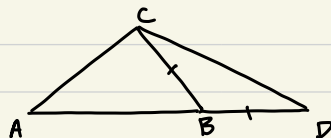


Prop 20, Book I. In any triangle, the sum of two sides taken together in any possible way is greater than the remaining side.

Proof. First, recall prop 19, Book I: "In any triangle, the greater angle is subtended by the greater side." Notice that this statement actually concerns two angles and two sides, i.e. if ABC is a triangle with $\angle ABC > \angle BAC$, then $|AC| > |BC|$.

Let ABC be a triangle. We show that

$$|AC| < |AB| + |BC|.$$



Pick D on AB with $|BD| = |BC|$. Then, BCD is isosceles and $\angle BCD = \angle BDC$. Now,

$$\begin{aligned}\angle ACD &= \angle ACB + \angle BCD = \angle ACB + \angle ADC \\ &> \angle ADC.\end{aligned}$$

By prop 19,

$$|AC| < |AD| = |AB| + |BD| = |AB| + |BC|.$$