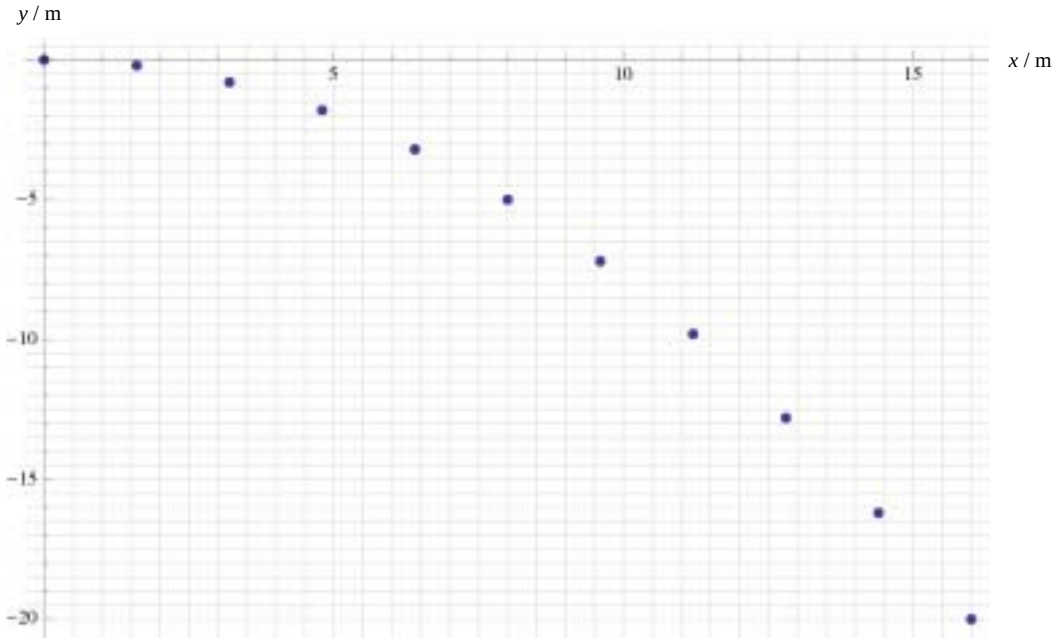
Extension Worksheet – Topic 2, Worksheet 4

1 The graph shows positions of a ball that was launched horizontally from a certain height on Earth. The positions are shown every 0.20 s.



a Use the diagram to estimate the initial velocity of the ball. [1]

b On the diagram above show the first 5 positions (i.e. at times 0 s, 0.2 s, 0.4 s, 0.6 s and 0.8 s) of a ball launched horizontally with a speed that is double that found in **a**. [2]

c On the diagram above show the positions of a ball launched horizontally with a speed equal to that in **a**, on a planet where the acceleration of free fall is double that on Earth. [2]

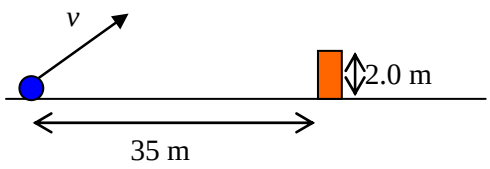
2 A ball is kicked horizontally with speed 15 m s^{-1} from the edge of a cliff falls to the sea below. The cliff is 25 m high above sea level.

a Calculate the angle the velocity of the ball makes with the horizontal as the ball impacts the sea ignoring air resistance. [3]

b State and explain the effect, if any, on your answer to **a** when air resistance cannot be ignored. [3]

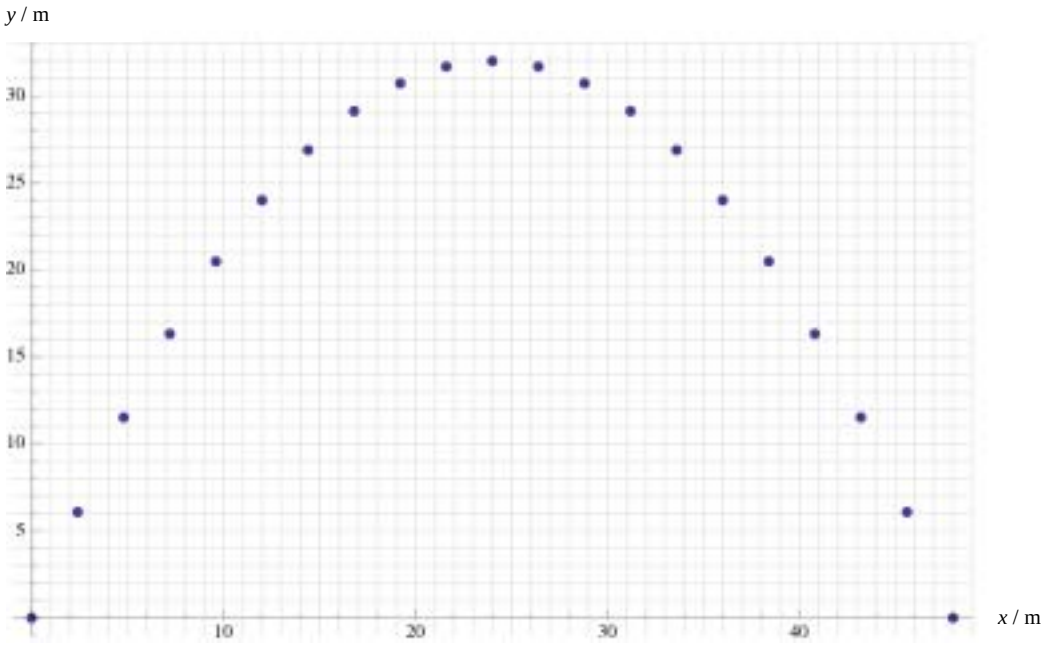
3 A ball is kicked on horizontal ground with velocity v on Earth. The horizontal distance travelled is R and the maximum height reached is H. Determine how these two quantities would change if the same ball is kicked with the same velocity on a planet where the acceleration of free fall is half that on Earth. [2]

4 A ball is kicked at an angle of 30° to the horizontal with speed v.



A wall of height 2.0 m is a distance of 35 m away. Deduce that if the ball is to go over the wall the speed v must be greater than approximately 21 m s^{-1}. [3]

5 The graph shows, at intervals of 0.20 s, the positions of a ball that was launched on the surface of a planet.



The initial vertical component of velocity is 32 m s^{-1}. Use the graph to estimate:

a The horizontal component of the velocity of the ball. [1]

b The angle to the horizontal the ball was launched at. [2]

c The acceleration of free fall on the surface of the planet. [2]

d The average vertical velocity between t = 3.6 s and t = 3.8 s. [2]