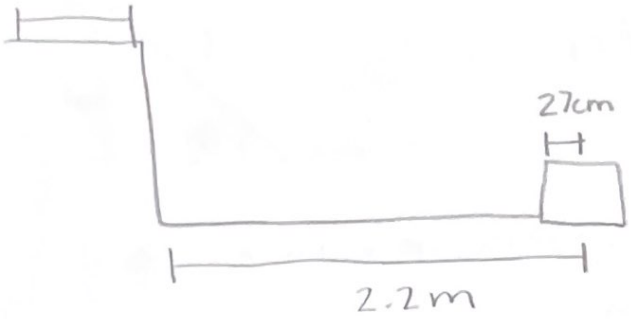
(9) $X_1 = 1.1\text{cm} \rightarrow 0.011\text{ m}$



$X_1 = 1.0\text{cm}$

$d_1 = 2.2\text{m} - 0.27\text{m} = 1.93$

$d_2 = 2.2\text{m}$

$X_2 = ?$

$\frac{27\text{cm}}{1} \cdot \frac{1\text{m}}{100\text{cm}} = 0.27\text{m}$

$PE_e = KE$

$\frac{1}{2}kx_1^2 = \frac{1}{2}mv^2$

$\sqrt{\frac{kx_1^2}{m}} = v$

$y = v = \frac{1}{2}gt^2$

$t = \sqrt{\frac{2y}{g}}$

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distance $= vt$

$d_1 = \sqrt{\frac{kx_1^2}{m}} \cdot \sqrt{\frac{2y}{g}}$ $\quad d_2 = \sqrt{\frac{kx_2^2}{m}} \cdot \sqrt{\frac{2y}{g}}$

$d_1^2 = \frac{kx_1^2}{m} \cdot \frac{2y}{g}$

$\frac{\left(g\frac{d_1^2 m}{2y}\right)}{x_1^2} = k$

$d_2 = \sqrt{\frac{\left(\frac{gd_1^2 m}{2y}\right)}{x_1^2}} \cdot \sqrt{\frac{2y}{g}}$

$d_2^2 = \frac{\left(\frac{gd_1^2 m}{2y}\right)}{x_1^2 m} \cdot x_2^2 \cdot \frac{2y}{g}$

$d_2^2 = \frac{d_1^2 m}{x_1^2 m} \cdot x_2^2$

find X_2:

$\sqrt{d_2^2 = \frac{d_1^2 x_2^2}{x_1^2}}$

$d_2 = \frac{d_1 x_2}{x_1}$

$\frac{d_2 x_1}{d_1} = x_2 \rightarrow \frac{(2.2)(0.011)}{1.93} = x_2$

$x_2 = 0.125\text{m}$