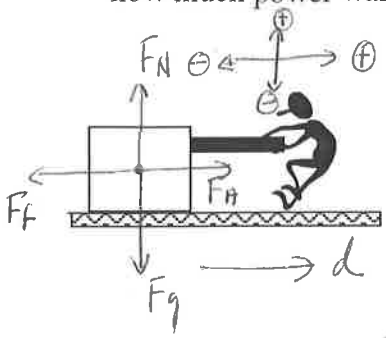
2. A student drags a 20.0 kg box horizontally across the floor at a constant speed for a distance of 3.00 meters by applying a force of 100. newtons for 8.0 seconds. Calculate how much work was done and how much power was dissipated.



$F_{NET} = \emptyset N$ (total)

$W = F\cos\theta d$

$d = 3.00m$

$F_A = 100.N$

$W_A + W_f = \emptyset J$

$W_A = (100.N)(\cos 0°)(3.0m) = 300J$

$W_f = (100.N)(\cos 180°)(3.0m) = -300J$

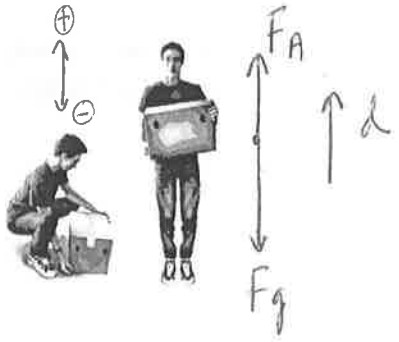
$300J + -300J = \emptyset J$

$W_{NET} = \emptyset J$

$P = \frac{W_A}{t} = \frac{300J}{8.0s} = 38 Watts$ $(37.5 W)$

3. The student then lifts the same 20.0 kilogram box 1.50 meters straight up in the air in 4.0 seconds at a constant speed.

a) Calculate the work he did and the power he used.



$W_A = F_A\cos\theta d$

$mg(0°)(1.5m)$

$g = 9.8\frac{m}{s^2}$

$W_A = 294J$

$F_A = -F_g = |mg|$

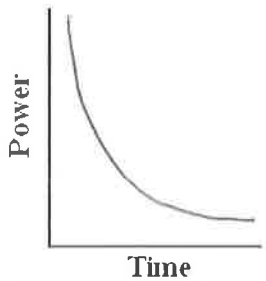
$P_A = \frac{294J}{4s} = 73.5 W$

NOTE: When lifting or lowering an object at a constant speed . . .

Applied Force is equal in magnitude to the force of gravity (weight of object).

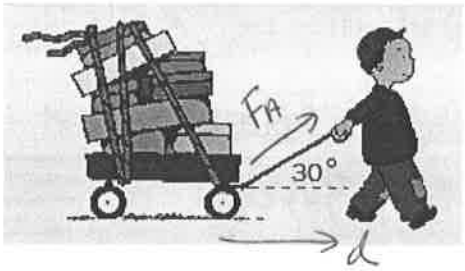
b) A second student lifted the same box to the same height at a constant speed but in only 2.0 seconds. Compare the work she did and the power she generated to those of the first student.

$P = \frac{W}{t} = \frac{W}{(\frac{1}{2}t)}$ then she used twice the power



$P \propto \frac{1}{t}$

4. If a child drags a 8.0 kilogram wagon for 10. meters by using a force of 20. newtons at an angle of 30.° with the horizontal, how much work does he do?



$W_A = F_A \cos\theta\, d$

$W_A = (20.\text{N})\cos(30°)(10.\text{m}) = 173.2\text{ J}$

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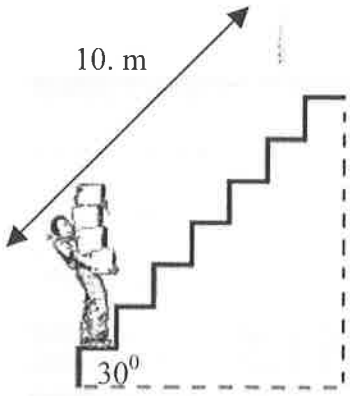
5. A student carries 150. newtons worth of books 10. meters up a flight of stairs which are inclined at an angle of 30^0 from the horizontal. How much work does he do?



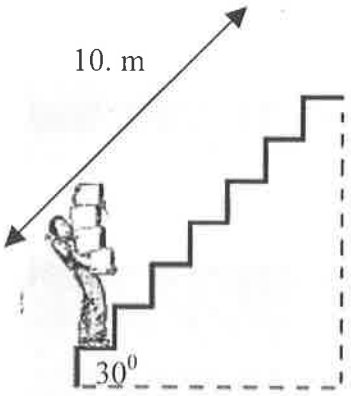
① $F_A \parallel d_y$

$F_A = 150.\text{N}$, $d = 10.\text{m}$, $\theta = 30°$, $d_y = d\sin\theta$, $F_g = 150.\text{N}$

① $W = Fd\sin\theta = 150.\text{N} \cdot 5\text{m} = 750\text{J}$

② $F_A = 150.\text{N}$, $F_A \parallel d$, $\theta = 60°$

② $W = F_A \cdot d\cos\theta = 750\text{J}$



$F_A\cos\theta$, $d = 10.\text{m}$, $\theta = 60°$, $\theta = 30°$, F_g

③ $W = F_g\sin\theta \cdot d = 750\text{J}$

F_{gL}, $F_g\sin\theta$, $\theta = 30°$, $F_g \parallel d$

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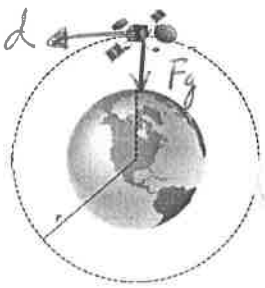
6. How much work is done on a 120.-kilogram satellite as it orbits the Earth?



$F \perp d$ No work is done.