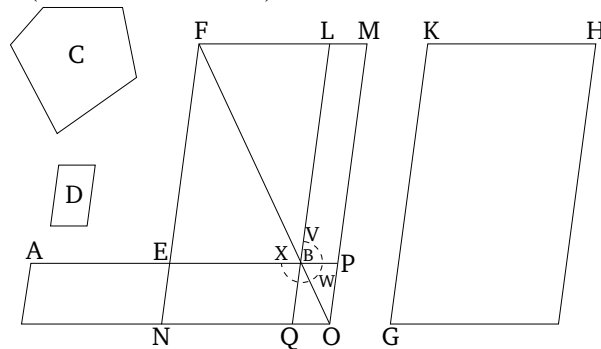


Book 6  
Proposition 29

To apply a parallelogram, equal to a given rectilinear figure, to a given straight-line, (the applied parallelogram) overshooting by a parallelogrammic figure similar to a given (parallelogram).



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, and  $D$  the (parallelogram) to which the excess is required (to be) similar. So it is required to apply a parallelogram, equal to the given rectilinear figure  $C$ , to the given straight-line  $AB$ , overshooting by a parallelogrammic figure similar to  $D$ .

Let  $AB$  have been cut in half at (point)  $E$  [Prop. 1.10], and let the parallelogram  $BF$ , (which is) similar, and similarly laid out, to  $D$ , have been described on  $EB$  [Prop. 6.18]. And let (parallelogram)  $GH$  have been constructed (so as to be) both similar, and similarly laid out, to  $D$ , and equal to the sum of  $BF$  and  $C$  [Prop. 6.25]. And let  $KH$  correspond to  $FL$ , and  $KG$  to  $FE$ . And since (parallelogram)  $GH$  is greater than (parallelogram)  $FB$ ,  $KH$  is thus also greater than  $FL$ ,

and  $KG$  than  $FE$ . Let  $FL$  and  $FE$  have been produced, and let  $FLM$  be (made) equal to  $KH$ , and  $FEN$  to  $KG$  [Prop. 1.3]. And let (parallelogram)  $MN$  have been completed. Thus,  $MN$  is equal and similar to  $GH$ . But,  $GH$  is similar to  $EL$ . Thus,  $MN$  is also similar to  $EL$  [Prop. 6.21].  $EL$  is thus about the same diagonal as  $MN$  [Prop. 6.26]. Let their (common) diagonal  $FO$  have been drawn, and let the (remainder of the) figure have been described.

And since (parallelogram)  $GH$  is equal to (parallelogram)  $EL$  and (figure)  $C$ , but  $GH$  is equal to (parallelogram)  $MN$ ,  $MN$  is thus also equal to  $EL$  and  $C$ . Let  $EL$  have been subtracted from both. Thus, the remaining gnomon  $XWV$  is equal to (figure)  $C$ . And since  $AE$  is equal to  $EB$ , (parallelogram)  $AN$  is also equal to (parallelogram)  $NB$  [Prop. 6.1], that is to say, (parallelogram)  $LP$  [Prop. 1.43]. Let (parallelogram)  $EO$  have been added to both. Thus, the whole (parallelogram)  $AO$  is equal to the gnomon  $VWX$ . But, the gnomon  $VWX$  is equal to (figure)  $C$ . Thus, (parallelogram)  $AO$  is also equal to (figure)  $C$ .

Thus, the parallelogram  $AO$ , equal to the given rectilinear figure  $C$ , has been applied to the given straight-line  $AB$ , overshooting by the parallelogrammic figure  $QP$  which is similar to  $D$ , since  $PQ$  is also similar to  $EL$  [Prop. 6.24]. (Which is) the very thing it was required to do.