

STEP III, 2010 Q5

- 5 The vertices A , B , C and D of a square have coordinates $(0, 0)$, $(a, 0)$, (a, a) and $(0, a)$, respectively. The points P and Q have coordinates $(an, 0)$ and $(0, am)$ respectively, where $0 < m < n < 1$. The line CP produced meets DA produced at R and the line CQ produced meets BA produced at S . The line PQ produced meets the line RS produced at T . Show that TA is perpendicular to AC .

Explain how, given a square of area a^2 , a square of area $2a^2$ may be constructed using only a straight-edge.

[**Note:** a straight-edge is a ruler with no markings on it; no measurements (and no use of compasses) are allowed in the construction.]



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