A block (43 kg) slides down a slope of 18°. Calculate the coefficient of friction if the block slides at a constant velocity.

$a = 0$

Find the work done by friction if the block travels 0.8 m.

$F_{net} = 0$

$mg\sin\theta = \mu mg\cos\theta$

$\frac{mg\sin\theta}{mg\cos\theta} = \frac{\mu mg\cos\theta}{mg\cos\theta}$

$\tan\theta = \mu$

$\mu = \tan 18$

$\mu = 0.3$

$W = Fs$

$W = \mu mg\cos\theta \cdot s$

$W = (130.35)(0.8)$

$W = 104 \Rightarrow 100\,J$

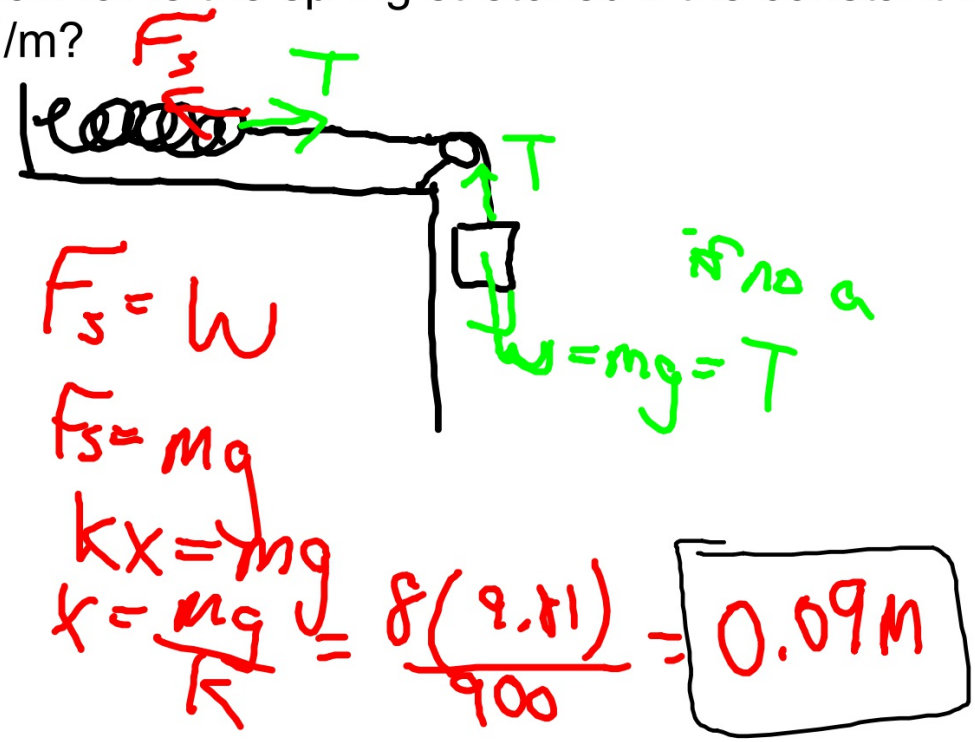
I run 4 laps around a 400 m track. I weigh 81 kg. How much work did I do if I accelerate at 0.002 ms^{-2} the entire time?

$S = 0 \quad W = 0$

Coach Cooper runs at the same rate and the same distance in a straight line, and he weighs 79 kg. Who did more work? What is the difference of our work?

$79\,kg\,(0.002\,m/s^2)(1600\,m) = 252.8 \Rightarrow 300\,J$

A spring on a table is connected to a string that goes over a frictionless, massless pulley. The string is attached to a mass of 8 kg which hangs off of the table. How far is the spring stretched if the constant is 900 N/m?



A 76 kg block on a frictionless slope of 42° is attached to a spring which anchors to a wall at the top of the slope. If the block comes to rest after pulling the spring 0.003 m, what is the spring constant?

