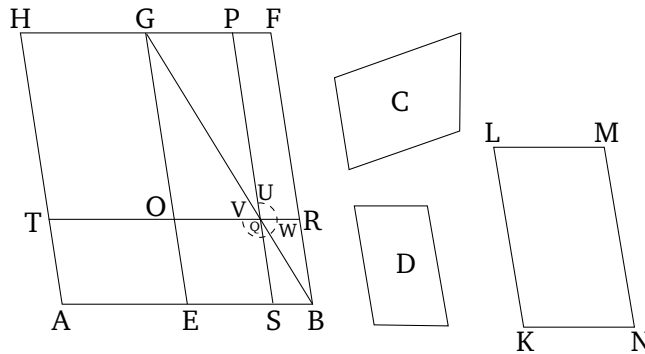


Book 6
Proposition 28

To apply a parallelogram, equal to a given rectilinear figure, to a given straight-line, (the applied parallelogram) falling short by a parallelogrammic figure similar to a given (parallelogram). It is necessary for the given rectilinear figure [to which it is required to apply an equal (parallelogram)] not to be greater than the (parallelogram) described on half (of the straight-line) and similar to the deficit.

Let AB be the given straight-line, and C the given rectilinear figure to which the (parallelogram) applied to AB is required (to be) equal, [being] not greater than the (parallelogram) described on half of AB and similar to the deficit, and D the (parallelogram) to which the deficit is required (to be) similar. So it is required to apply a parallelogram, equal to the given rectilinear figure C , to the straight-line AB , falling short by a parallelogrammic figure which is similar to D .



Let AB have been cut in half at point E [Prop. 1.10], and let (parallelogram) $EBFG$, (which is) similar, and similarly laid out, to (parallelogram) D , have been de-

scribed on EB [Prop. 6.18]. And let parallelogram AG have been completed.

Therefore, if AG is equal to C then the thing prescribed has happened. For a parallelogram AG , equal to the given rectilinear figure C , has been applied to the given straight-line AB , falling short by a parallelogrammic figure GB which is similar to D . And if not, let HE be greater than C . And HE (is) equal to GB [Prop. 6.1]. Thus, GB (is) also greater than C . So, let (parallelogram) $KLMN$ have been constructed (so as to be) both similar, and similarly laid out, to D , and equal to the excess by which GB is greater than C [Prop. 6.25]. But, GB [is] similar to D . Thus, KM is also similar to GB [Prop. 6.21]. Therefore, let KL correspond to GE , and LM to GF . And since (parallelogram) GB is equal to (figure) C and (parallelogram) KM , GB is thus greater than KM . Thus, GE is also greater than KL , and GF than LM . Let GO be made equal to KL , and GP to LM [Prop. 1.3]. And let the parallelogram $OGPQ$ have been completed. Thus, $[GQ]$ is equal and similar to KM [but, KM is similar to GB]. Thus, GQ is also similar to GB [Prop. 6.21]. Thus, GQ and GB are about the same diagonal [Prop. 6.26]. Let GQB be their (common) diagonal, and let the (remainder of the) figure have been described.

Therefore, since BG is equal to C and KM , of which GQ is equal to KM , the remaining gnomon UWV is thus equal to the remainder C . And since (the complement) PR is equal to (the complement) OS [Prop. 1.43], let (parallelogram) QB have been added to both. Thus, the

whole (parallelogram) PB is equal to the whole (parallelogram) OB . But, OB is equal to TE , since side AE is equal to side EB [Prop. 6.1]. Thus, TE is also equal to PB . Let (parallelogram) OS have been added to both. Thus, the whole (parallelogram) TS is equal to the gnomon VWU . But, gnomon VWU was shown (to be) equal to C . Therefore, (parallelogram) TS is also equal to (figure) C .

Thus, the parallelogram ST , equal to the given rectilinear figure C , has been applied to the given straight-line AB , falling short by the parallelogrammic figure QB , which is similar to D [inasmuch as QB is similar to GQ [Prop. 6.24]]. (Which is) the very thing it was required to do.