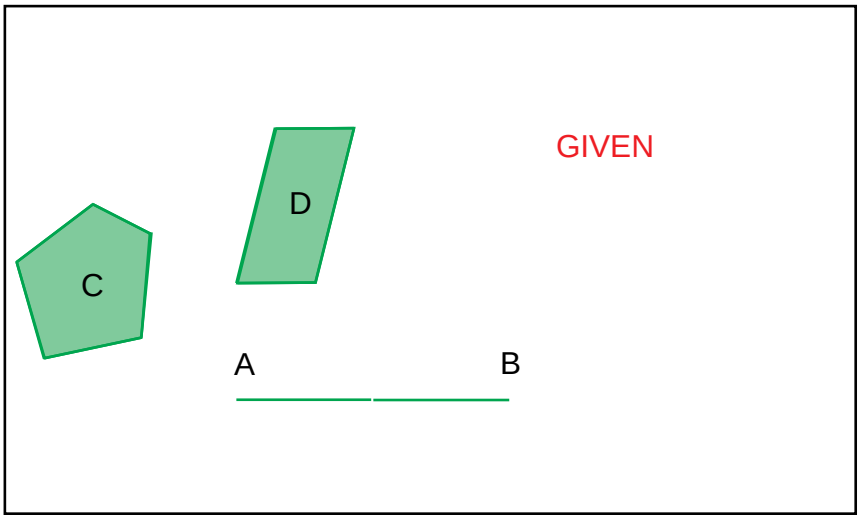
Construction 47: Book VI, Proposition 29

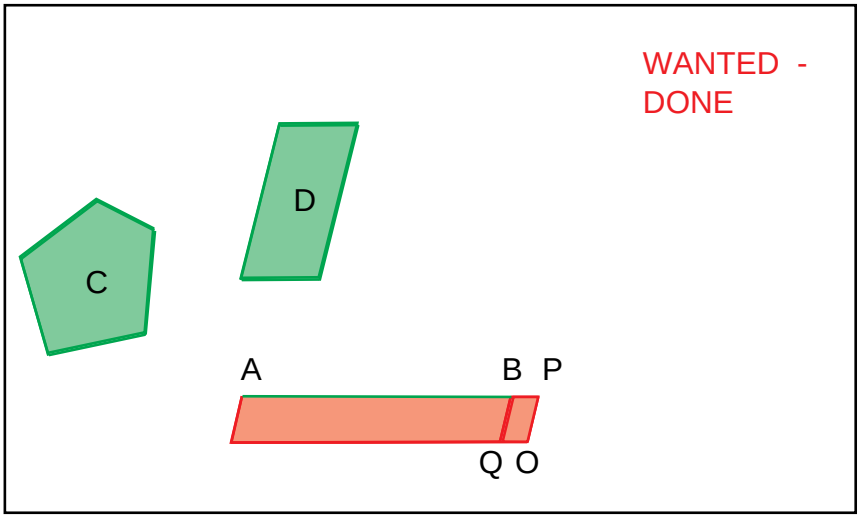
To a given straight line to apply a parallelogram equal to a given rectilineal figure and exceeding by a parallelogrammic figure similar to a given one.



VI.29:4. Let AB be the given straight line, C the given rectilineal figure to which the figure to be applied to AB is required to be equal, and D that to which the excess is required to be similar;

