

Cursed with a flat tire, a student uses a tire iron to apply a constant torque of 90 ft-lbs to move a lug nut through 0.36 revolutions. Determine: a) torque (N-m), b) angular displacement (degrees and radians), and c) work done (J).

Given: $\theta = 0.36 \text{ r}$ & $\tau = 90 \text{ ft-lbs}$.

a) $\tau = 90 \text{ ft-lbs} (1.355818 \text{ N-m/1 ft-lbs}) \Rightarrow \underline{\tau = 122.024 \text{ N-m.}}$

b) $\theta = 0.36 \text{ rev} (2\pi \text{ rad/1 rev}) \Rightarrow \underline{\theta = 2.26195 \text{ rad.}}$

$\theta = 0.36 \text{ rev} (360^\circ/1 \text{ rev}) \Rightarrow \underline{\theta = 129.6^\circ.}$

c) Per (1-12), $W = \tau \theta = 122.024 (2.262) \Rightarrow \underline{W = 276.01 \text{ J.}}$