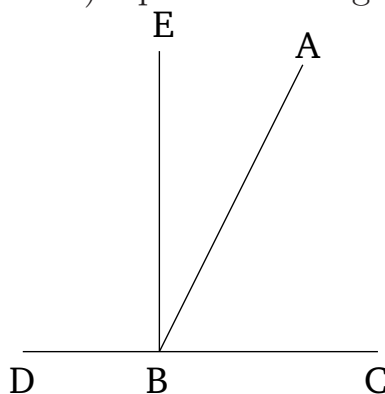# Book 1
Proposition 13

If a straight-line stood on a(nother) straight-line makes angles, it will certainly either make two right-angles, or (angles whose sum is) equal to two right-angles.

E
A

D   B   C

For let some straight-line AB stood on the straight-line CD make the angles CBA and ABD. I say that the angles CBA and ABD are certainly either two right-angles, or (have a sum) equal to two right-angles.

In fact, if CBA is equal to ABD then they are two right-angles [Def. 1.10]. But, if not, let BE have been drawn from the point B at right-angles to [the straight-line] CD [Prop. 1.11]. Thus, CBE and EBD are two right-angles. And since CBE is equal to the two (angles) CBA and ABE, let EBD have been added to both. Thus, the (sum of the angles) CBE and EBD is equal to the (sum of the) three (angles) CBA, ABE, and EBD [C.N. 2]. Again, since DBA is equal to the two (angles) DBE and EBA, let ABC have been added to both. Thus, the (sum of the angles) DBA and ABC is equal to the (sum of the) three (angles) DBE, EBA,

and ABC [C.N. 2]. But (the sum of) CBE and EBD was also shown (to be) equal to the (sum of the) same three (angles). And things equal to the same thing are also equal to one another [C.N. 1]. Therefore, (the sum of) CBE and EBD is also equal to (the sum of) DBA and ABC. But, (the sum of) CBE and EBD is two right-angles. Thus, (the sum of) ABD and ABC is also equal to two right-angles.

Thus, if a straight-line stood on a(nother) straight-line makes angles, it will certainly either make two right-angles, or (angles whose sum is) equal to two right-angles. (Which is) the very thing it was required to show.