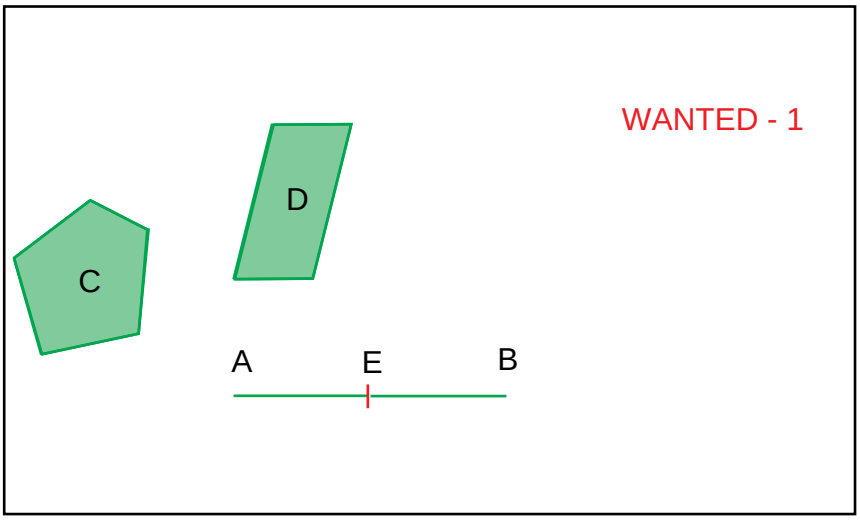
VI.29:8. Thus it is required to apply to the straight line AB a parallelogram equal to the rectilineal figure C and exceeding by a parallelogrammic figure similar to D.

That is, AD equal to C, QP similar to D.



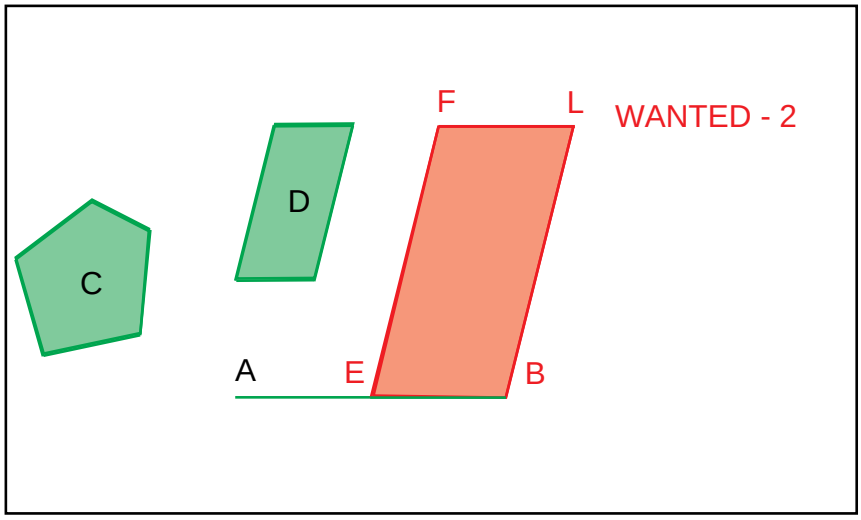
We outline 5 stages.;

Stage 1.
VI.27:11. Let AB be bisected at E; ([I.10])



Stage 2.

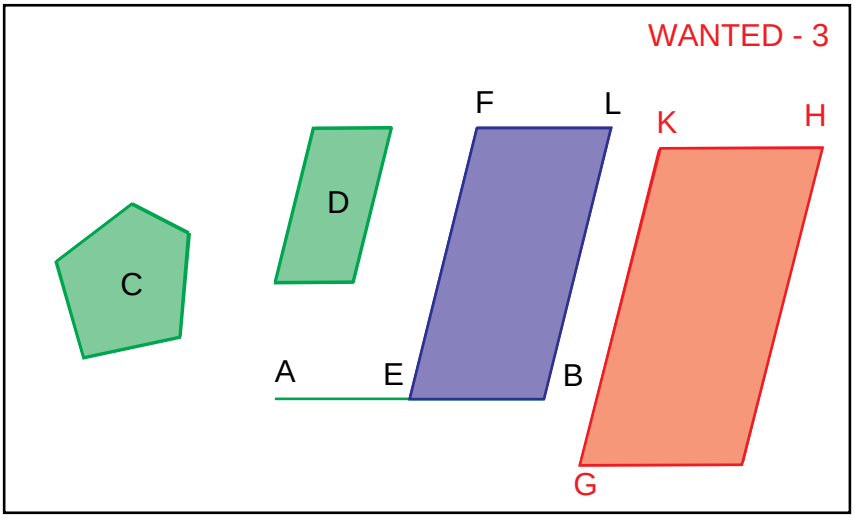
VI.27:12. let there be described on EB the parallelogram BF similar and similarly situated to D; ([VI.18])



Stage 3.

