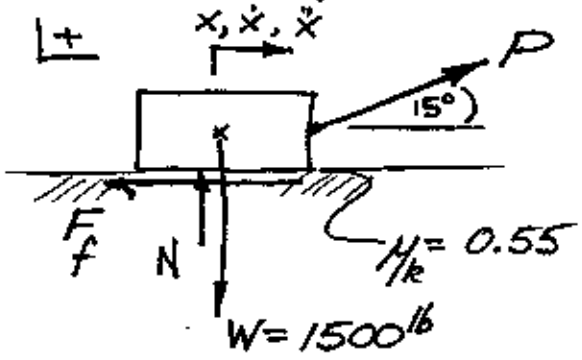
HIBBELER

WORK is using FORCE to move a mass a specified dist; $W = Fd$



FORCE = P
pulls a dist., $x = 25'$
at constant speed, $\dot{x} = ?$
$\therefore \ddot{x} = a = 0$

? Pulling force = Tension
? WORK

$\Sigma \vec{F}_x = m\vec{a}_x^{\,0}$

$P\cos 15° - F_f = 0$

$P\cos 15° = \mu N$
? ?

$\Sigma \vec{F}_y = m\vec{a}_y^{\,0}$

$P\sin 15° - W + N = 0$
? ?

SOLVE SIMULTANEOUSLY

$\frac{P\cos 15°}{0.55} = N \rightarrow P\sin 15° - 1500^{lb} + \frac{P\cos 15°}{0.55} = 0$

$.259P + 1.756P = 1500^{lb.}$

$\boxed{P = 744.33^{lb.}}$

WORK $= (744.33^{lb.})(25') = 18.608 \times 10^3$ ft.lb.

Oops! P is pulling @ an angle.

$(744.33 \cos 15°)(25') = 17.974 \times 10^3$ ft lb.

WORK EFFORT $\doteq 18 \times 10^3$ ft.lb.

needed to overcome a WORK LOSS due to friction of:

$F_f = \mu N = P\cos 15° = 718.97^{lb.}$

where $N = \frac{P\cos 15°}{\mu} = 1307.2^{lb.} < W$ because component of pulling force lifts.

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