$F = mg\sin\theta$

$k = 16629$

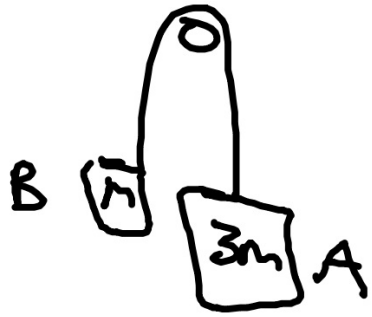
$k = 200000 \frac{N}{m}$

$mg\sin\theta = kx$

$k = \frac{mg\sin\theta}{x}$

$k = \frac{76(9.81)(\sin 42)}{0.003}$

Two masses are hanging via an Atwood's machine. If mass A is 3 times the size of mass B, find the tension of the string in terms of mass B and g.



$$F_{net} = 3mg - mg$$

$$a = \frac{2mg}{2m} = \frac{g}{2}$$

$$T = mg + \frac{mg}{2}$$

$$T = \frac{3}{2}mg$$

A 800 kg car hits the brakes while traveling 40. m/s. If the brakes decelerate at a rate of 8.0 ms^{-2} until the car stops, how much work was done by the brake?

$F = ma$

$F = (800kg)(-8.0 m/s^2)$

$F = -6400\ N$

$W = F \cdot s$

$V^2 = v^2 + 2as$

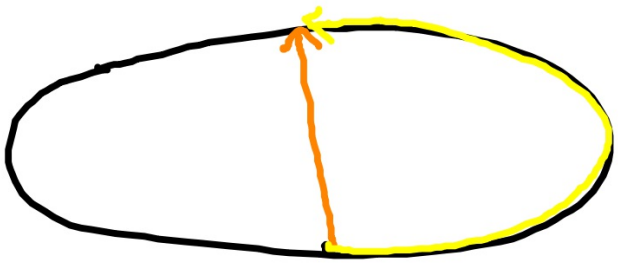
$\frac{V^2 - v^2}{2a} = s$

$\frac{0^2 - 40^2}{2(-8)} = s$

$s = 100$

$W = (6400)(100) = \boxed{-600000\ J}$

Kate and Katie are racing. Kate is much faster than Katie, so Kate has to run on the track as Katie can cut across the field. If Kate and Katie have the same mass and reach the other side of the track at the same time, who did more work?



$m_{Kate} = m_{Katie}$

Work is the same

$s_{Katie} = s_{Kate}$

$m_{Katie} = m_{Kate}$

$t_{Katie} = t_{Kate}$

therefore

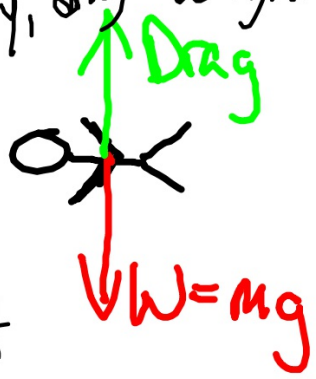
$a_{Katie} = a_{Kate}$

A 75 kg skydiver falls 1000 m while at terminal velocity. How much work is done on the skydiver by drag?

At terminal velocity, drag = weight

$W = mgs$ **700000 J**

$= (75\text{kg})(9.8\text{m/s}^2)(1000\text{m}) = 735750\text{ J}$



What is the net work done on the skydiver?

$F_{net} = 0$ Drag = weight

W = 0 J

If George and Bill are stacking 0.5 m cubes on top of each other, and they take turns stacking the cubes starting with George. How much more work does Bill do than George if the cubes each have a mass of 10 kg and the first cube is placed at a height of 0.25 m, assuming each stacks 2 cubes.

$W_B = mgh_1 + mgh_3$

$W_B = mg(h_1 + h_3)$

$W_B = 10(9.81)(0.25 + 1.25)$

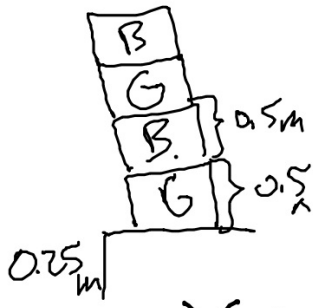
$1.5\,m$

$W_G = mgh_2 + mgh_4$

$W_G = mg(h_2 + h_4)$

$W_G = 10(9.81)(0.75 + 1.75)$

$2.5\,m$



$W_G - W_B = 10(9.81)(1\,m)$

$\Delta W = 98.1\,J$

If a 4500 kg tractor is traveling at 14 m/s, what braking force must be applied to stop in less than 37 m?

$U = 14\ m/s$

$V = 0$

$S \leq 37\ m$

$V^2 = U^2 + 2aS$

$\frac{V^2 - U^2}{2S} = a$

$\frac{0 - 14^2}{2(37)} = a$

$a = 2.65\ m/s^2$

$F = ma$

$F = (4500kg)(2.65\ m/s^2)$

$F = 11925\ N$

$F = 12000\ N$