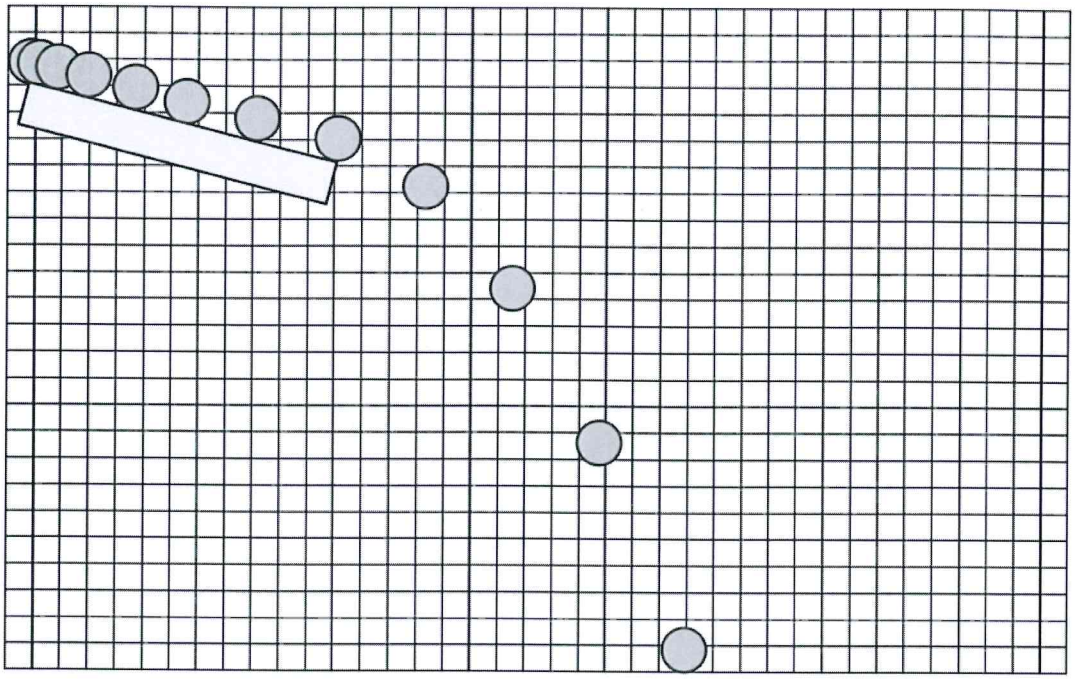
Chapter 7 Projectile Exam Q page 1

Question 1

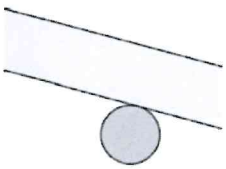
(19 marks)

Below is a diagram of a photograph taken using a strobe light flashing at 10.0 Hz. The camera is able to take multiple photographs of a single ball moving down a frictionless inclined plane over a short period of time. Each square on the background grid measures 5.0 cm × 5.0 cm. Ignore air resistance unless instructed otherwise.



(a) Draw and label the force(s) acting on the ball while it is on the inclined plane below.

(2 marks)



(b) As the ball leaves the inclined plane, its motion changes. (4 marks)

(i) Describe the horizontal and vertical accelerations just after the ball has left the inclined plane.

(ii) How would each of these accelerations be affected if air resistance was considered?

(c) Use the diagram to determine the horizontal velocity of the ball after it has left the inclined plane. Express your answer to an appropriate number of significant figures.

(3 marks)

(d) The angle of the plane to the horizontal is 14°. Determine the component of gravitational acceleration that acts along the inclined plane. (2 marks)

(e) Calculate the horizontal component of the ball's acceleration. Given that the ball starts from rest on the first strobe light flash and reaches the end of the inclined plane on the eighth flash, use the horizontal component of acceleration to determine the ball's horizontal velocity component as it leaves the inclined plane. (5 marks)

(f) Use the motion of the ball to calculate the length of the inclined plane. (3 marks)

