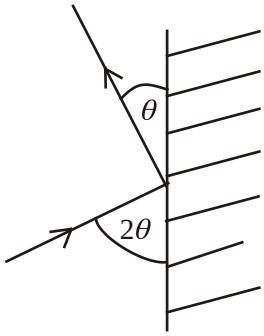
1.



A small smooth ball B, moving on a horizontal plane, collides with a fixed vertical wall. Immediately before the collision the angle between the direction of motion of B and the wall is 2θ where $0^o < \theta < 45°$. Immediately after the collision the angle between the direction of motion of B and the wall is θ as shown in the diagram above. Given that the coefficient of restitution between B and the wall is $\frac{3}{8}$, find the value of $\tan\theta$.

(Total 8 marks)

1.

$u\cos 2\theta = v\cos\theta$	M1 A1	
$\frac{3}{8}u\sin 2\theta = v\sin\theta$	M1 A1	
$3\tan 2\theta = 8\tan\theta$	M1	
$\frac{6\tan\theta}{1-\tan^2\theta} = 8\tan\theta$	M1	
$\tan^2\theta = \frac{1}{4}$ $(\tan\theta \neq 0)$		
$\tan\theta = \frac{1}{2}$	M1 A1	8

[8]

1. This was another standard problem, which most candidates managed easily. The majority of candidates recognised the need to apply conservation of momentum parallel to the wall and Newton's experimental law perpendicular to it. Those that did so often went on to score full marks on this question.

There were many ways through the trigonometric manipulation including working with *tan* throughout, or solving for *cos* first and then finding *tan*. Errors involving the incorrect use of *e* were rare but sign errors in the use of Newton's Experimental Law were more common.