

# Higher Physics Masterclass 1



- 1) A small plastic popper toy is estimated to have a launch speed of  $8 \text{ ms}^{-1}$
- a) Find the maximum height the toy popper can reach.. **[3.3m]**
  - b) The toy popper increases its speed from zero to  $8 \text{ ms}^{-1}$  over a distance of 0.05 m. Calculate the acceleration of the toy popper. **[640  $\text{ms}^{-2}$ ]**
- 2) A car travelling at  $15 \text{ ms}^{-1}$  accelerates for a distance of 30 m at  $8 \text{ ms}^{-2}$   
Determine the final velocity of the car. **[27  $\text{ms}^{-1}$ ]**
- 3) A stone is dropped down a water well and the splash takes place 1.3 seconds after it is dropped. A week later the stone is dropped down the same water well from the same position and the time taken to hear the splash is 1.0 seconds.  
Find the increase in the level of water in the water well. **[3.38 m]**

- 4) An advertising balloon is held down by a thin rope as shown.  
The mass of the balloon is 10 kg and the tension of the rope is 20 N.

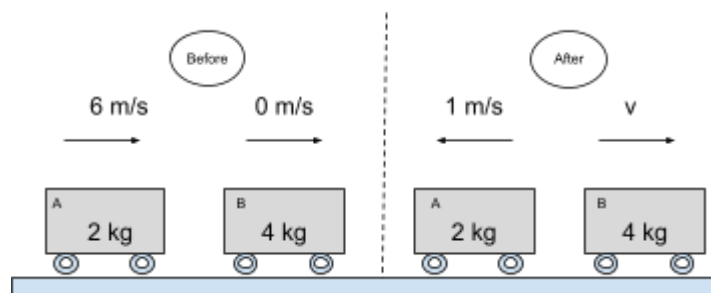
- a) Show on a diagram all the vertical forces acting on the balloon.
- b) Determine the buoyancy force acting on the balloon.
- c) Find the acceleration of the balloon when the rope is cut.



- 5) A firework is launched at an angle of  $45^\circ$  with a speed of  $25 \text{ m s}^{-1}$
- a) Calculate the horizontal and vertical components of the firework's velocity.
  - b) Find the maximum height reached by the firework
  - c) Find the time the firework was in flight
  - d) Calculate the horizontal range of the firework.

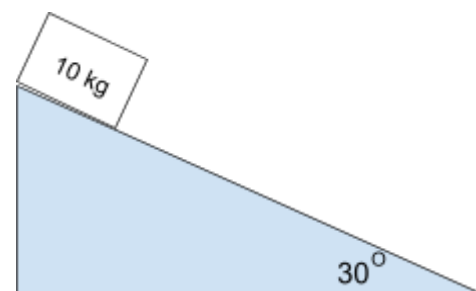
6) Two small physics trolleys collide as shown:

- Calculate the speed of the 4 kg trolley.
- Determine whether the collision is elastic or inelastic.

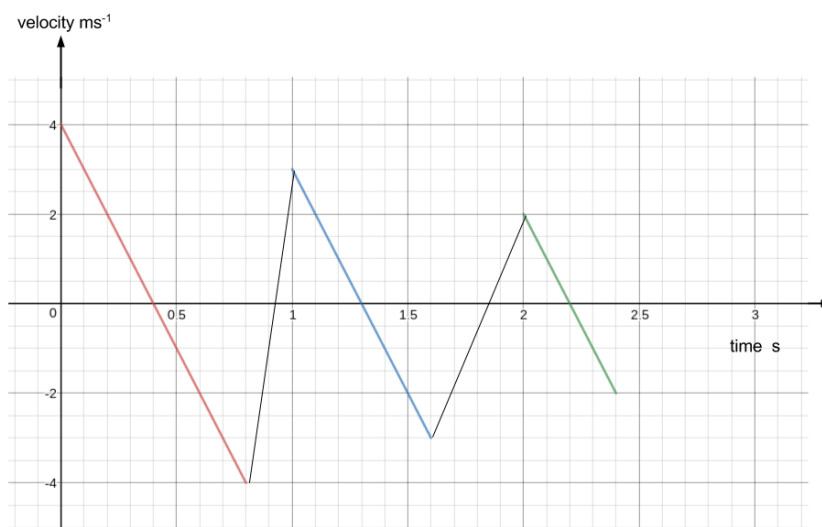


7) A 10 kg block accelerates down a slope. The slope has an angle of  $30^\circ$  and the surface of the slope exerts a force of friction on the block equal to 41 N.

- Calculate the net force acting on the block down the slope.
- Show that the block's acceleration down the slope is  $0.8 \text{ ms}^{-2}$ .



8) The velocity time graph of a bouncing ball is captured by a laptop sensor.



- Determine the maximum height the ball reached
- Calculate the acceleration of the ball during the last bounce.
- Explain what could cause the difference in the acceleration of the bounces.

**Use the QR Code in the heading for video solutions**