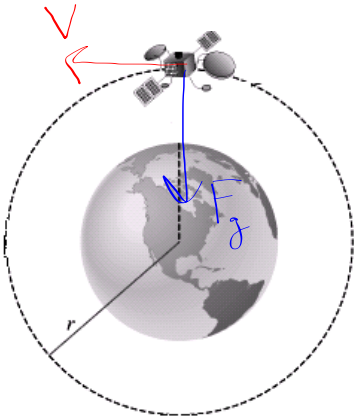
6. How much work is done on a 120.-kilogram satellite as it orbits the Earth?

centripetal forces never do work

F is in, V is tangent

cos (90) = 0



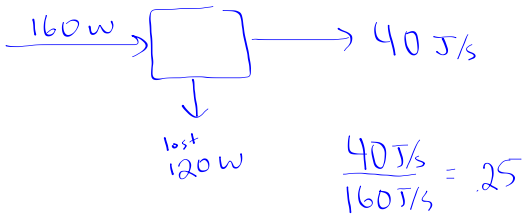

Efficiency:

the ratio of the amount of useful work done to the amount of total work done

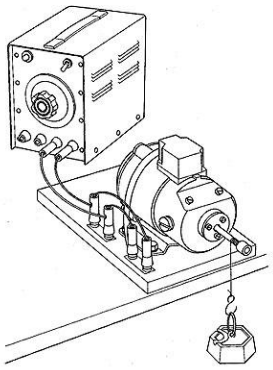
Formula: $eff = \frac{useful}{total}$

1. An electric motor has an input power of 160 W. In raising a load, 120 W of power are dissipated. What is the efficiency of the motor?

lost as heat




$\frac{40\ J/s}{160\ J/s} = .25$



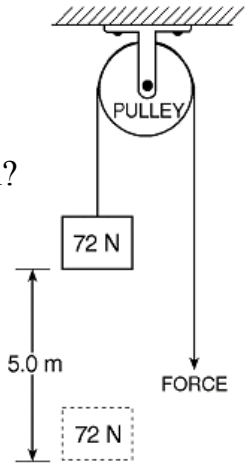
2. A student does 400. J of work using a pulley to raise a 72 N box to a height of 5.0 meters.

a) How much work does the student do against gravity?

$W = F \cdot d = 72\ N \cdot 5\ m = 360\ J$

b) How much work does the student do against friction?

$W_f = 40\ J$



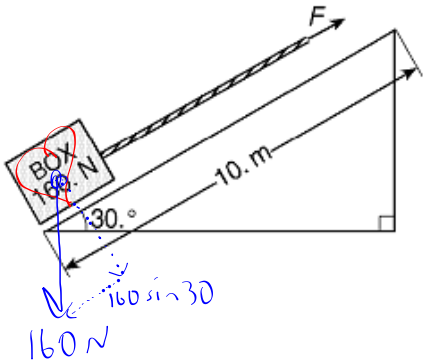

c) How efficient is this pulley?

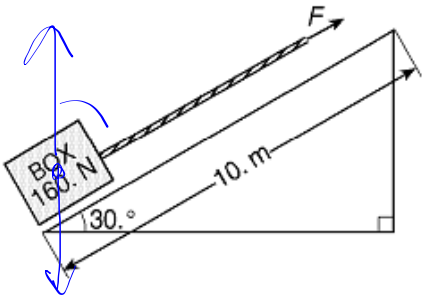
$\frac{360\ J}{400\ J} = .9$

3. A 160.-newton box is pulled to the top of a frictionless ramp at constant speed as shown in the diagram. Calculate the amount of work done.

$W = F_{\parallel} \cdot d$

$80N \cdot 10m$



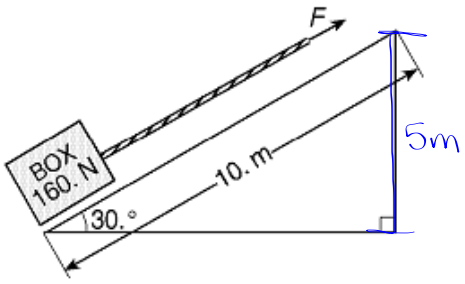



$160N \cdot 10m \cdot \cos 60$

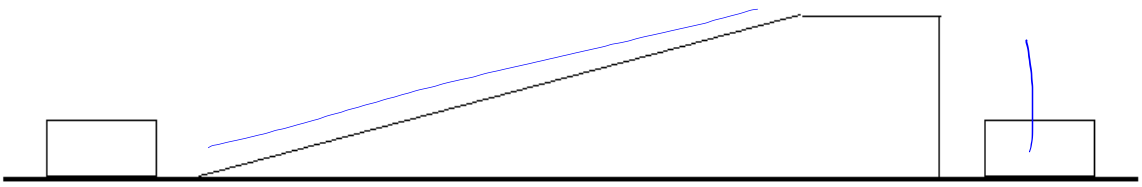
$= 800J$

$Fd_{\parallel}$

$160N \cdot 5m$



4. Compare the amount of work needed to get this box to the top of the hill by either lifting it or dragging it up the incline if:



a) the incline is frictionless

same

b) the incline is not frictionless

$W_{ramp} > W_{lift}$

## Path Independent:

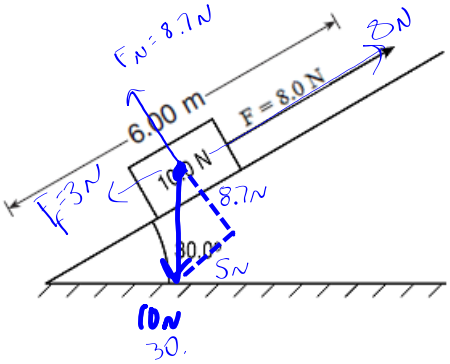
In the absence of friction, work done against gravity is independent of the path chosen

5. An 8.0 newton force is used to pull a 10.0 newton box 6.00 meters up a rough hill at constant speed as shown in the diagram.

a) How much work was done pulling the box up the hill?

$W = F_{\parallel} \cdot d$

$8N \cdot 6m = 48J$




b) How much work was done overcoming gravity?

60°

$F_g \cdot d \cdot \cos\theta$ or $F_g \cdot d \sin\theta$

$F_{\parallel} \cdot d = 5N \cdot 6m = 30J$

c) How much work was done overcoming friction?

$F_f \cdot d = 3N \cdot 6m = 18J$