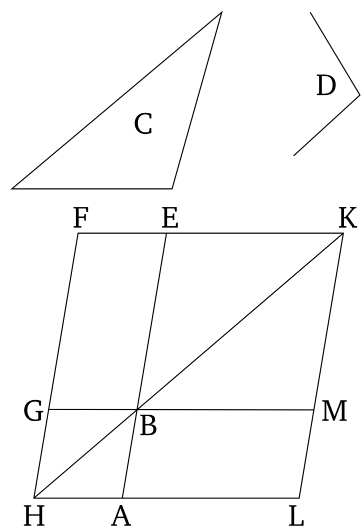
Book 1
Proposition 44

To apply a parallelogram equal to a given triangle to a given straight-line in a given rectilinear angle.



Let AB be the given straight-line, C the given triangle, and D the given rectilinear angle. So it is required to apply a parallelogram equal to the given triangle C to the given straight-line AB in an angle equal to (angle) D.

Let the parallelogram $BEFG$, equal to the triangle C, have been constructed in the angle EBG, which is equal to D [Prop. 1.42]. And let it have been placed so that BE is straight-on to AB. And let FG have been drawn through to H, and let AH have been drawn through A parallel to either of BG or EF [Prop. 1.31], and let HB have been joined. And since the straight-line HF falls across the parallels AH and EF, the (sum of the) angles AHF and HFE is thus equal to two right-angles

[Prop. 1.29]. Thus, (the sum of) BHG and GFE is less than two right-angles. And (straight-lines) produced to infinity from (internal angles whose sum is) less than two right-angles meet together [Post. 5]. Thus, being produced, HB and FE will meet together. Let them have been produced, and let them meet together at K. And let KL have been drawn through point K parallel to either of EA or FH [Prop. 1.31]. And let HA and GB have been produced to points L and M (respectively). Thus, $HLKF$ is a parallelogram, and HK its diagonal. And AG and ME (are) parallelograms, and LB and BF the so-called complements, about HK. Thus, LB is equal to BF [Prop. 1.43]. But, BF is equal to triangle C. Thus, LB is also equal to C. Also, since angle GBE is equal to ABM [Prop. 1.15], but GBE is equal to D, ABM is thus also equal to angle D.

Thus, the parallelogram LB, equal to the given triangle C, has been applied to the given straight-line AB in the angle ABM, which is equal to D. (Which is) the very thing it was required to do.