VI.27:14. and let GH be constructed at once equal to the sum of BF, C and similar and similarly situated to D. [VI.25]

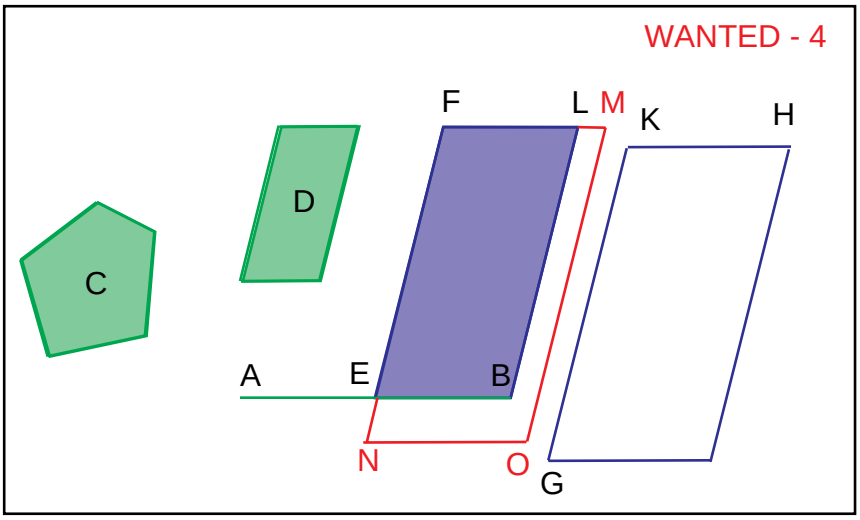
Note: Here Euclid calls upon VI.25 to construct a parallelogram equal to a rectilineal figure, BF, C, which is not connected in one piece. Nevertheless, the method of VI.25, which proceeds by triangulation, is successful.



Stage 4.

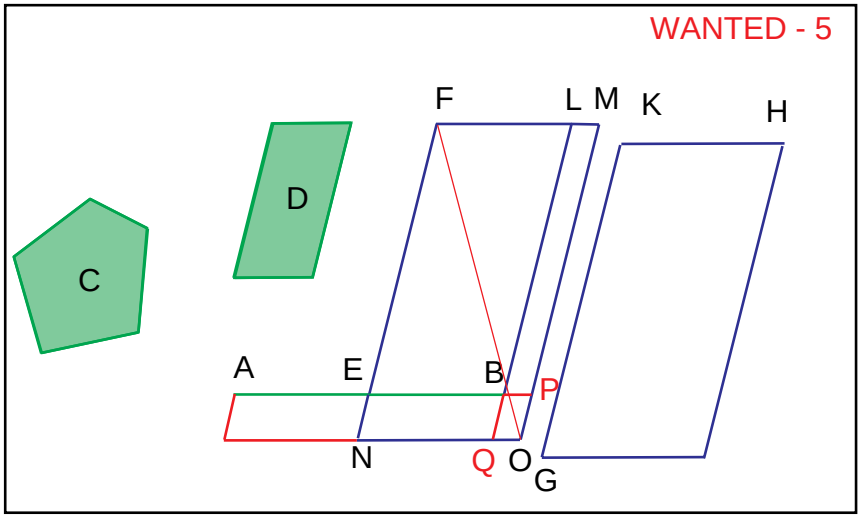
VI.29:19. Let FL, FE be produced, let FLM be equal to KH, and FEN to KG, and let MN be completed;

Therefore MN is both equal and similar to GH.



Stage 5.

VI.29:26. Let their diameter FO be drawn, and let the figure be described.



Done.

VI.29:39. Therefore to the given straight line AB there has been applied the parlallelogram AO equal to the given rectilineal figure C and exceeding by a parallelogrammic figure QP which is similar to D.