

Work Energy Theorm
3 Types of Work Done.

$m = 20\text{ kg}$ $F = 40\text{ N}$
 $f = 10\text{ N}$ $d = 10\text{ m}$

$F_{\text{net}} = F - f = 40 - 10 = 30\text{ N}$

3 Types of Work done

① Work done by friction $W = f \cdot d = (10\text{ N})(10\text{ m}) = 100\text{ J}$ (HEAT LOSS)

② Work done by F_{net} $W = F_{\text{net}} \cdot d = (30\text{ N})(10\text{ m}) = 300\text{ J}$ (Gain in KE)

Work done Person F $W = F \cdot d = (40\text{ N})(10\text{ m}) = 400\text{ J}$ (Energy Input)

* Work done by person (Total work done) = Heat + Gain in KE
 $400\text{ J} = 100\text{ J} + 300\text{ J}$

Power = $P = \frac{\text{Work}}{\text{Time}}$
Person $P = \frac{400\text{ J}}{3.6\text{ s}} = 109.6\text{ watt}$

$a = \frac{F_{\text{net}}}{m} = \frac{30\text{ N}}{20\text{ kg}} = 1.5\text{ m/s}^2$
 $d = \frac{1}{2} a t^2$
 $t = \sqrt{\frac{2d}{a}} = \sqrt{\frac{2(10\text{ m})}{1.5\text{ m/s}^2}} = 3.66\text{ s}$

Efficiency = $\frac{W_{\text{output}}}{W_{\text{input}}} \times 100 = \frac{300\text{ J}}{400\text{ J}} \times 100 = 75\%$

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