M.7 Work and Energy

M.7.1 Work

From the ideas we have about work we can say that work requires some effort. E.g. pushing a wheel barrow. Thus some force is being applied over some distance.
From common sense we get

Work = Force × Displacement

or $W = F \times x$

The units for work are the Joule (J)

Example:
Find the work done against a frictional force of 7 N. If the fridge is kept at a constant velocity of 2 ms^{-1} for a distance of 10 m.

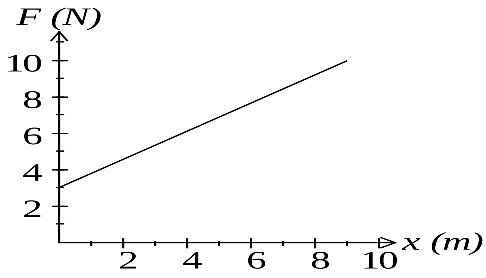
M.7.2 Work From Graphs

The area under a force-displacement graph shows the work done.

ie Work done = area under F-x graph

This follows for all F-x graphs even those where F is not constant.

Example: Find the work done
1.



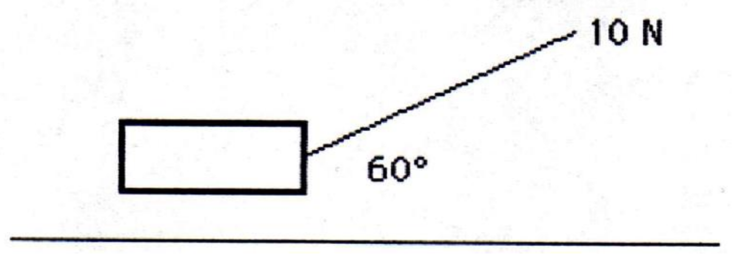
M.7.3 The Scalar Nature of Work

Work is a scalar but force and displacement are vectors. What happens if the force applied and the displacement are not in the same direction? We then need to take the component of the force in the direction of the displacement.

So Work = distance × component of force in direction of displacement

Work = $x \times F_{||} = F\, x \cos\theta$

Example:
Find the work done by the force if the distance moved is 6 m.



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