

- 7 A particle  $P$  is projected with speed  $V \text{ m s}^{-1}$  at an angle  $75^\circ$  above the horizontal from a point  $O$  on a horizontal plane. It then moves freely under gravity.

(a) Show that the total time of flight, in seconds, is  $\frac{2V}{g} \sin 75^\circ$ . [2]

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A smooth vertical barrier is now inserted with its lower end on the plane at a distance 15 m from  $O$ . The particle is projected as before but now strikes the barrier, rebounds and returns to  $O$ . The coefficient of restitution between the barrier and the particle is  $\frac{3}{5}$ .

(b) Explain why the total time of flight is unchanged. [1]

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(c) Find an expression for  $V$  in terms of  $g$ .

[7]

[illegible]