Diagonals of a Kite Theorem

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May 1, 2015

This Theroem only applies to convex kites. Refereed by Ms. Ange Rehnstrom.

Theorem 2.2. The diagonals of a convex kite, ABCD, must cross.

Proof. Create diagonal BD. Notice two isosceles triangles are formed, triangle ABD and triangle CBD. Draw the perpendicular from A to BD. This point is called X. By Ms. Van Nevel's Theorem H, X is the midpoint of BD. Similarly, creating the perpendicular from C to BD creates a point Y. We say that X and Y are the same point and therefore segments AX and CY form diagonal AC. Since X and Y are both the midpoints of the common side BD it is true that X and Y are the same point. It remains to show that A, X, and C are all co-linear. Since X is the foot of a perpendicular drawn from A to BD we know that angles AXD and AXB are right. It is also true that point X is the foot of the perpendicular drawn from C to BD, again showing that angle CXD and angle CXB are both right angles. By Euclid I.14 it follows that AX and CX are in fact in a straight line and therefore the diagonal AC must cross the diagonal BD.
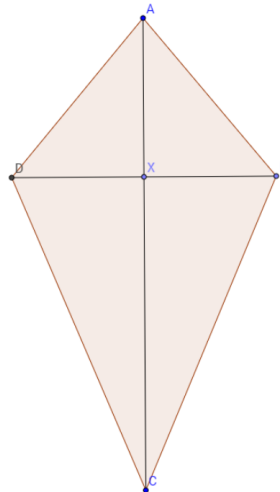

Figure 1: Kite ABCD

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