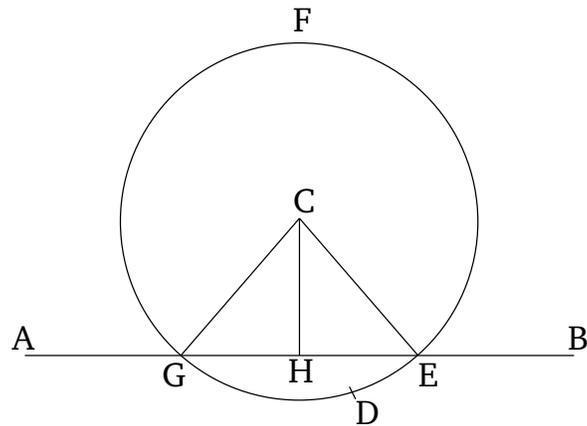


# Book 1

## Proposition 12

To draw a straight-line perpendicular to a given infinite straight-line from a given point which is not on it.



Let  $AB$  be the given infinite straight-line and  $C$  the given point, which is not on  $(AB)$ . So it is required to draw a straight-line perpendicular to the given infinite straight-line  $AB$  from the given point  $C$ , which is not on  $(AB)$ .

For let point  $D$  have been taken at random on the other side (to  $C$ ) of the straight-line  $AB$ , and let the circle  $EFG$  have been drawn with center  $C$  and radius  $CD$  [Post. 3], and let the straight-line  $EG$  have been cut in half at (point)  $H$  [Prop. 1.10], and let the straight-lines  $CG$ ,  $CH$ , and  $CE$  have been joined. I say that the (straight-line)  $CH$  has been drawn perpendicular to the given infinite straight-line  $AB$  from the given point  $C$ , which is not on  $(AB)$ .

For since  $GH$  is equal to  $HE$ , and  $HC$  (is) common,

the two (straight-lines)  $GH$ ,  $HC$  are equal to the two (straight-lines)  $EH$ ,  $HC$ , respectively, and the base  $CG$  is equal to the base  $CE$ . Thus, the angle  $CHG$  is equal to the angle  $EHC$  [Prop. 1.8], and they are adjacent. But when a straight-line stood on a(nother) straight-line makes the adjacent angles equal to one another, each of the equal angles is a right-angle, and the former straight-line is called a perpendicular to that upon which it stands [Def. 1.10].

Thus, the (straight-line)  $CH$  has been drawn perpendicular to the given infinite straight-line  $AB$  from the given point  $C$ , which is not on  $(AB)$ . (Which is) the very thing it was required to do.