2 Fig. 2.1 shows a ball to be shot at an angle θ above the level ground towards a wall 20 m away from it. x is the displacement from the launching point in the direction of the wall.

Fig. 2.1

Fig. 2.2 shows the variation of the vertical component of the ball's velocity v_y with displacement x.

v_y / m s^{-1}

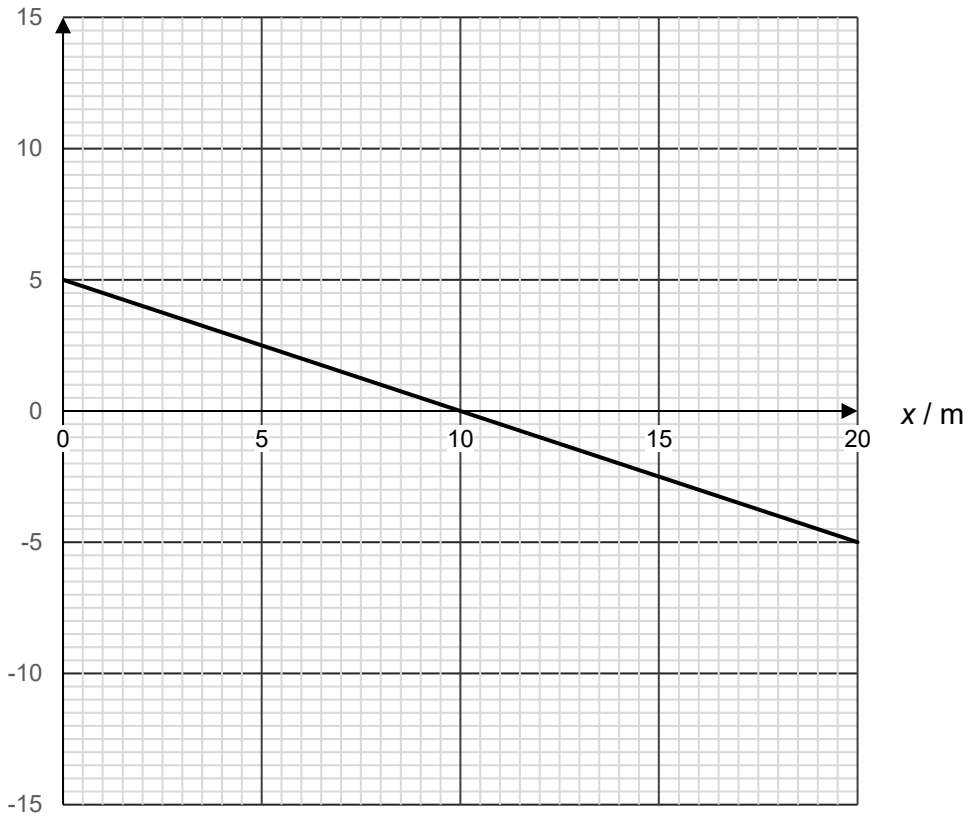

Fig. 2.2

(a) Show that the time taken for the ball to reach the wall is 1.02 s.

[2]

(b) Hence, or otherwise, determine the horizontal component of the ball's velocity.

horizontal velocity = ... m s^{-1} [1]

(c) Determine θ.

θ = ...° [2]

(d) The ball is now projected at different θ with the same speed.

On Fig. 2.2, sketch the variation of v_y with x if the ball were to hit the wall when it is at its maximum height.

[1]