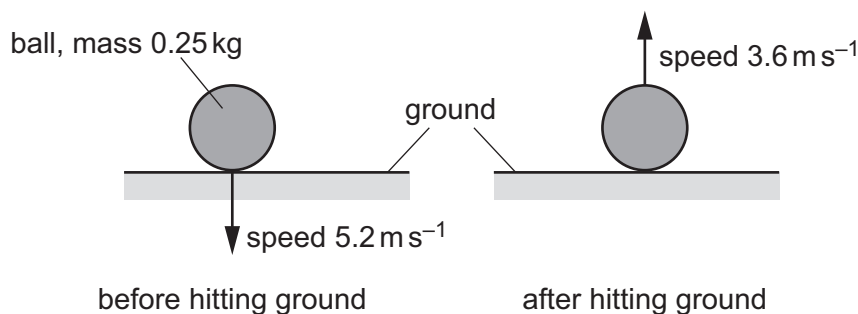


- 4 A small ball is dropped from rest from height  $h_1$  above the ground and falls vertically downwards. The ball collides with the ground and bounces back vertically upwards, reaching a maximum height  $h_2$ . Fig. 4.1 shows the ball just before and just after hitting the ground.



**Fig. 4.1**

The ball has mass  $0.25 \text{ kg}$  and is in contact with the ground for a time of  $0.18 \text{ s}$ . Just before the ball hits the ground, it has speed  $5.2 \text{ m s}^{-1}$ . Just after it leaves the ground, it has speed  $3.6 \text{ m s}^{-1}$ . Air resistance acting on the ball is negligible.

- (a) State and explain whether the collision is elastic or inelastic.

.....  
 .....  
 ..... [1]

- (b) (i) Calculate the change in momentum of the ball during the collision with the ground.

change in momentum = .....  $\text{kg m s}^{-1}$  [2]

- (ii) Determine the average force on the ball during the collision with the ground.

force = .....  $\text{N}$  [2]



\* 0000800000011 \*

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(c) Calculate the ratio  $\frac{h_2}{h_1}$ .

ratio = ..... [3]

[Total: 8]