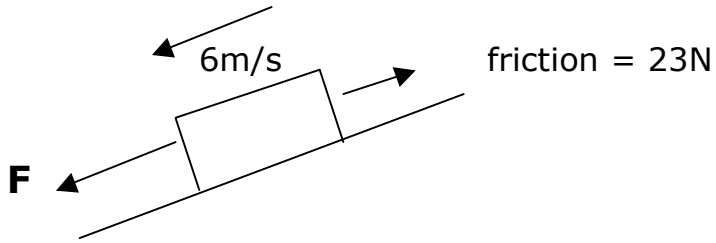
Transport Homework

(handed out on 07/02/2007 – to be handed in on 14/02/2007)

Forces

1. A box slides down a slope at a constant speed of 6m/s as shown below. If the box experiences a friction force of 23N what is the size of the downward force labelled as F in the diagram?



2. A rocket has a mass of $4x10^4$kg. When the engines ignite for take-off, an upward thrust force of $1x10^6$N is produced.

   a) Calculate the weight of the rocket on the Earth's surface.
   b) Draw a free body diagram to show the forces acting on the rocket during ignition.
   c) Calculate the resultant vertical force on the rocket at take-off.
   d) Use your answer to part c to calculate the upward acceleration of the rocket at lift-off.

3. A car driver keeps her foot on the accelerator but the car does not accelerate. Explain why the car does not accelerate.

4. Copy and complete this table. (1 tonne = 1000kg)

Mass	Acceleration	Force
3kg	$4m/s^2$	?
?	$12\ m/s^2$	6N
$2.5x10^3$kg	?	15kN
?	$0.6\ m/s^2$	10^4N
75 tonnes	$2.3x10^{-3}\ m/s^2$	?

Work and Power

5. A woman has to exert an average force of 260N to push a trolley around Tesco.

   a) If she does 208kJ of work how far has she walked around the supermarket?
   b) Calculate the average power of the woman if she takes 1 hour to do the shopping.

6. A cat takes 15s to push a ball for 8.7m with an average force of 1.9N.

   a) How much work does the cat do?
   b) What power does the cat develop?