A block of mass $m = 3$ kg compresses a horizontal spring by $x = 0.4$ m. When it is released the block moves across a horizontal plain a distance of $s = 2.4$ m before coming to rest. If the coefficient of friction between the block and the table is $\mu = 0.3$, what is the force constant?

Solution

The change of energy is equal to work done

$$\frac{kx^2}{2} = \mu mgs.$$

So

$$k = \frac{2\mu mgs}{x^2},$$

$$k = \frac{2 \times 0.3 \times 3 \times 9.8 \times 2.4}{0.4^2} = 264.6 \ \frac{\text{N}}{\text{m}}.$$

Answer $= 264.6 \frac{\text{N}}{\text{m}}$.