Answer on Question #82153, Physics / Mechanics | Relativity

Question:

A box of unknown mass is sliding with an initial speed

vi = 5.30 m/s

across a horizontal frictionless warehouse floor when it encounters a rough section of flooring

d = 2.00 m

long. The coefficient of kinetic friction between the rough section of flooring and the box is 0.100. Using energy considerations, determine the final speed of the box (in m/s) after sliding across the rough section of flooring.

Solution:

Using energy considerations, we can write that $0,5mv_1^2 = 0,5mv_2^2 + \mu mgd$ and respectively

$v_2 = v_1\sqrt{1-\frac{2\mu gd}{v_1^2}} = 5.3\sqrt{1-\frac{20\cdot 0.1\cdot 2}{28.1}} = 4.9$ (m/s).

The answer:

The final speed $v_2 = v_1\sqrt{1-\frac{2\mu gd}{v_1^2}} = 4.9$ m/s.