A 2.00kg block is pushed against a spring with negligible mass and force constant k=400N/m, compressing it 0.200m. When the block is released, it moves along a frictionless, horizontal surface and then up a frictionless incline with the slope 37.0o. (fig 3)

1) What is the speed of the block as it slides along the horizontal surface after having left the spring?
2) How far does the block travel up the incline before starting to slide back down?

1) The law of conservation of energy:

$$\frac{mv^2}{2} + \frac{kx^2}{2} = const$$

where $\frac{mv^2}{2}$ is kinetic energy of the block, $\frac{k\Delta l^2}{2}$ – energy of spring deformation, m – mass of the block, x – spring deformation.

Therefore, if block left the spring ($x = 0$) :

$$\frac{mv^2}{2} + 0 = 0 + \frac{k\Delta l^2}{2}$$

where Δl is initial spring deformation

$$v = \sqrt{\frac{k}{m}\Delta l^2} = 2.83\frac{m}{s}$$

Answer: $2.83\frac{m}{s}$

2) The law of conservation of energy:

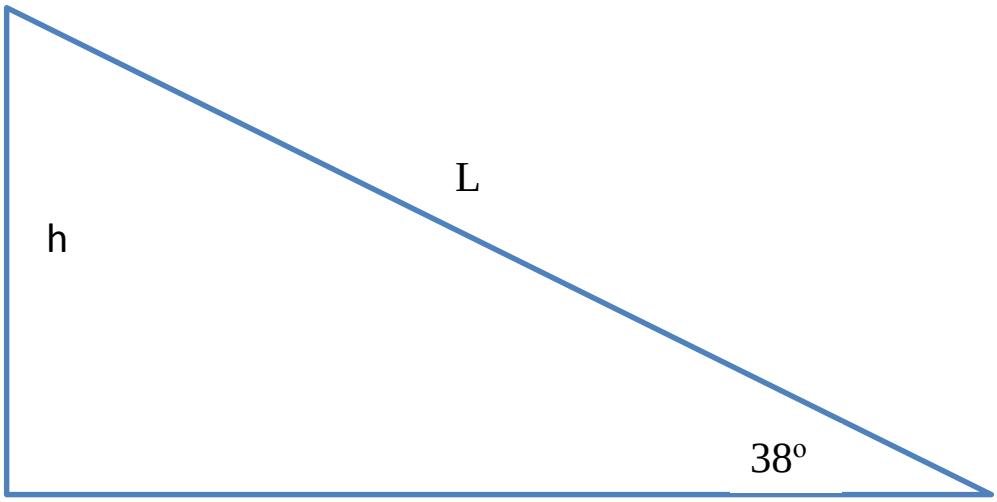
$$\frac{mv^2}{2} + mgh = const$$

where h is height

$$\frac{mv^2}{2} + 0 = 0 + mgh$$

$$h = \frac{v^2}{2g}$$

Distance along incline equals:



$$L = \frac{h}{\sin 37°} = \frac{v^2}{2g \sin 37°} = 0.68\ m$$

Answer: $0.68\ m$