

STEP III, 2014 , Q5 MS

5. ABCD is a parallelogram if and only if $\overline{AB} = \overline{DC}$ which yields the required result. To be a square as well, angle $ABC = 90^\circ$, and $|AB| = |BC|$, so $c - b = i(b - a)$. Treating the two results as simultaneous equations to be solved for a and c in terms of b and d , the second result of the stem can be shown with reversible logic. For part (i) the same logic can be used for PXQ as just used for ABC . From the stem, $XYZT$ is a square if and only if $i(x - z) = y - t$, and

$x + z = y + t$ and given the working for X in part (i), these can be shown to be true treating Y, Z , and T similarly



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