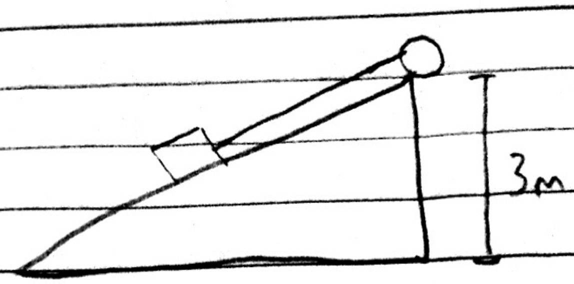
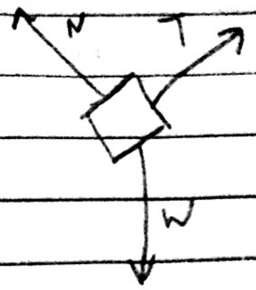
1.





a.

Tension and weight are doing work upon the block. Normal force is not because it is perpindicular to displacement.

b.

No, the applied force is an external or nonconservative force, and since it does work, energy is conserved.

c.

$$ME_I + W_{ext} = ME_F$$

$$W_{ext} = ME_F - ME_I$$

$$ME = KE + PE$$

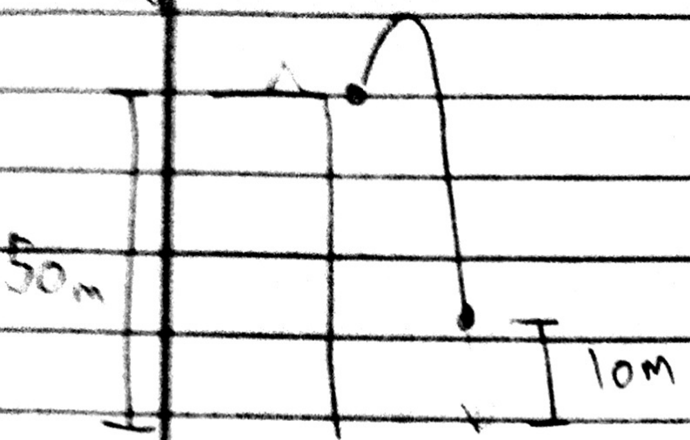
$$W = \cancel{\tfrac{1}{2}mv_f^2} + mgh_F - \cancel{\tfrac{1}{2}mv_0^2} + \cancel{mgh_0}$$

$$W = mgh_f$$

$$W = (50kg)(9.8 m/s^2)(3m)$$

$$W = 1470j$$

2



energy is conserved.

$$K_i + U_i = K_f + U_f$$

$$K_i - K_f = U_f - U_i$$

$$(1/2)\cancel{m}(V_i^2 - V_f^2) = \cancel{m}g(y_f - y_i)$$

$$V_i^2 - V_f^2 = 2g(y_f - y_i)$$

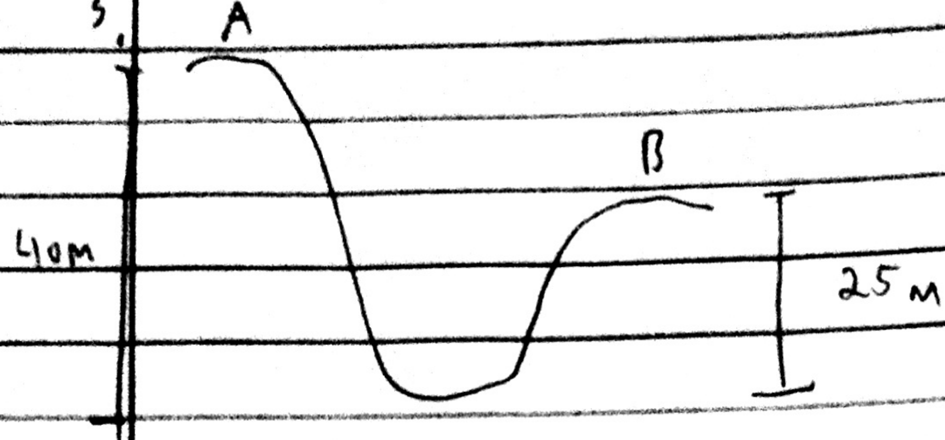
$$V_f^2 = V_i^2 - 2g(y_f - y_i)$$

$$V_f^2 = 25(m/s)^2 - 2(9.8 m/s^2)(-40)$$

$$V_f^2 = 809(m/s)^2$$

$$V_f = 28.4 m/s$$

3.



a.
The energy at point A is purely potential energy because the cart isn't initially moving, and the energy at the bottom of the hill is purely kinetic.

$\cancel{m}gh = \frac{1}{2}\cancel{m}V^2$

$gh = \frac{1}{2}V^2$

$V = \sqrt{2gh}$

$\boxed{V = 28.0\ m/s}$

b.

$\cancel{m}gh_o = \cancel{m}gh_f + \frac{1}{2}\cancel{m}V_f^2$

$gh_o = gh_f + \frac{1}{2}V_f^2$

$V_f^2 = 2(gh_o - gh_f)$

$= 2(392 - 245)$

$V_f^2 = 294$

$V_f = 17.1\ m/s$