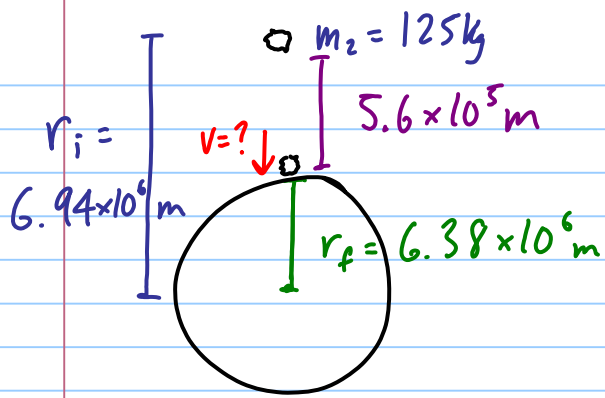A 125 kg chunk of space debris falls from an altitude of 5.6×10^5 m above the Earth's surface. If it starts at rest at what speed will it impact the Earth (ignoring air resistance)?

$m_2 = 125 kg$

$5.6 \times 10^5 m$

$r_i = 6.94 \times 10^6 m$

$v = ?$

$r_f = 6.38 \times 10^6 m$

$$\Delta E_p = G m_1 m_2 \left(\frac{1}{r_i} - \frac{1}{r_f} \right) \checkmark$$

$$= (6.67 \times 10^{-11})(5.98 \times 10^{24})(125) \left(\frac{1}{6.94 \times 10^6} - \frac{1}{6.38 \times 10^6} \right)$$

$$= -6.306 \times 10^8 J \checkmark$$

$$\Delta E_k = -\Delta E_p \checkmark$$

$$= 6.306 \times 10^8 J$$

$$\Delta E_k = E_{k_f} = \tfrac{1}{2} m v^2 \checkmark$$

$$v = \sqrt{\frac{2 E_k}{m}} = \sqrt{\frac{2(6.306 \times 10^8)}{125}} = \boxed{3200 \, m/s} \checkmark$$