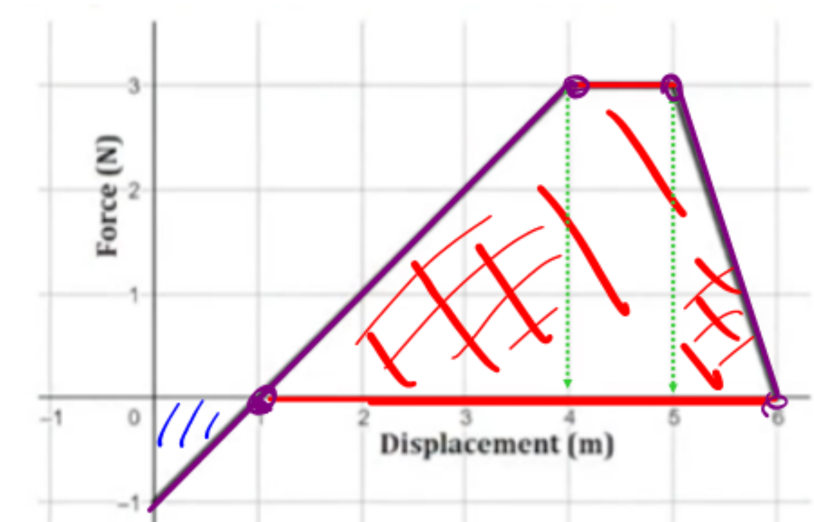
Final Practice

15/03/24 8:46 am

What is the initial speed of a 2.8 kg object if it ends with the speed of 5.3 m/s over the 6 meters distance shown is the graph?



$\Delta E = W = \Delta K + \Delta U_g$ (zero) $\cos\theta$

$\boxed{K = \frac{1}{2} m \cdot v^2}$

$\boxed{E = K.E + P.E}$

$W = \Delta K$

$A_{triangle} = \frac{b \times h}{2}$

$A_t = \frac{1 \times (-1)}{2}$

$A_t = -0.5\ J$

$A_{trapezoid} = \frac{(b_1 + b_2)h}{2}$

$= \frac{(5+1)}{2} \times 3 = 9$

$A_{rea} = K - K_0 = \frac{1}{2}mv^2 - \frac{1}{2}mv_0^2$

$9 - 0.5 = \frac{1}{2} \cdot 2.8 \cdot 5.3^2 - \frac{1}{2} \cdot 2.8 \cdot V_0^2$

