[Sir Thomas L. Heath, *The Thirteen Books of Euclid's Elements* (2nd edition), p. 282 (1925).]

[Heath's commentary on Euclid, *Elements*, Book I, Proposition 17.]

1. taken together in any manner, πάντη μεταλαμβανόμεναι, i.e. any pair added together.

As in his note on the previous proposition, Proclus tries to state the *cause* of the property. He takes the case of two straight lines forming right angles with a transversal and observes that it is the *convergence of the straight lines* towards one another ($\sigma \acute{\nu} \varkappa \upsilon \sigma \iota \varsigma \tau \breve{\omega} \varkappa \upsilon \vartheta \varkappa \iota \breve{\omega} \iota)$, the lessening of the two right angles, which produces the triangle. He will not have it that the fact of the exterior angle being greater than the interior and opposite angle is the *cause* of the property, for the odd reason that "it is not necessary that a side should be produced, or that there should be any exterior angle constructed ... and how can what is not necessary be the cause of what is necessary?" (p. 311, 17–21).

Agreeably to this view, Proclus then sets himself to prove the theorem without producing a side of the triangle.

Let ABC be a triangle. Take any point D on BC, and join AD.



Then the exterior angle ADC of the triangle ABD is greater than the interior and opposite angle ABD.

Similarly the exterior angle ADB of the triangle ADC is greater than the interior and opposite angle ACD.

Therefore, by addition, the angles ADB, ADC are together greater than the angles ABC, ACB.

But the angles ADB, ADC are equal to two right angles; therefore the angles ABC, ACB are less than two right angles.

Lastly, Proclus proves (what is obvious from this proposition) that there cannot be more than one perpendicular to a straight line from a point without it. For if this were possible, two of such perpendiculars would form a triangle in which two angles would be right angles: which is impossible, since any two angles of a triangle are together less than two right angles.