

STEP II, 2013, Q10 MS

Question 10.

Following the usual methods of considering horizontal and vertical parts of the motion will lead to the first result (some additional variables will need to be used, but they will cancel out to reach the final result.

If B and C are the same point then the result in part (i) can be applied for this point which will give an equation which is easily solved to give $\alpha = 60^\circ$ once the double angle formula has been applied.

For the final part it is possible to find the times at which the particle reaches each of the two points. The two equations reached can then be used to find an expression for the difference between the time at which the particle reaches each of the two points and then it can easily be deduced whether this is positive or negative, which will show which point is reached first.



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