

a 20 kg box falls from the back of a truck and hits the ground with a speed of 15m/s. it slides for a distance of 45m before coming to rest. determine the work done on the box by friction.

For any net force acting on a particle moving along any curvilinear path, its work equals the change in the kinetic energy of the particle, it is known as the work-energy theorem:

$$W = T_2 - T_1$$

$$T = \frac{mv^2}{2} \text{ - kinetic energy of the particle, therefore: } W = \frac{mv_2^2}{2} - \frac{mv_1^2}{2}$$

$$v_2 = 0 \text{ - box coming to rest}$$

$$\text{So, } W = 0 - \frac{mv_1^2}{2} \Rightarrow W = -\frac{mv_1^2}{2}$$

$$v_1 \text{ - initial speed}$$

$$W = -20 * \frac{15^2}{2} J = -2250 J$$

$$\text{Answer: } W = -2250 J$$