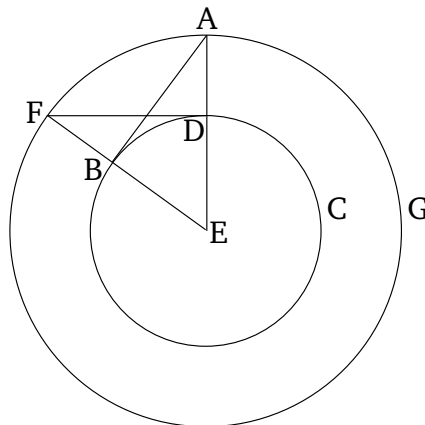# Book 3
Proposition 17

To draw a straight-line touching a given circle from a given point.

Let A be the given point, and BCD the given circle. So it is required to draw a straight-line touching circle BCD from point A.

For let the center E of the circle have been found [Prop. 3.1], and let AE have been joined. And let (the circle) AFG have been drawn with center E and radius EA. And let DF have been drawn from from (point) D, at right-angles to EA [Prop. 1.11]. And let EF and AB have been joined. I say that the (straight-line) AB has been drawn from point A touching circle BCD.

For since E is the center of circles BCD and AFG, EA is thus equal to EF, and ED to EB. So the two (straight-lines) AE, EB are equal to the two (straight-lines) FE, ED (respectively). And they contain a common angle at E. Thus, the base DF is equal to the base AB, and triangle DEF is equal to triangle EBA,

and the remaining angles (are equal) to the (correspond-ing) remaining angles [Prop. 1.4]. Thus, (angle) EDF (is) equal to EBA. And EDF (is) a right-angle. Thus, EBA (is) also a right-angle. And EB is a radius. And a (straight-line) drawn at right-angles to the diameter of a circle, from its extremity, touches the circle [Prop. 3.16 corr.]. Thus, AB touches circle BCD.

Thus, the straight-line AB has been drawn touching the given circle BCD from the given point A. (Which is) the very thing it was required to do.