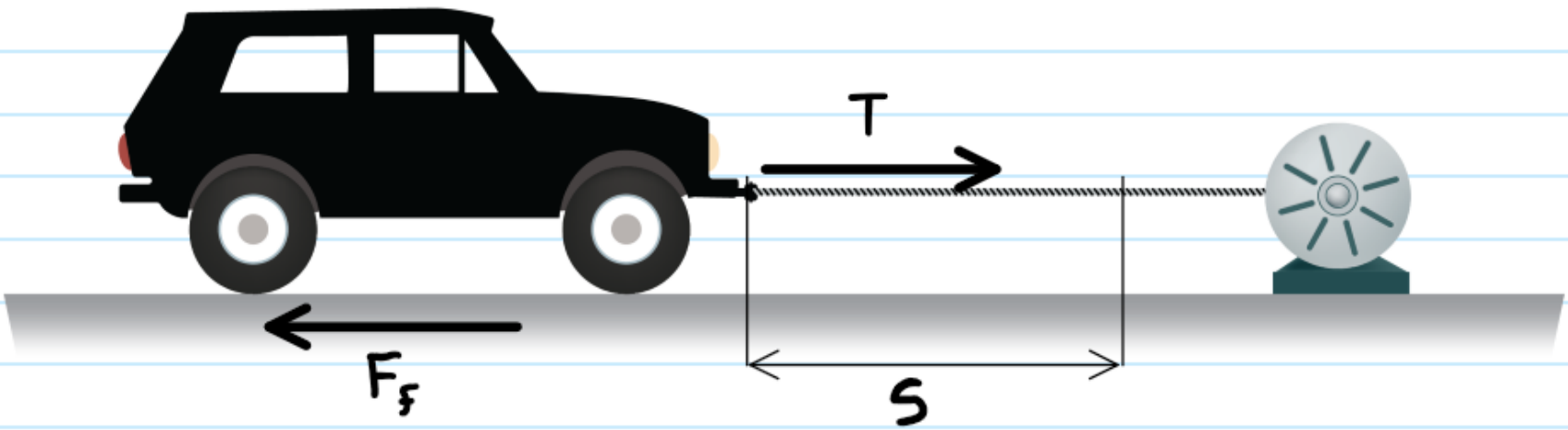
21-P-WE-GD-001



You have been called in to winch a broken SUV clear of a roadway. The winch provides a constant tensile force of $\underset{\sim}{T}$ N. The wheels of the SUV has seized preventing them from rolling. The SUV has a mass of $\underset{\sim}{m}$ Kg, while the coefficient of Kinetic friction between the wheels and the road is $\underset{\sim}{\mu}$.

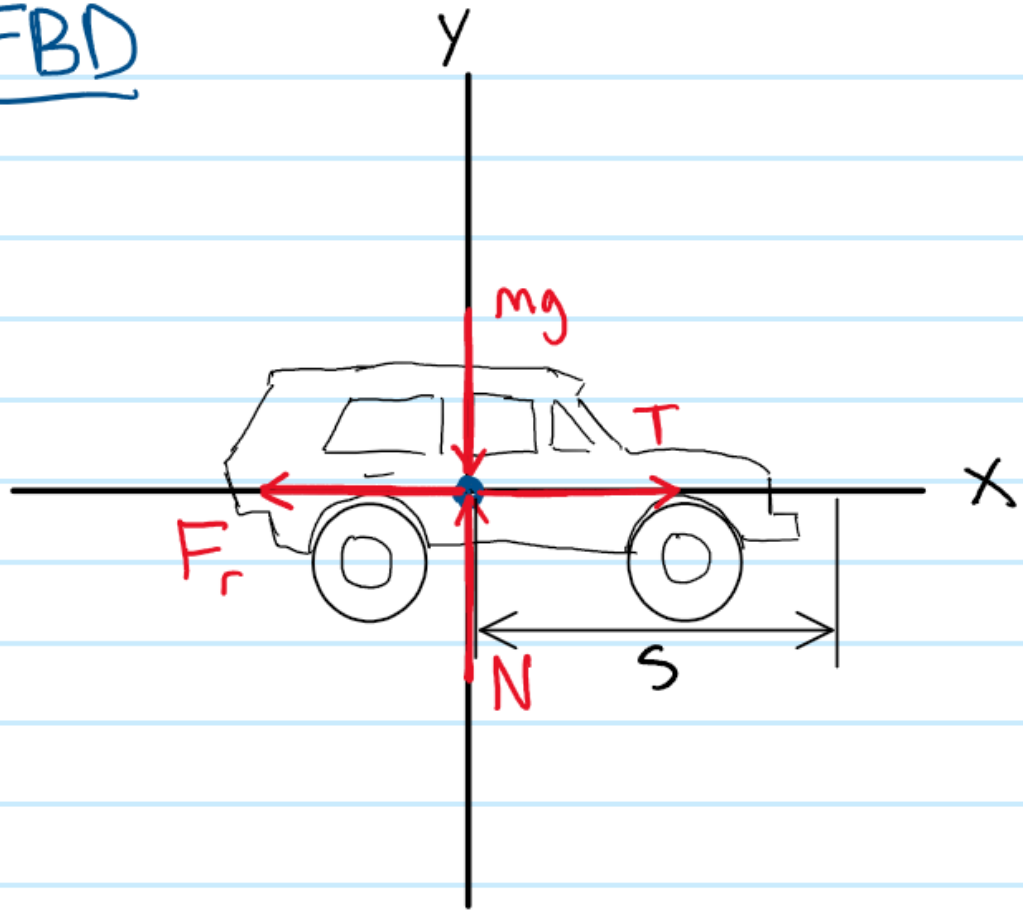
If the SUV is towed $\underset{\sim}{s}$ m, what is the work done by both the winch and friction?

(Assume $g = 9.81\ m/s^2$, neglect the size of the SUV)

given T, m, g, s, μ_k

find W_T, W_{Fr}

FBD



Force Equilibrium

$\Sigma F_x = ma_x = T - F_r$

$\Sigma F_y = ma_y^{\nearrow 0} = N - mg$

$N = mg \qquad F_r = \mu N = \mu mg$

Work

Force in opposite direction of motion

$W_T = Ts \qquad W_{Fr} = -\mu mgs$