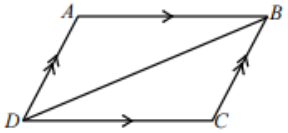
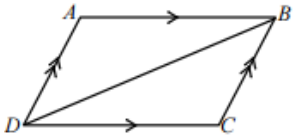
Properties of Parallelograms Name:_____A#___

1. Construct a proof for each property of parallelograms.

<table>
<tr><th>Statement</th><th>Diagram</th><th>Proof</th></tr>
<tr><td>a)
Given: ABCD is a parallelogram.

Prove: Opposite sides are congruent.</td><td> 
</td><td></td></tr>
<tr><td>b)
Given: ABCD is a parallelogram.

Prove: Opposite angles are congruent.</td><td> 
</td><td>
<table>
<tr><th>Statement</th><th>Reason</th></tr>
<tr><td></td><td>Given</td></tr>
<tr><td>$\overline{AB} \parallel \overline{DC}$</td><td></td></tr>
<tr><td></td><td>Alternate Interior Angle Theorem</td></tr>
<tr><td>$\overline{AD} \parallel \overline{BC}$</td><td></td></tr>
<tr><td>$\angle ADB \cong \angle CBD$</td><td></td></tr>
<tr><td></td><td>Reflexive Property</td></tr>
<tr><td></td><td>Angle Side Angle Congruence Postulate</td></tr>
<tr><td>$\angle DCB \cong \angle BAD$ (a pair of opposite angles)</td><td></td></tr>
<tr><td>$m\angle ADB + m\angle CDB = m\angle ADC$
$m\angle ABD + m\angle CBD = m\angle CBA$</td><td></td></tr>
<tr><td>$\angle CDB \cong \angle ABD$
$\angle ADB \cong \angle CBD$</td><td></td></tr>
<tr><td>$m\angle CDB = m\angle ABD$
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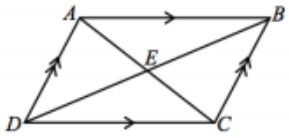
<tr><td>$m\angle CDB + m\angle ADB = m\angle CBA$</td><td></td></tr>
<tr><td>$m\angle CBA = m\angle ADC$</td><td></td></tr>
<tr><td>$\angle CBA \cong \angle ADC$ (a pair of opposite angles)</td><td></td></tr>
</table>
</td></tr>
</table>

<table>
<tr>
<td>c)
Given: ABCD is a parallelogram.

Prove: Consecutive angles are supplementary.</td>
<td>Label the parallelogram below using the given.
  </td>
<td>
<table>
<tr><th>Statement</th><th>Reason</th></tr>
<tr><td>ABCD is a parallelogram</td><td>Given</td></tr>
<tr><td>$\angle ABC$ and $\angle BCD$ are supplementary</td><td rowspan="4">Same Side Interior Angle Theorem</td></tr>
<tr><td>$\angle BCD$ and $\angle CDA$ are supplementary</td></tr>
<tr><td>$\angle CDA$ and $\angle DAB$ are supplementary</td></tr>
<tr><td>$\angle DAB$ and $\angle ABC$ are supplementary</td></tr>
</table>
For the proof above there is a key step missing in the reasoning. Identify what is missing and where it should go. Explain how you know.
</td>
</tr>
<tr>
<td>d)
Given: ABCD is a parallelogram.

Prove: The diagonals bisect each other.</td>
<td> 
</td>
<td>In this proof you are allowed to use any of the 3 properties you've already proven.</td>
</tr>
</table>

2. In order to disprove a conjecture, all that is needed is a single counterexample (an example where the conjecture is not true). Draw a counterexample for each of the following.

a. The diagonals of a parallelogram are congruent.	b. The diagonals of a parallelogram are perpendicular.