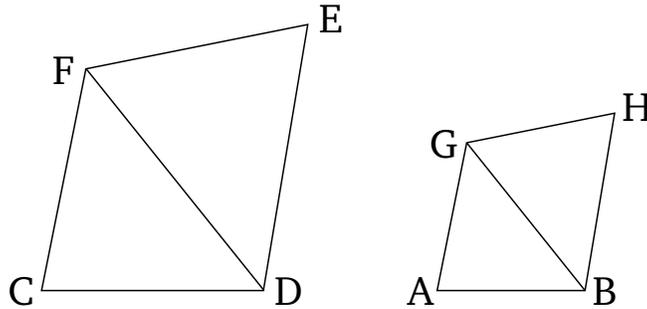


# Book 6

## Proposition 18

To describe a rectilinear figure similar, and similarly laid down, to a given rectilinear figure on a given straight-line.



Let  $AB$  be the given straight-line, and  $CE$  the given rectilinear figure. So it is required to describe a rectilinear figure similar, and similarly laid down, to the rectilinear figure  $CE$  on the straight-line  $AB$ .

Let  $DF$  have been joined, and let  $GAB$ , equal to the angle at  $C$ , and  $ABG$ , equal to (angle)  $CDF$ , have been constructed on the straight-line  $AB$  at the points  $A$  and  $B$  on it (respectively) [Prop. 1.23]. Thus, the remaining (angle)  $CFD$  is equal to  $AGB$  [Prop. 1.32]. Thus, triangle  $FCD$  is equiangular to triangle  $GAB$ . Thus, proportionally, as  $FD$  is to  $GB$ , so  $FC$  (is) to  $GA$ , and  $CD$  to  $AB$  [Prop. 6.4]. Again, let  $BGH$ , equal to angle  $DFE$ , and  $GBH$  equal to (angle)  $FDE$ , have been constructed on the straight-line  $BG$  at the points  $G$  and  $B$  on it (respectively) [Prop. 1.23]. Thus, the remaining (angle) at  $E$  is equal to the remaining (angle) at  $H$  [Prop. 1.32]. Thus, triangle  $FDE$  is equiangular to triangle  $GHB$ . Thus, proportionally, as  $FD$  is to  $GB$ , so

$FE$  (is) to  $GH$ , and  $ED$  to  $HB$  [Prop. 6.4]. And it was also shown (that) as  $FD$  (is) to  $GB$ , so  $FC$  (is) to  $GA$ , and  $CD$  to  $AB$ . Thus, also, as  $FC$  (is) to  $AG$ , so  $CD$  (is) to  $AB$ , and  $FE$  to  $GH$ , and, further,  $ED$  to  $HB$ . And since angle  $CFD$  is equal to  $AGB$ , and  $DFE$  to  $BGH$ , thus the whole (angle)  $CFE$  is equal to the whole (angle)  $AGH$ . So, for the same (reasons), (angle)  $CDE$  is also equal to  $ABH$ . And the (angle) at  $C$  is also equal to the (angle) at  $A$ , and the (angle) at  $E$  to the (angle) at  $H$ . Thus, (figure)  $AH$  is equiangular to  $CE$ . And (the two figures) have the sides about their equal angles proportional. Thus, the rectilinear figure  $AH$  is similar to the rectilinear figure  $CE$  [Def. 6.1].

Thus, the rectilinear figure  $AH$ , similar, and similarly laid down, to the given rectilinear figure  $CE$  has been constructed on the given straight-line  $AB$ . (Which is) the very thing it was required to do.