Work and Power

1.) A man pushes a wheelbarrow forward at a constant speed over level ground by exerting a steady force of $+120.N$.

a.) How much work does he do in moving the wheelbarrow $8.0\ m$?

b.) How much work is done by friction while the wheelbarrow moves $8.0\ m$?

c.) The man continues to exert $+120.N$, but the wheelbarrow hits a patch of soft soil and slows down for $6.0\ m$. How much work does he do during this time?

d.) The man continues to push with $+120.N$, but the wheel barrow hits a rock and stops. How work is done while the wheelbarrow is stuck?

e.) While pushing the wheelbarrow the man's partner drops a $20.0\ kg$ bag of cement into the wheelbarrow. How much work is done over the next $2.0\ m$?

f.) How much work is done by gravity on the bag of cement, as the man pushes the wheelbarrow $5.0\ m$?

2.) A car of mass $1.0 \times 10^3 kg$ is travelling at a constant speed of $50.\frac{km}{h}$. The force of friction on the car is $500.N$. The engine force increases to $750.N$ so that the car accelerates for $6.0\ s$.

a.) How much work is done by the engine in the $6.0\ s$?

b.) How much work is done by the force of friction during the same $6.0\ s$?

3.) An object of mass $2.0\ kg$ falls to the floor from an $80.0\ cm$ high table. How much work is done by the force of gravity?

4.) Engine A can lift $50.0\ kg$ a distance of $12\ m$ in $15\ s$. Engine B can lift $110\ kg$ a distance of $12\ m$ in $35\ s$.

a.) Which engine can exert the greater force?

b.) Which engine is more powerful?

5.) What is the average power of a car engine that can accelerate a car of mass $1250\ kg$ from rest to $80.\frac{km}{h}$ in $10.0\ s$ when the force of friction on the car is $725\ N$?

6.) If a $10.\ N$ force is needed to just keep a $1.6\ kg$ object from moving across a floor at a steady speed, how much work is done in moving it $3.2\ m$?

Answers – 1a.) $960\ J$ b.) $960\ J$ c.) $720\ J$ d.) $0\ J$ e.) $240\ J$ f.) $0\ J$

2a.) $6.6 \times 10^4\ J$ b.) $4.39 \times 10^4\ J$ 3.) $15.7\ J$ 4a.) engine $A\ =\ 496\ N$, engine $B\ =\ 1080\ J$

b.) engine A = $4.3\ W$, engine B = $0.74\ W$ 5.) $3.89 \times 10^5\ W$ 6.) $32\ J$