Answer on Question #70704, Physics / Other

Superman must stop a train traveling at 33.3 m/s in 150. m to keep it from hitting a stalled car on the tracks. If the train's mass is 3.60×10^5 kg, how much force must he exert on the train?

Solution:

Newton's Second Law for force

$$F = ma$$

Kinematics equation

$$a = \frac{v^2 - v_0^2}{2d}$$

where a is acceleration, d is distance, v_0 is initial velocity and v is final velocity.

$$a = \frac{v^2 - v_0^2}{2d}$$

The final velocity is

$$v = 0$$

So,

$$F = \frac{m(v^2 - v_0^2)}{2d}$$

Substituting

$$F = \frac{3.60 \times 10^5 \times (0 - 33.3^2)}{2 \times 150} = -13.31 \times 10^5 \, N$$

The minus sign indicates that the force is in opposite direction to motion of train.

Answer: $13.31 \times 10^5 \, N$