

**AQA – Momentum and collisions – A2 Further Mathematics Mechanics****1. June/2021/Paper\_7367/3M/No.3**

A ball has mass 0.4 kg and is hit by a wooden bat.

The speed of the ball just before it is hit by the bat is  $6 \text{ m s}^{-1}$

The velocity of the ball immediately after being hit by the bat is perpendicular to its initial velocity.

The speed of the ball just after it is hit by the bat is  $8 \text{ m s}^{-1}$

Show that the impulse on the ball has magnitude 4 N s

**[3 marks]**

**2. June/2021/Paper\_7367/3M/No.6**

A ball of mass  $m$  kg is held at rest at a height  $h$  metres above a horizontal surface.

The ball is released and bounces on the surface.

The coefficient of restitution between the ball and the surface is  $e$

Prove that the kinetic energy lost during the first bounce is given by

$$mgh(1 - e^2)$$

**[4 marks]**