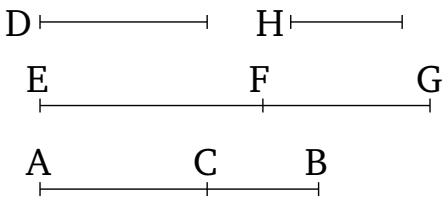
# Book 10
# Proposition 48

To find a first binomial (straight-line).

Let two numbers $AC$ and $CB$ be laid down such that their sum $AB$ has to $BC$ the ratio which (some) square number (has) to (some) square number, and does not have to $CA$ the ratio which (some) square number (has) to (some) square number [Prop. 10.28 lem. I]. And let some rational (straight-line) $D$ be laid down. And let $EF$ be commensurable in length with $D$. $EF$ is thus also rational [Def. 10.3]. And let it have been contrived that as the number $BA$ (is) to $AC$, so the (square) on $EF$ (is) to the (square) on $FG$ [Prop. 10.6 corr.]. And $AB$ has to $AC$ the ratio which (some) number (has) to (some) number. Thus, the (square) on $EF$ also has to the (square) on $FG$ the ratio which (some) number (has) to (some) number. Hence, the (square) on $EF$ is commensurable with the (square) on $FG$ [Prop. 10.6]. And $EF$ is rational. Thus, $FG$ (is) also rational. And since $BA$ does not have to $AC$ the ratio which (some) square number (has) to (some) square number, thus the (square) on $EF$ does not have to the (square) on $FG$ the ratio which (some) square number (has) to (some) square number either. Thus, $EF$ is incommensurable in length with $FG$ [Prop 10.9]. $EF$ and $FG$ are thus rational (straight-lines which are) commensurable in square only. Thus, $EG$ is a binomial (straight-line) [Prop. 10.36]. I say that (it is) also a first (binomial straight-line).




For since as the number $BA$ is to $AC$, so the (square) on $EF$ (is) to the (square) on $FG$, and $BA$ (is) greater than $AC$, the (square) on $EF$ (is) thus also greater than the (square) on $FG$ [Prop. 5.14]. Therefore, let (the sum of) the (squares) on $FG$ and $H$ be equal to the (square) on $EF$. And since as $BA$ is to $AC$, so the (square) on $EF$ (is) to the (square) on $FG$, thus, via conversion, as $AB$ is to $BC$, so the (square) on $EF$ (is) to the (square) on $H$ [Prop. 5.19 corr.]. And $AB$ has to $BC$ the ratio which (some) square number (has) to (some) square number. Thus, the (square) on $EF$ also has to the (square) on $H$ the ratio which (some) square number (has) to (some) square number. Thus, $EF$ is commensurable in length with $H$ [Prop. 10.9]. Thus, the square on $EF$ is greater than (the square on) $FG$ by the (square) on (some straight-line) commensurable (in length) with ($EF$). And $EF$ and $FG$ are rational (straight-lines). And $EF$ (is) commensurable in length with $D$.

Thus, $EG$ is a first binomial (straight-line) [Def. 10.5]. (Which is) the very thing it was required to show.