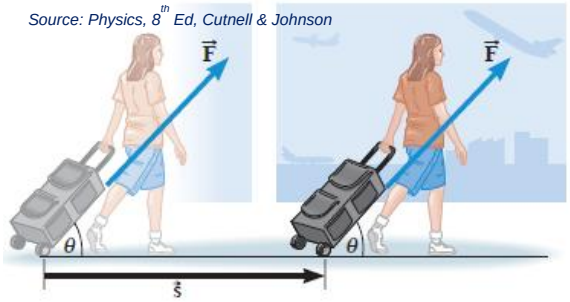
NAME: _____ **DATE:** _____
IB Physics

2.3.4 POWER AND EFFICIENCY *Class Lecture Examples*

EXAMPLE 1
Find the power exerted by a 45.0 N force in pulling the suitcase shown at an angle 50.0° for a distance of 75.0 m in 55.0 s.

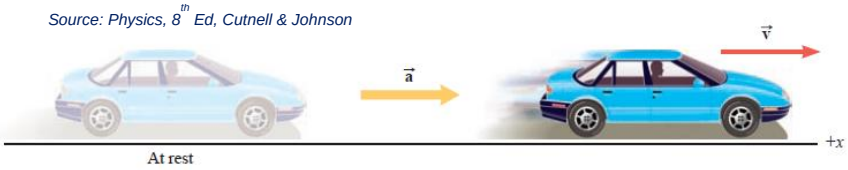
Source: Physics, 8th Ed, Cutnell & Johnson



EXAMPLE 2
What is the minimum power required to lift a mass of 50.0 kg up a vertical distance of 12 m in 5.0 s?

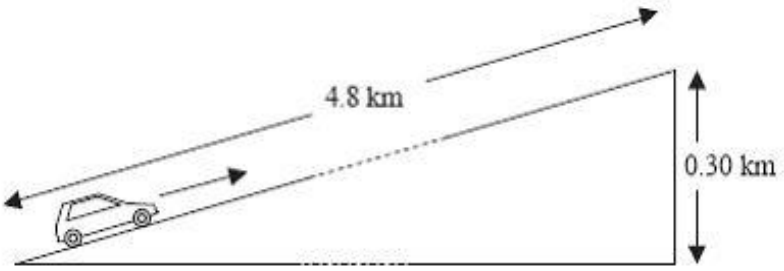
EXAMPLE 3
A car, starting from rest, accelerates in the *x* direction. It has a mass of 1.10×10^3 kg and maintains an acceleration of 4.60 ms^{-2} for 5.00 s. Assume that a single horizontal force accelerates the vehicle. Determine the average power generated by this force.

Source: Physics, 8th Ed, Cutnell & Johnson



EXAMPLE 4

A car drives up a straight incline that is 4.8 km long. The total height of the incline is 0.30 km. The car moves up the incline at a steady speed of 16 m s^{-1}. During the climb, the average friction force acting on the car is 5.0×10^2 N. The total weight of the car and the driver is 1.2×10^4 N. Calculate a value for the minimum power output of the car engine needed to move the car from the bottom to the top of the incline.



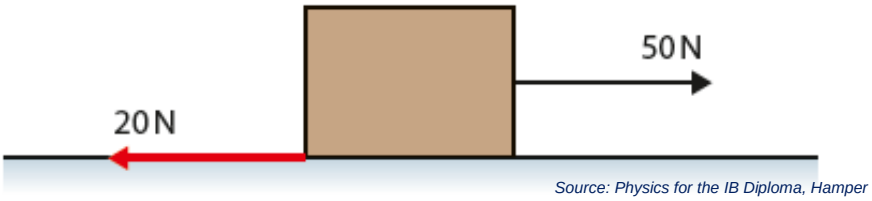
Source: IB Past Paper Questions

EXAMPLE 5

A nuclear power station produces 10 GW of electrical power. The power generated by the nuclear reactions in the core of the reactor is 25 GW. Determine the efficiency of the power station.

EXAMPLE 6

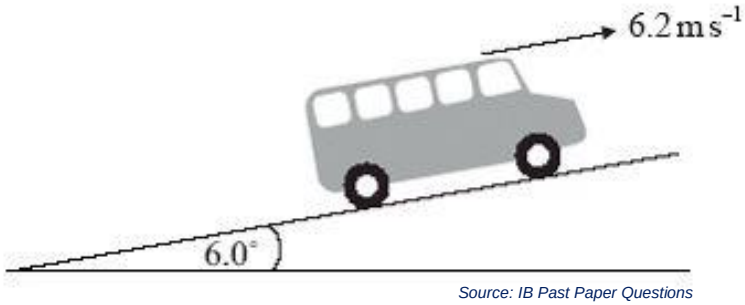
A box of mass 10.0 kg is pulled along the floor for 2.0 m by a horizontal force of 50.0 N. If the frictional force is 20.0 N, what is the efficiency of the agent pulling the box?



Source: Physics for the IB Diploma, Hamper

EXAMPLE 7

A bus is travelling at a constant speed of 6.2 m s^{-1} along a section of road that is inclined at an angle of 6.0° to the horizontal.



Source: IB Past Paper Questions

a) The mass of the bus is 8.5×10^3 kg. Determine the rate of increase of gravitational potential energy of the bus.

b) The total output power of the engine of the bus is 70 kW and the efficiency of the engine is 35 %. Calculate the input power to the engine.