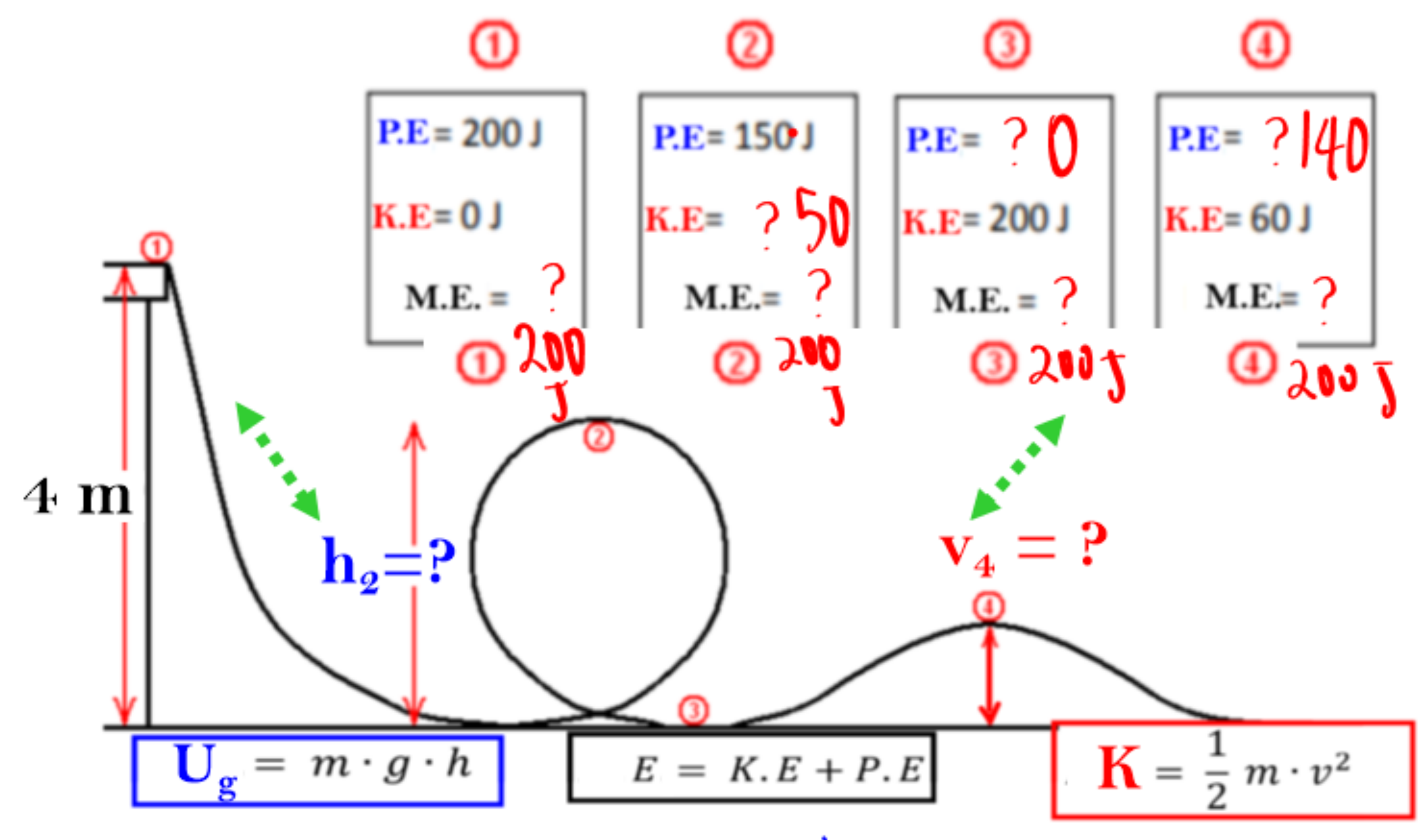
$8.5 = 39.3 - 1.4 \cdot V_0^2$

$1.4 \cdot V_0^2 = 39.3 - 8.5$

$V = \sqrt{\frac{30.8}{1.4}} = 22$

$V = 4.7\ \frac{m}{s}$

2. Fill in the missing values (ignore friction)



$\boxed{U_g = m \cdot g \cdot h}$ $\boxed{E = K.E + P.E}$ $\boxed{K = \frac{1}{2} m \cdot v^2}$

$200 = m \cdot 9.8 \cdot 4$

$\frac{200}{39.2} = m$

$m = 5.1\ kg$

$U_{g_2} = m \cdot g \cdot h_2$

$150 = 5.1 \times 9.8 \times h_2$

$\frac{150}{50} = h_2 = 3\ m$

$60 = \frac{1}{2} \cdot 5.1 \cdot v^2$

$\frac{60}{2.55} = v^2$

$v = \sqrt{\ } = 4.8\ \frac{m}{s}$

Ralphie's mass is 28 kg. He slides down a slide that is 4.8-m tall and reaches a velocity of 3.2 m/s at the bottom of the slide. How much work was done by friction on Ralphie?

