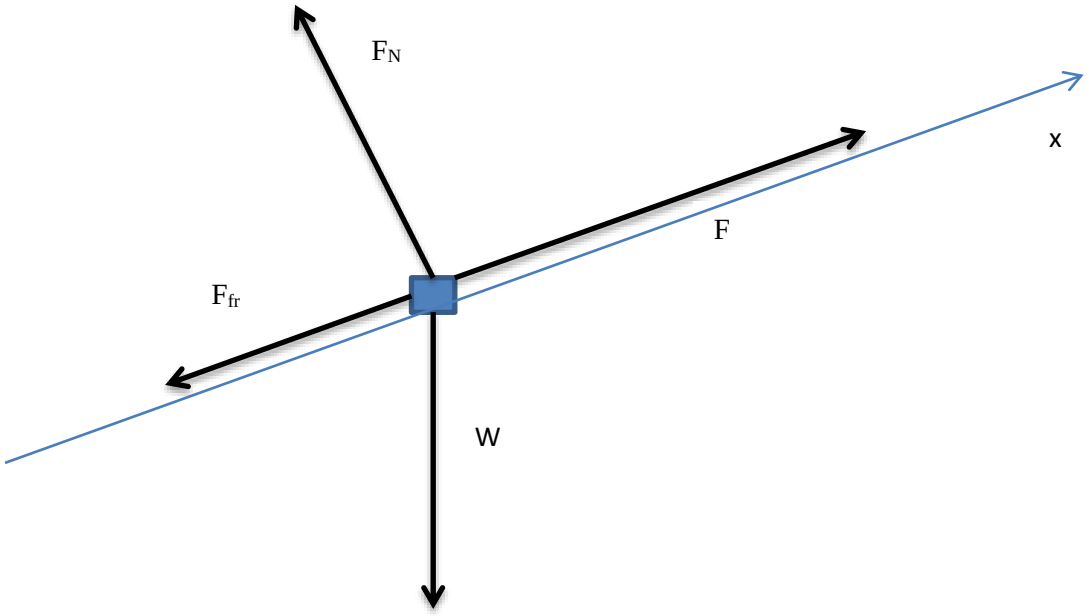
A 1590-kg car is being driven up a 6.58 ° hill. The frictional force is directed opposite to the motion of the car and has a magnitude of 529 N. A force F is applied to the car by the road and propels the car forward. In addition to these two forces, two other forces act on the car: its weight W and the normal force FN directed perpendicular to the road surface. The length of the road up the hill is 243 m. What should be the magnitude of F, so that the net work done by all the forces acting on the car is 187 kJ?



F_{fr} – friction force

F – force

The net force is directed along x and equals:

$$F_{net} = F - F_{fr} - W \sin 6.58°$$

The work done by a constant force of magnitude F on a point that moves a displacement d in the direction of the force is the product:

$$A = Fd$$

Therefore work of net force equals:

$$A = \left(F - F_{fr} - W \sin 6.58°\right)d$$

$$F = \frac{A}{d} + F_{fr} + W \sin 6.58° = 3086\ N$$

Answer: $3086\ N$