AQA – Work, energy and power – A2 Further Mathematics Mechanics

1. June/2021/Paper_7367/3M/No.1

A spring of natural length 50 cm and modulus of elasticity λ newtons has an elastic potential energy of 4 J when compressed by 5 cm.

Find the value of λ

Circle your answer.

[1 mark]

8 16 800 1600

2. June/2021/Paper_7367/3M/No.8

In this question use $g = 9.8\,\text{m s}^{-2}$

A lift is used to raise a crate of mass 250 kg

The lift exerts an upward force of magnitude P newtons on the crate.

When the crate is at a height of x metres above its initial position

$$P = k(x + 1)(12 - x) + 2450$$

where k is a constant.

The crate is initially at rest, at the point where $x = 0$

(a) Show that the work done by the upward force as the crate rises to a height of 12 metres is given by

$$29\,400 + 360k$$

[3 marks]

(b) The speed of the crate is $3\,\text{m s}^{-1}$ when it has risen to a height of 12 metres.

Find the speed of the crate when it has risen to a height of 15 metres.

[5 marks]

(c) Find the height of the crate when its speed becomes zero.

[2 marks]

(d) Air resistance has been ignored.

Explain why this is reasonable in this context.

[1 mark]