

A 325-N force accelerates a 50.0-kg crate from rest along a horizontal frictionless surface for a distance of 20.0 m as shown in the figure.

<http://edugen.wileyplus.com/edugen/courses/crs3976/art/qb/qu/c06/r7-1.png>

What is the final speed of the crate?

The law of conservation of energy:

$$\Delta E + W = 0$$

where  $\Delta E$  – change of body's energy,  $W$  – work of force

Work for uniform force directed along displacement can be expressed by the following equation:

$$W = Fd$$

where  $F$  is the force,  $d$  is the displacement.

Change of body's energy equals  $-\frac{mv^2}{2}$ , therefore:

$$\frac{mv^2}{2} = Fd$$

$$v = \sqrt{\frac{2Fd}{m}} = \sqrt{\frac{2 * 325 * 20}{50} \frac{m}{s}} = 16.1 \frac{m}{s}$$

Answer:  $16.1 \frac{m}{s}$