Question 2

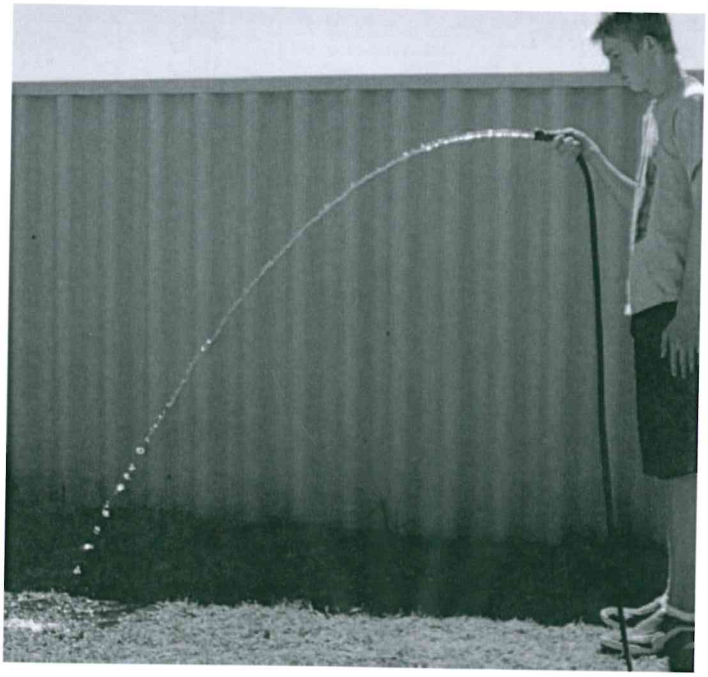
(5 marks)

Mindy flicks a coin across a desk. The coin leaves the edge of the desk and lands at a point 0.455 m below the desk top and 1.45 m from the edge of the desk. Calculate the velocity in m s^{-1} of the coin as it leaves the desktop.

Question 3

(5 marks)

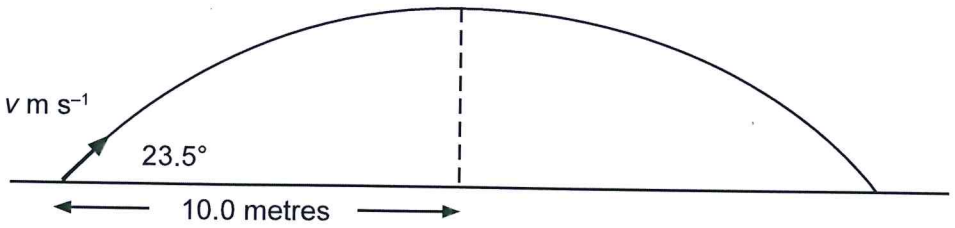
Mick is watering the lawn and wants to estimate the initial velocity of the water coming from the hose. Use information from the photograph to estimate the magnitude of the initial velocity of the water. Express your answer to an appropriate number of significant figures.



Question 4

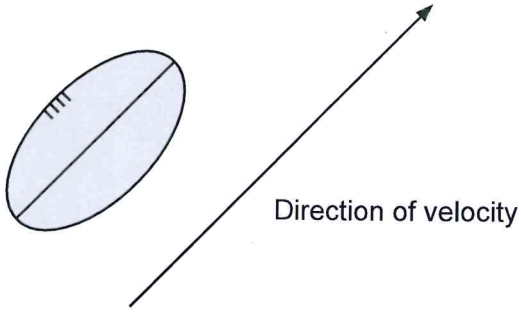
(14 marks)

Gary is playing in a park and decides to kick a ball over a branch of a large tree. He places the ball on the ground to kick it. The path of the ball is shown in the diagram. The tree is 10.0 m away. Gary kicks the ball with a velocity v at an angle of 23.5° to the horizontal. The ball will just clear the branch.



Question 4 cont

(a) Draw the force(s) acting on the ball just after it has been kicked. (2 marks)



(b) The ball is in the air for 1.33 s. Assuming no air resistance, determine:

(i) the initial velocity of the ball in m s^{-1} (4 marks)

(ii) the height of the branch (3 marks)

(iii) the distance in metres on the opposite side of the tree that Gary should place his sister so she can catch the ball when it is 1.25 m above the ground. (5 marks)