**Activity 3.1.2a Proving the Triangle Sum Theorem**

**Triangle Sum Theorem:** The sum of the interior angle measures in any triangle is 180°.



Given: ∆*ABC*

Prove: $m∠BCA+m∠CAB+m∠ABC=180°$

Proof: Translate ∆*ABC* by the vector from *B* to *A* to form ∆*A1’AC’*. Then translate ∆*ABC* by the vector from *C* to *A* to form ∆*A2’B’A*.

By special property (b) of translation, a line not containing the translation vector is mapped onto a line parallel to itself. Thus $\overleftrightarrow{ B'A}∥\\_\\_\\_$ and $\overleftrightarrow{ AC'}∥\\_\\_\\_\\_$.

By the parallel postulate, there is only \_\_\_\_line through A parallel to $\overleftrightarrow{ BC}$, so $\overleftrightarrow{ B'A}$ and $\overleftrightarrow{ AC'}$ are the same line.

Applying the Angle Addition Postulate we have $m∠1+m∠2+m∠3=\\_\\_\\_\\_$.

Since translations preserve angle measure, $m∠\\_\\_\\_\\_\\_=m∠BCA$ and $m∠\\_\\_\\_\\_=m∠ABC$.

Also by the Vertical Angles Theorem $m∠\\_\\_\\_\\_=m∠CAB$.

Substituting for the measures of angles 1, 2, and 3 in the above equation we have

$m∠BCA+m∠CAB+m∠ABC=\\_\\_\\_\\_\\_°.$