Book 1
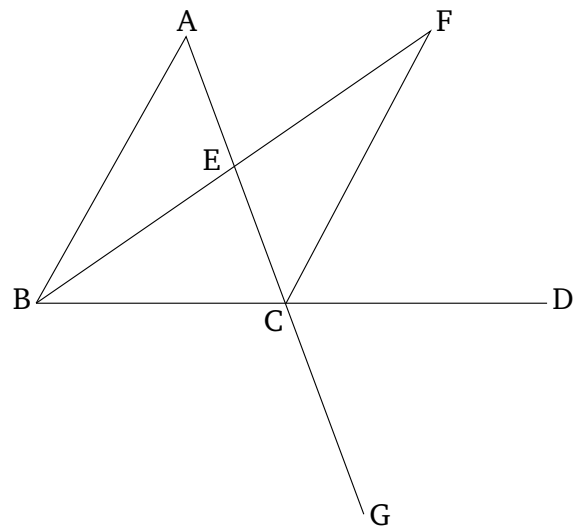# Proposition 16

For any triangle, when one of the sides is produced, the external angle is greater than each of the internal and opposite angles.

Let ABC be a triangle, and let one of its sides BC have been produced to D. I say that the external angle ACD is greater than each of the internal and opposite angles, CBA and BAC.

Let the (straight-line) AC have been cut in half at (point) E [Prop. 1.10]. And BE being joined, let it have been produced in a straight-line to (point) F. And let EF be made equal to BE [Prop. 1.3], and let FC have been joined, and let AC have been drawn through to (point) G.

Therefore, since AE is equal to EC, and BE to EF, the two (straight-lines) AE, EB are equal to the two (straight-lines) CE, EF, respectively. Also, angle AEB is equal to angle FEC, for (they are) vertically opposite [Prop. 1.15]. Thus, the base AB is equal to the base FC, and the triangle ABE is equal to the triangle FEC, and the remaining angles subtended by the equal sides are equal to the corresponding remaining angles [Prop. 1.4]. Thus, BAE is equal to ECF. But ECD is greater than ECF. Thus, ACD is greater than BAE. Similarly, by having cut BC in half, it can be shown (that) BCG—that is to say, ACD—(is) also greater than ABC.

Thus, for any triangle, when one of the sides is produced, the external angle is greater than each of the internal and opposite angles. (Which is) the very thing it was required to show.