Name: KEY

Date:

Section C D F

The Masters School
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Physics

Work I

1. A catcher "gives" with a baseball when catching it. If the baseball exerts a force of 470 N on the glove, so that the glove is displaced 8.0 cm, how much work is done by the ball?

$W = Fd$

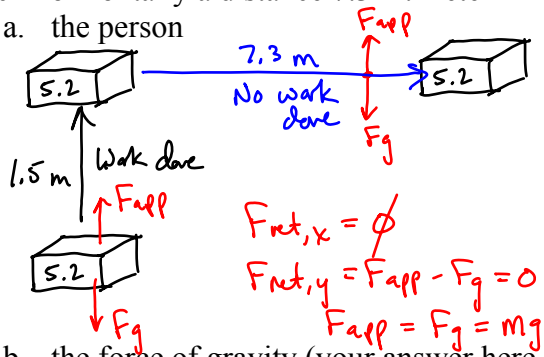
$W = (470)(.08)$

$W = 37.6 \text{ J}$

2. A person lifts a 5.2 kg cement block at a constant rate a vertical distance 1.5 m and then carries the block horizontally a distance 7.3 m. Determine the work done by

$F_{net} = 0$

a. the person



$F_{net,x} = 0$

$F_{net,y} = F_{app} - F_g = 0$

$F_{app} = F_g = mg = 51 \text{ N}$

$W_{TOT} = W_{vertical} + W_{horizontal}$ (horizontal = 0)

$= F_{app} \cdot d$ (Force is ⊥ to Direction of movement)

$= 51 \cdot 1.5$

$W_{TOT} = 76.5 \text{ J}$

b. the force of gravity (your answer here should be negative)

$W = Fd\cos\theta$ ← b/c F_g is 180° from direction of movement

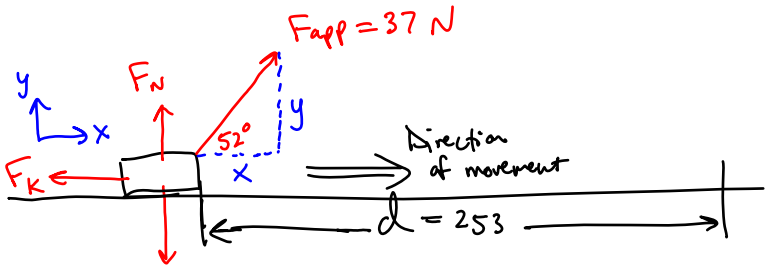
$W = F_g \cdot d \cdot (\cos 180°)$

$W = 51 \cdot (1.5) \cdot (-1)$

$W = -76.5 \text{ J}$

3. A flight attendant pulls her 70.0 N flight bag a distance of 253 m along a level airport floor at a *constant speed*. The force she exerts is 37.0 N at an angle of 52.0° above the horizontal.
   a. Find the work she does on the flight bag.
   b. Find the work done by the force of friction on the flight bag.
   c. Find the coefficient of kinetic friction between the flight bag and the floor. (remember that $\mu_k = F_k / F_N$)

F_g $F_{net_x} = 0$



a) $W_{person} = F d \cos\theta$

$W_{person} = F_{app} \cdot 253 \cdot \cos 52°$

$W_{person} = 5763$ J

$F_{net,x} = F_{appx} - F_K = 0$

$F_{net,y} = F_{appy} + F_N - F_g = 0$

$F_{appx} = F_{app} \cos 52 = 22.78$ N

$F_{appy} = F_{app} \sin 52 = 29.16$ N

$F_K = F_{appx}$

b) $W_{friction} = F d \cos\theta$

$W_{friction} = F_K d (\cos 180)$

$W_{friction} = (22.78)\cdot(253)(-1)$

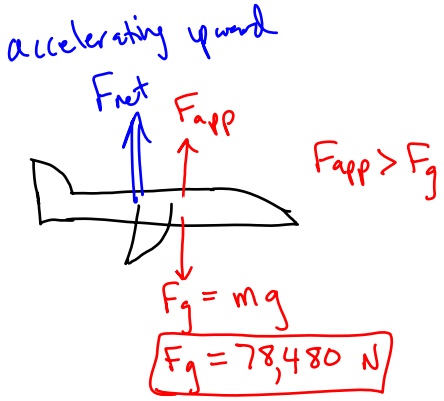
$W_{friction} = -5763$ J

c) $\mu_k = \frac{F_K}{F_N} = \frac{22.78}{F_g - F_{appy}} = \frac{22.78}{70 - 29.16}$

$\mu_k = \frac{22.78}{40.84} = .558$

4. A plane designed for vertical takeoff has a mass of 8.0×10^3 kg. Find the net work done by all forces on the plane as it *accelerates* upward at 1.0 m/s^2 through a distance of 28.0 m after starting from rest. (remember that $F_{net} = ma$)

This is a great feat for aeronautics by the way, there is a short video here of a vertical launch:
http://www.youtube.com/watch?v=w-OnJIkWftU&feature=related



$W = F d \cos\theta$

$W = F_{net} \cdot (28)(\cos 0°)$

$W = (m \cdot a)(28)(1)$

$W = (8000 \cdot 1)(28)$

$W_{net} = 224{,}000$ J