bisect each other, then the quadrilateral is a parallelogram.* [Hint: Look for congruent triangles and alternate interior angles.]

Construction 6: Parallelogram

Objective: Construct a parallelogram and prove that your construction is a parallelogram.

I used the definition of a parallelogram to create my construction:

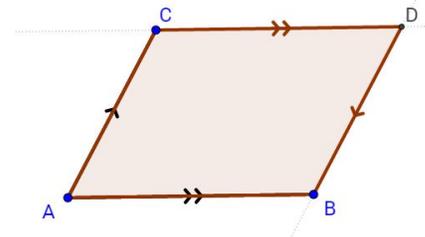
Parallelogram: a quadrilateral where each pair of sides is parallel.

| No. | Name | Definition |
|-----|------------------------|---------------------------------------|
| 1 | Point A | |
| 2 | Point B | |
| 3 | Segment a | Segment [A, B] |
| 4 | Point C | |
| 5 | Segment b | Segment [A, C] |
| 6 | Line c | Line through C parallel to a |
| 7 | Line d | Line through B parallel to b |
| 8 | Point D | Intersection point of c, d |
| 9 | Quadrilateral poly1 | Polygon A, C, D, B |
| 9 | Segment a ₁ | Segment [A, C] of Quadrilateral poly1 |
| 9 | Segment c ₁ | Segment [C, D] of Quadrilateral poly1 |
| 9 | Segment d ₁ | Segment [D, B] of Quadrilateral poly1 |
| 9 | Segment b ₁ | Segment [B, A] of Quadrilateral poly1 |

ion $\overline{AB} \parallel \overline{CD}$

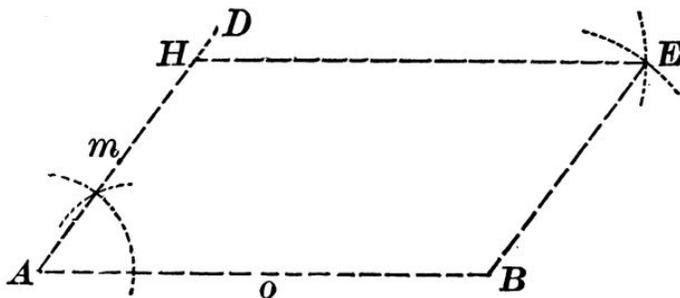
ion $\overline{AC} \parallel \overline{BD}$

ogram \diamond



Construction 6: Parallelogram

Objective: Construct a parallelogram and prove that your construction is a parallelogram.



I used Theorem 5-4: Opposite sides of a parallelogram are congruent.

1. Draw two intersecting segments that meet at endpoints.
2. Use the compass to measure the length of one segment and mark the length from the endpoint of the other segment.
3. Repeat for the other original segment.
4. Mark the intersection as the vertex of that parallelogram.

1. \overline{AB} and \overline{AD} are given
2. \overline{AB} is congruent to \overline{DE} by construction.
3. \overline{AD} is congruent to \overline{BE} by construction.
4. $ABED$ is a parallelogram because if opp. sides of a parallelogram are congruent then it's a parallelogram.

Resources: Constructing Parallel Lines: <http://www.mathopenref.com/constparallel.html>

Constructing a Bisector: <http://www.mathopenref.com/constbisectline.html>

Construction 06: Constructing Parallelograms Rubric

| | | | | |
|-----------------------------------|--|--|--|---|
| | | | | |
| Diagram | Parallelogram is exact and construction marks are clear and only relevant to the method used. | Parallelogram is almost exact and construction marks are clear and mostly relevant to the method used. | Parallelogram is within 5 mm of exact and construction marks are clear and mostly relevant to the method used. | Parallelogram is not exact and construction marks are unclear and/ not relevant to the method used. |
| Use of Technology | Students used Geogebra or ruler and compass to draw precise and clear lines, arcs and angles. Construction is completed with an efficient and elegant method using a minimum number of steps. | Students used Geogebra or ruler and compass to draw accurate and clear lines, arcs and angles. Construction is completed with an efficient and effective method using a modicum number of steps. | Students used Geogebra or ruler and compass to draw approximate lines, arcs and angles. Construction is completed with an somewhat effective method. | Students freehand draws unclear lines, arcs and angles. Construction is completed with an no discernable method. |
| Description/ Justification | Objective is written at top of the page. Descriptions refer to labeled geometric figures. Complete Construction Protocol is given or complete description of the method of construction. Proof of construction is clear, complete and concises. | Objective is written at top of the page. Descriptions refer to labeled geometric figures. Mostly complete Construction Protocol is given or mostly complete description of the method of construction. Proof of construction is clear, and complete.. | Objective is written at top of the page. Descriptions refer to labeled geometric figures. Somewhat complete Construction Protocol is given or complete description of the method of construction. Proof of construction is unclear or incomplete. | Objective is not written at top of the page. Descriptions do not refer to labeled geometric figures. No Construction Protocol is given or description of the method of construction. Proof of construction is unclear or incomplete or missing |
| Technicalities | Construction is titled. All key figures are labeled. Constructions are completed in pencil or by Geogebra | Construction is titled. Most key points are labeled. Constructions are completed in pencil or by Geogebra | Construction is not titled. Some key points are labeled. Constructions are completed in pencil or by Geogebra | Points are not labeled. Construction is untitled. Construction completed in pen or using an non-exact drawing program. |