

Impulse Questions

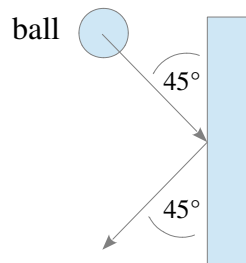
1. A ball of mass $m = 200\text{g}$ is initially at rest. The ball is then hit with a bat. After being hit, the ball travels to the right with a horizontal speed of 12ms^{-1} .

- (a) Calculate the magnitude of the momentum of the ball immediately after being hit. /2
- (b) The ball is in contact with the bat for $6 \times 10^{-3}\text{s}$. Calculate the average force exerted by the bat on the ball. /3
- (c) State the average force exerted by the ball on the bat, and write an equation which supports your answer. /2

2. Derive Newton's second law in terms of momentum $\vec{F} = \frac{\Delta \vec{p}}{\Delta t}$. /2

3.
If you inflate a balloon and then let it go, it will fly around the room. If the air is leaving the balloon at 10ms^{-1} and flowing at 100gs^{-1} , determine the magnitude of the average force being applied to the balloon. /2

4.
A ball of mass 0.53 kg is moving at a speed of 4.1 ms^{-1} when it collides with a wall. The ball bounced off the wall without a change of speed. The ball is moving at 45° to the wall before and after the collision, as shown in the diagram below:



Determine the magnitude and direction of the change in momentum of the ball. /4