

STEP II, 2005, Q10 EC

Q10 This turned out to be the most popular and the best answered question of Section B.

The key to the obtaining of a completely correct response is the setting up of displacement-time equations which take into account both the different time origins and the different displacement origins of the two missiles. Without a correct form of these equations, or some equivalent, it is impossible to make significant progress with this question. With these, accurate working will speedily take the candidate to a complete and correct solution. As it was, most responses made

almost no progress, though on the other hand, a few were complete in every respect and well presented.

The four basic equations which describe the horizontal and vertical components of the motion of the particles are essentially:

$$x_1 = 80t, y_1 = 60t - 5t^2, x_2 = 180 - 120(t - T), y_2 = 160(t - T) - 5(t - T)^2 \quad (t \geq T) \quad (*)$$

In this context, some candidates used $t + T$ and t in place of t and $T - t$, respectively, but then left themselves with problems with regard to the interpretation of results at the end of their analysis.

Almost all candidates who got as far as (*), or some equivalent, worked from $x_1 = x_2$ and $y_1 = y_2$ to establish (eventually) a quadratic equation in T alone. It was in this process that many inaccuracies, such as one would not expect at this level, occurred. Beyond that, a small minority went on to obtain the roots $T = 1, 90$, but hardly anyone could produce an effective argument as to why, in fact, $T = 1$.



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