**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:

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 and .

By the parallel postulate, there is only \_\_\_\_line through A parallel to , so and are the same line.

Applying the Angle Addition Postulate we have .

Since translations preserve angle measure, and .

Also by the Vertical Angles Theorem .

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