2 A ball is thrown horizontally from the top of a building, as shown in Fig. 2.1.

For Examiner's Use

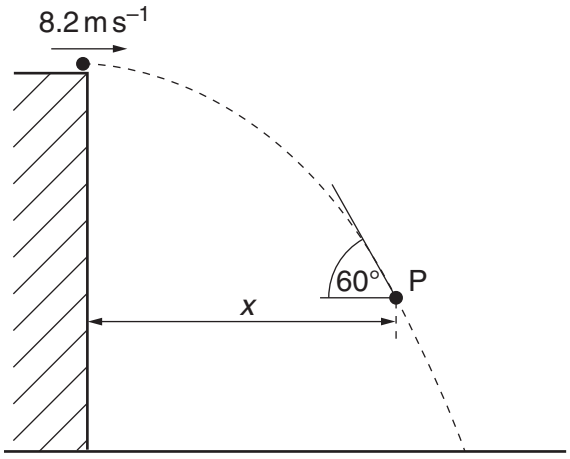

Fig. 2.1

The ball is thrown with a horizontal speed of $8.2\,m\,s^{-1}$. The side of the building is vertical. At point P on the path of the ball, the ball is distance x from the building and is moving at an angle of 60° to the horizontal. Air resistance is negligible.

(a) For the ball at point P,

(i) show that the vertical component of its velocity is $14.2\,m\,s^{-1}$,

[2]

(ii) determine the vertical distance through which the ball has fallen,

distance = ... m [2]

(iii) determine the horizontal distance x.

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x = ... m [2]

(b) The path of the ball in **(a)**, with an initial horizontal speed of $8.2\,m\,s^{-1}$, is shown again in Fig. 2.2.

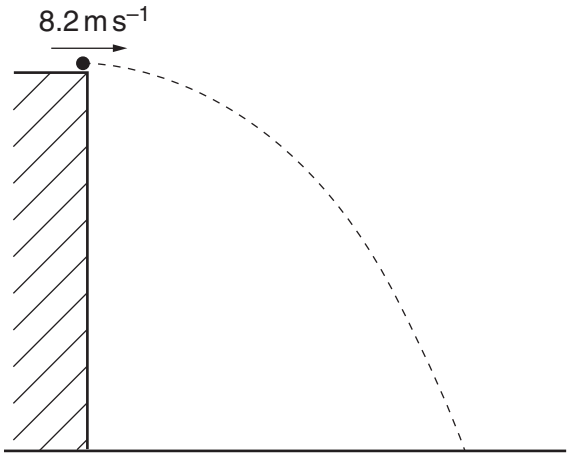

Fig. 2.2

On Fig. 2.2, sketch the new path of the ball for the ball having an initial horizontal speed

(i) greater than $8.2\,m\,s^{-1}$ and with negligible air resistance (label this path G), [2]

(ii) equal to $8.2\,m\,s^{-1}$ but with air resistance (label this path A). [2]