2   A ball, initially at rest, slides down the roof of a house at a constant acceleration of 5.0 m s^{-2}. It moves through a distance of 4.0 m before dropping off the edge of the roof to the muddy ground and coming to a complete stop upon impact, 15.0 m below. The roof slopes downward at an angle of 37.0° as shown in Fig. 2.1.
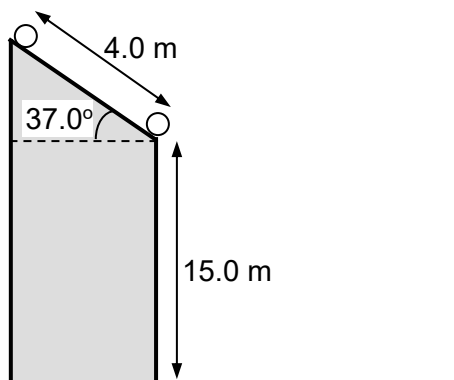

Fig. 2.1

(a)   Show that the speed of the ball when it reaches the edge of the roof is 6.32 m s^{-1}.

[1]

(b)   Calculate the horizontal and vertical components of the velocity of the ball just before it lands on the ground.

horizontal component of velocity = …………………………….. m s^{-1}

vertical component of velocity = …………………………….. m s^{-1} [2]

(c) Determine the total time that the ball is in motion.

total time = ………………………………. s   [3]

(d) Sketch labelled graphs to show the variation with time of the

    (i) magnitude of acceleration *a* of the ball,

[2]

    (ii) speed *v* of the ball.

[2]

[Total: 10]