

Geometry – Converses of Parallel Theorems and Example of Proof

Claim: If a pair of lines are cut by a transversal so that alternate interior angles are congruent, then the lines are parallel.

Proof of claim: Suppose that angles 5 and 3 are congruent. We’d like to show that this implies lines j and k are are parallel. The only fact we have, concerning angles implying that lines are parallel, comes from our ‘super postulate’ (postulate 3.4 in the textbook). This states that if corresponding angles are congruent, then we can conclude that lines are parallel.

So let’s consider the angle that corresponds with angle 5, which is angle 1. Notice that angle 1 and 2 form a linear pair, so their measures add to be 180 degrees. Interestingly, angles 3 and 2 also form a linear pair, so their measures add to be 180 degrees. From this, we can deduce that angles 1 and 3 must have the same measure. So here we have it…

We began with the supposition that m<5 = m<3. We now know that m<3 = m<1. Therefore, we can conclude that m<5=m<1 (This is called the transitive property of equality, but you could also just use substitution). Recall, angles 1 and 5 are corresponding angles.

Now we’ve established that corresponding angles are congruent, which (as the ‘super postulate’ states) means the lines j and k must be parallel. // 🡨This is a snazzy symbol to communicate we’re done.

There are a few exercises / questions on back ☺

1. Using this as model, write a proof of the converse of theorem 3.2. You can refer to my illustration, or you can draw your own and include it with your proof.
2. ‘Scavenger Hunt’ chapter 1.
3. Record the name / theorem related to angles 1 and 3.
4. In words you understand, define \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ angles (the answer to part a)
5. In the proof example provided, for the sake of readability, the following statements are made without as much support as may be needed:

“Notice that angle 1 and 2 form a linear pair, so their measures add to be 180 degrees. Interestingly, angles 3 and 2 also form a linear pair, so their measures add to be 180 degrees. From this, we can deduce that angles 1 and 3 must have the same measure. “

Give detailed support of these statements. You might find it useful to translate the verbal sentences into equations in which the measures of angles 1, 2, and 3 are variables.