$h = 0$

$\boxed{W = \Delta E} = E - E_0$

$\boxed{E = K + U_g}$

$W = (K + \cancel{U_g}) - (\cancel{K_0} + U_{g_0})$

zero zero

$K_0 = \frac{1}{2}mv_0^2$ zero

$U_g = mgh$ zero

$W = \frac{1}{2}mv^2 - mgh_0$

$W = \frac{1}{2} \cdot 28 \cdot 3.2^2 - 28 \cdot 9.8 \cdot 4.8 = -1174\ J$

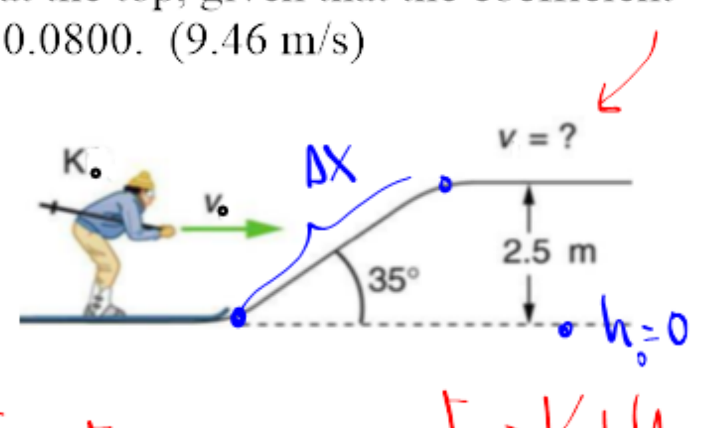
A 60.0-kg skier with an initial speed of 12.0 m/s coasts up a 2.50-m high rise as shown in the figure. Find her final speed at the top, given that the coefficient of friction between her skis and the snow is 0.0800. (9.46 m/s)

$\Delta E = W$

$W = F \cdot \Delta x \cdot cos(\theta)$ ← $F\ \Delta x$

$K = \frac{1}{2}mv^2$

$\Delta U_g = mg\,\Delta y$



$W_{F_f} = \Delta E = E - E_0$

$E = K + U$

$F_f \cdot \Delta x \cdot \cos(180°) = \underbrace{(K + U_g)}_{Final} - \overbrace{(K_0 + \cancel{U_{g_0}})}^{initial}$

-1 zero $(h_0 = 0)$

$-\mu \cdot F_N \cdot \Delta x = \frac{1}{2}mv^2 + mgh - \frac{1}{2}mv_0^2$ (1)

$V = ?$

$\Delta x = ?$ $\sin(\theta) = \frac{opp.}{hyp.}$ → $\sin(35) = \frac{2.5}{\Delta x}$

$\Delta x = \frac{2.5}{\sin(35°)} = 4.36\ m$ (2)

$F_N = ? = mg\cos(35°)$

$F_N = 60 \times 9.8 \times \cos(35°) = 482\ N$ (3)

(3) and (2) into (1)

$-0.08 \times 482 \times 4.36 = \underbrace{\frac{1}{2} \cdot 60 \cdot V^2}_{} + \underbrace{60 \cdot 9.8 \cdot 2.5}_{} - \underbrace{\frac{1}{2} \cdot 60 \cdot 12^2}_{}$

$-168 = 30 \cdot V^2 + 1470 - 4320$

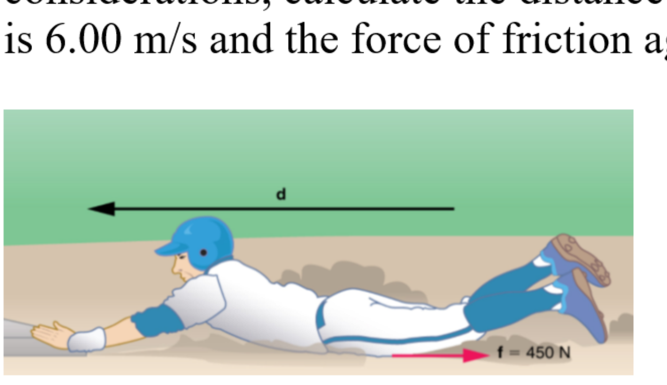
$4320 - 1470 - 168 = 30 \cdot V^2$

$\frac{2682}{30} = V^2 = 89.4\ \frac{m^2}{s^2}$

$V = \sqrt{89.4} = 9.5\ \frac{m}{s}$

(a) How high a hill can a car coast up (engine disengaged) if work done by friction is negligible and its initial speed is 110 km/h? (b) If, in actuality, a 750-kg car with an initial speed of 110 km/h is observed to coast up a hill to a height 22.0 m above its starting point, how much thermal energy was generated by friction? (c) What is the average force of friction if the hill has a slope 2.5° above the horizontal?

Consider the situation shown where a baseball player slides to a stop on level ground. Using energy considerations, calculate the distance the 65.0-kg baseball player slides, given that his initial speed is 6.00 m/s and the force of friction against him is a constant 450. N.



Suppose that the 65.0 kg player is running up a hill having a 5.00° incline upward with a surface similar to that in the baseball stadium. The player slides with the same initial speed, 6.00 m/s and the frictional force is still 450. N. Determine how far he slides.