

Quiz 4

Name: _____ Student Number: _____

CALCULATORS ALLOWED.

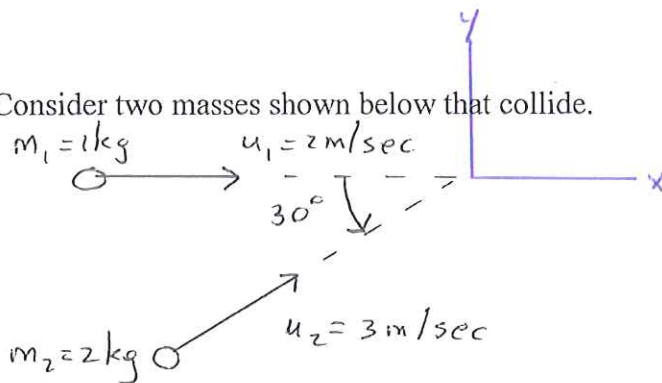
1. (4 marks) A grandfather clock is loaded onto a rocket that accelerates upwards with an acceleration g . Is the period affected and if so how?

Period $T = 2\pi \sqrt{\frac{l}{g}}$

The effect of upward acceleration by g is to double gravity. $\Rightarrow T' = 2\pi \sqrt{\frac{l}{2g}} = \frac{T}{\sqrt{2}}$

$\therefore T' < T \Rightarrow$ clock speeds up.

2. (6 marks) Consider two masses shown below that collide.



- Assuming the two masses stick together what is the final velocity?
- Is the collision elastic? (No marks will be given without showing a calculation backing up your answer.)

Initial Momentum = Final Momentum

$$m_1(u_1, 0) + m_2(u_2 \cos 30^\circ, u_2 \sin 30^\circ) = (m_1 + m_2) \vec{v}$$

$$\vec{v} = \frac{1}{2+1} \left[(2, 0) + 2(3 \cos 30^\circ, 3 \sin 30^\circ) \right]$$

$$\therefore \vec{v} = (2.4, 1) \text{ m/sec.}$$

$$\begin{aligned} \text{Initial K.E.} &= \frac{1}{2} m_1 u_1^2 + \frac{1}{2} m_2 u_2^2 \\ &= \frac{1}{2} \cdot 1 \cdot 2^2 + \frac{1}{2} \cdot 2 \cdot 3^2 \\ &= 11 \text{ J} \end{aligned}$$

$$\begin{aligned} \text{Final K.E.} &= \frac{1}{2} (m_1 + m_2) v^2 \\ &= \frac{1}{2} (1+2) (2.4^2 + 1^2) \\ &= 10.1 \text{ J} \\ &\neq \text{Initial K.E.} \end{aligned}$$

\therefore inelastic collision.