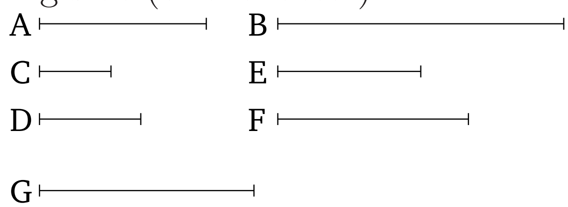
Book 8
Proposition 18

There exists one number in mean proportion to two similar plane numbers. And (one) plane (number) has to the (other) plane (number) a squared† ratio with respect to (that) a corresponding side (of the former has) to a corresponding side (of the latter).



Let A and B be two similar plane numbers. And let the numbers C, D be the sides of A, and E, F (the sides) of B. And since similar numbers are those having proportional sides [Def. 7.21], thus as C is to D, so E (is) to F. Therefore, I say that there exists one number in mean proportion to A and B, and that A has to B a squared ratio with respect to that C (has) to E, or D to F—that is to say, with respect to (that) a corresponding side (has) to a corresponding [side].

For since as C is to D, so E (is) to F, thus, alternately, as C is to E, so D (is) to F [Prop. 7.13]. And since A is plane, and C, D its sides, D has thus made A (by) multiplying C. And so, for the same (reasons), E has made B (by) multiplying F. So let D make G (by) multiplying E. And since D has made A (by) multiplying C, and has made G (by) multiplying E, thus as C is to E, so A (is) to G [Prop. 7.17]. But as C (is) to E, [so] D (is) to F. And thus as D (is) to F, so A (is) to G. Again, since E has made G (by) multiplying D, and has made

B (by) multiplying F, thus as D is to F, so G (is) to B [Prop. 7.17]. And it was also shown that as D (is) to F, so A (is) to G. And thus as A (is) to G, so G (is) to B. Thus, A, G, B are continously proportional. Thus, there exists one number (namely, G) in mean proportion to A and B.

So I say that A also has to B a squared ratio with respect to (that) a corresponding side (has) to a corresponding side—that is to say, with respect to (that) C (has) to E, or D to F. For since A, G, B are continuously proportional, A has to B a squared ratio with respect to (that A has) to G [Prop. 5.9]. And as A is to G, so C (is) to E, and D to F. And thus A has to B a squared ratio with respect to (that) C (has) to E, or D to F. (Which is) the very thing it was required to show.