Example problems – work, power, and energy

1. A force, P = 200 N, pulls a 10-kg box from rest up a rough ramp that is 20 meters long and rises 8 meters. A constant friction of 100 N acts on the box as the box slides across the surface. Force P requires 30 seconds to pull the box to the top of the ramp.

(a) How much work does force P do in pulling the object up the ramp?

(b) What was the power output of force P?

(c) How much work does friction do?

(d) How much work does gravity do?

(e) How much work does the normal force do?

(f) How much work does force P do against friction?

(g) How much work does force P do against gravity?

(h) How much work is done on the box?

(i) What was the CHANGE in the KE of the box from the bottom to the top of the ramp?

(j) What was the KE of the box at the bottom of the ramp?

(k) What is the KE of the box at the top of the ramp?

(l) What is the speed of the box at the top of the ramp?

2. A person pulls a box across a level, frictionless surface.

10 N

37o

3 m

The person pulls with a force of 10 N at an upward

angle of 37o with the surface. The box has a mass

of 4 kg and the person pulls the box from rest a distance

of 3 m.

(a) How much work did the person do?

(b) What was the CHANGE in kinetic energy of the box during these 3 m?

(c) What was the speed of the box after the 3 m?

3. An electric motor hauled a bucket from the ground to the top of a 50-meter tall building.

The motor developed 2000 W of power. The motor moved the bucket at a constant

speed of 1 m/s.

(a) What was the NET force on the bucket?

(b) What force did the motor exert on the bucket?

(c) How long did the motor take to lift the bucket?

(d) How much work did the motor do on the bucket?

(e) What is the weight of the bucket?

(f) What is the mass of the bucket?

(g) How much work did gravity do?

(h) How much work is done on the bucket?

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