

Power - rate at which work is done, or energy is transformed

$$P = \frac{W}{t} \quad \text{Power} = \frac{\text{Work}}{\text{time}}$$

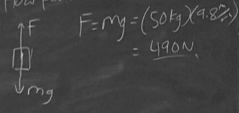
measured in Watts (W)

horsepower = 746 watts

ex 2) 50kg box needs to be lifted at constant speed of 3.0 m/s. How powerful does the motor need to be?

$$P = F \cdot v = (490N)(3.0 \text{ m/s})$$

$$P = 1470 \text{ W}$$



Another Equation for power

$$P = F \cdot v$$

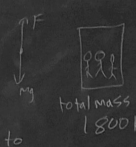
Power = (Force)(velocity)

$$W = F \cdot d \quad v = \frac{d}{t}$$

$$P = \frac{W}{t} = \frac{F \cdot d}{t} = F \cdot v$$

ex 1) P = 500W  
How long does motor have to be on to do 10 kJ of work?

$$P = \frac{W}{t} \quad t = \frac{W}{P} = \frac{10,000 \text{ J}}{500 \text{ W}} = 20 \text{ sec}$$



Due at end of class

1) A 1000 kg elevator has a maximum load of 800 kg. Minimum power must the motor deliver to lift a loaded elevator at a constant speed of 3.0 m/s? How long does it take a 19 kW steam engine to do  $6.8 \times 10^7 \text{ J}$  of work?

3) A rain cloud contains  $2.66 \times 10^7 \text{ kg}$  of water vapor. How long would it take a 2.00 kW motor to raise the same amount of water to the cloud's alt. h.w., 20 km  
 $PE = 5.2 \times 10^{11} \text{ J}$   
 $t = 2.6 \times 10^5 \text{ sec}$

