Hegewald-Manternach-Stuhr Theorem

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Theorem 1.1 Part B. If ABCD is a square, then angle BAC is congruent to angle BDC.

Proof. Let rhombus ABCD be a square. We know triangle ABD and triangle DCA are isosceles triangles because each triangle has two congruent sides by definition of a square. Because we know that the triangle ABD and DCA are isosceles, we know the base angles of isosceles are congruent from Euclid 1.5. Therefore angle ACB is congruent to angle ABC. Likewise DAC is also congruent to angle DCA. We know that all of these angles are congruent because the diagonals constructed bisect the right angles of each vertex because of Ms. Freking's presentation on Theorem 3.3. Similarly, triangle DAB and DCB are isosceles triangles because two sides are congruent by definition of a square. Then we know that angles BCA, BAC, CDB, and CBD are all congruent to one another. Because angle DAB is a right angle, we know that angle DAC and BAC are half a right angle. Likewise, angle ADC is a right angle so we know angles ABD and BDC are half a right angle. Therefore angles BDC and angle BAC are congruent.

□

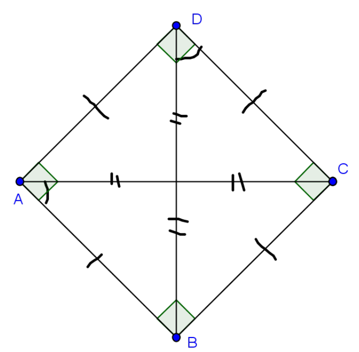

Figure 1: The rhombus featured here is also a square which demonstrates that angle BDC is congruent to BAC