1 An object is launched at a speed of 30 m s^{-1} with an angle of 60° from the ground as shown in Fig. 1.1. Ignore air resistance.

Fig 1.1

(a) Show that the time taken for the object to reach its maximum height is 2.6 s.

[1]

(b) Sketch the variation with time *t* of the vertical component of the velocity v_y on Fig. 1.2, from the time it leaves the ground to the time it returns to the ground. [2]

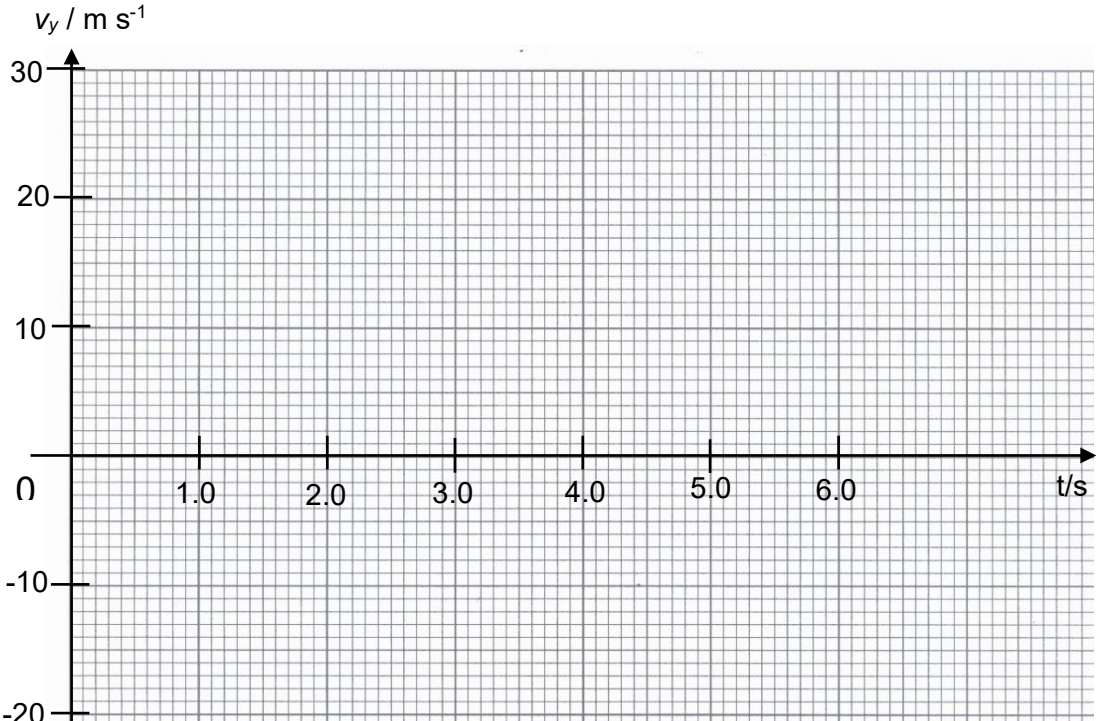

Fig. 1.2

(c) Sketch on Fig. 1.3,

(i) the variation of the horizontal component of the velocity v_x with time of the object for the duration of time in flight.

Label this line **A**. [1]

(ii) the variation of the horizontal component of the velocity v_x with time of the object for the duration of time in flight if air resistance is not negligible.

Label this line **B**. [2]

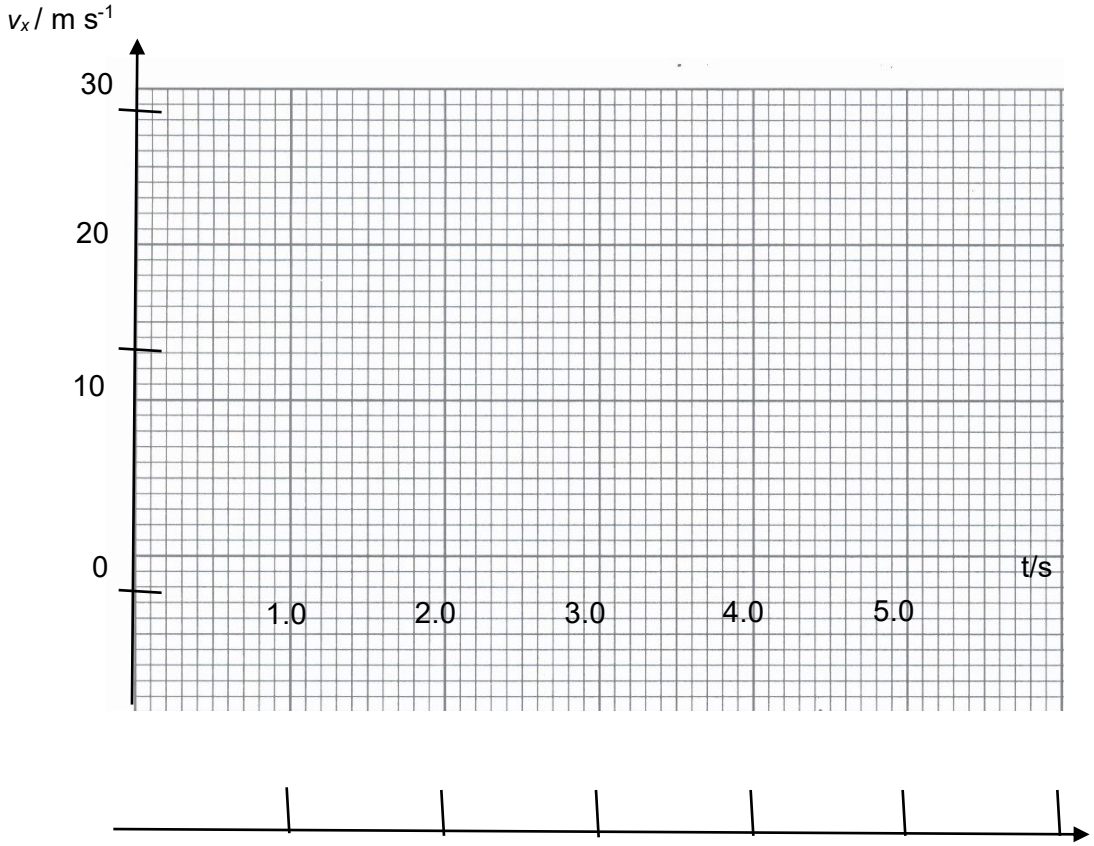

Fig. 1.3

(d) A second object is launched at the same instant with the same speed but at an angle of 30° above the ground. Air resistance is negligible.

Determine the vertical displacement between the two objects at 2.6 s.

vertical displacement = …… m [2]

[Total: 8 marks]