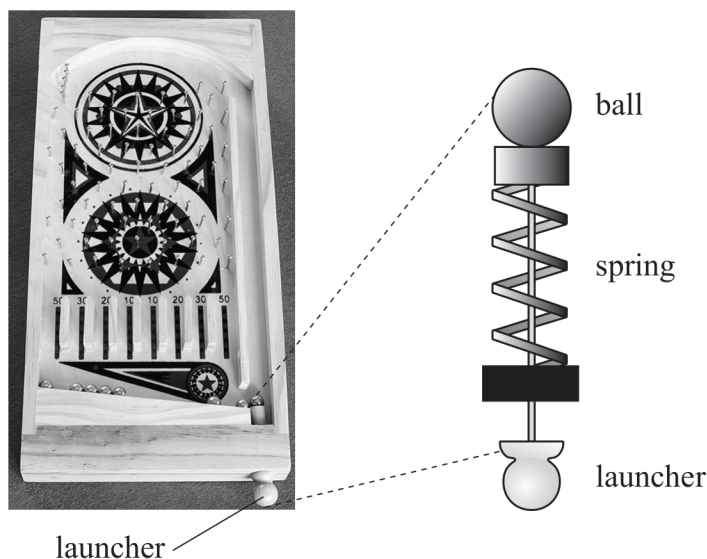


- 16 The photograph shows a toy pinball machine. The launcher is pulled back, compressing a spring. The spring obeys Hooke's law. When the launcher is released, the spring returns to its original length and a small ball is launched horizontally into the machine.



(Source: © Valery Voenny / Alamy Stock Photo)

When the launcher is pulled back, the spring is compressed by 5.0 cm. When the spring is released, the ball is launched at a speed of  $8.0 \text{ cm s}^{-1}$ .

- (a) Show that the kinetic energy of the ball just after launching is about  $4 \times 10^{-5} \text{ J}$ .

mass of ball = 12 g

(2)

- (b) Determine the force on the ball when the spring is released.

(2)

Force = .....

(c) Determine the stiffness of the spring.

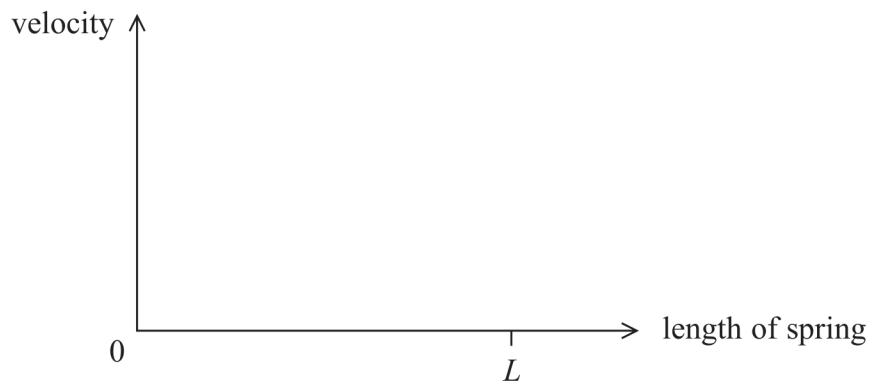
(2)

Stiffness = .....

(d) The spring returns to its original length  $L$ .

Sketch a graph, on the axes below, to show how the velocity of the ball varies with the length of the spring.

(4)



(Total for Question 16 = 10 marks)