Questions can be answered in multiple ways. Both ways must be known for mastery

Energy vs. Force Net

A 0.25Kg rock is thrown up at 20m/s.
How high will the rock travel?
How fast is the rock at 10m high?

Kinematics

$V_f = V_i + at_{1/2}$

$0 = 20 + -9.8t$

$\frac{-20}{-9.8} = t$

$t = 2.04$

$Y_f = Y_0 + V_i t + \frac{1}{2} a t^2$

$= 0 + 20(2.0) + \frac{1}{2}(-9.8)(2.0)^2$

$40 \quad + -19.6$

$Y_f = 20.4m$

energy

$KE = mhg$

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

$\frac{mv^2}{2mg} = h$

$\frac{v^2}{2g} = h$

$\frac{20^2}{2 \cdot 10} = 20m$

A rocket with a mass of 2.5kg launches up to a height of 800m in 3 seconds. (motor burns out after 3 sec)
What is the force of the engine?
How fast is the rocket traveling at 800m?
How much higher will the rocket go up before stopping?

$X_f = X_i + V_i t + \frac{1}{2} a t^2$

$800 = 0 + 0 + \frac{1}{2} a (3)^2$

$a = 177.\ m/s^2$

$V_f = V_i + at$

$= 0 + 177(3)$

$V_f = 533 m/s$

$V_f = V_i + at$

$0 = 533 + -9.8(t)$

$t = 54.4 sec$

$V_f^2 = V_i^2 + 2ad$

$\frac{-V_i^2}{2a} = d$

$\frac{533^2}{2(9.8)} =$ higher $14204m$

Energy

800 m PE+KE → total energy

@800 m
V = 533 m/s — total energy of Rocket

$KE + PE =$

$\frac{1}{2}(2.5)533^2 + 2.5(10)800$

$355111J + 20000J$

$= 375111J$

Height using Energy

ENERGY = PE

$375111 = mhg$

$h = 15000m$

$F \cdot d = Energy$

$F_{ave} = \frac{Energy}{d}$

$468N = \frac{375111}{800}$

Force of

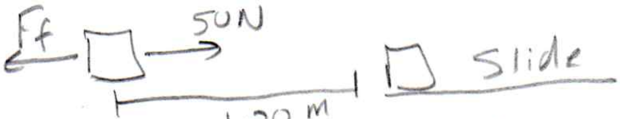
A 20Kg Box is dragged with a 50N force for 100M then allowed to slide with no force added.

The uK = 0.2.

How fast will the box be traveling at 100m?

How much energy is the person exerting?

How far will the box slide if allowed to slide after the 100m mark.



$a = \frac{\Sigma F}{m}$ $\frac{Fa - Ff}{m}$ $\frac{50-40}{20} = 0.5$

$F_f = F_N \cdot u$

$20 \cdot 10 \cdot .2 = 40N = F_f$

$m g \cdot u$

$X_f = X_i + v_i t + \frac{1}{2} a t^2$

$100 = 0 + 0 + \frac{1}{2}(0.5) t^2$

$t = 20$ sec.

$V_f = V_i + at$

$= 0 + 0.5 \cdot (20)$

$= 10$ m/s @100m

same ←

Energy

Energy = $F \cdot d$

$50 \cdot 100 = 5000J$

$5000 = KE + TE$ (friction)

$5000 = \frac{1}{2} m v^2 + m g u d$

$\frac{1}{2}(20) v^2 + 20 \cdot 10 \cdot .2 \cdot 100$

$10 v^2 - 4000J$

$\sqrt{\frac{1000}{10}}$ $1000 = 10 v^2$

$10 = V$

Let go of Rope

$a = \frac{\Sigma F}{m} = \frac{F_f}{m} = \frac{-40}{20} = -2 m/s^2$

$V_f = V_i + at$

$= 10 + -2(t)$ $t = 5$ sec

$X_f = X_i + V_i t + \frac{1}{2} a t^2$

$= 0 + 10(5) + \frac{1}{2}(-2)(5)^2$

$50 + -25$

$X_f = 25m$

farther (125 total)

How much farther will it slide

$KE \rightarrow TE$ friction

$\frac{1}{2} m v^2 = m g u d$

$\frac{v^2}{2 g u} = d$

$\frac{10^2}{2 \cdot 10 \cdot .2} = 25m$