Read 6.3

D2L updated Group scores

Group tomorrow (work)

Exam 2 prep online

- old Exam
- answers
- solutions

1 handwritten sheet for exam

Office hours 1:30-2:30 today
2:45-3:45 thursday

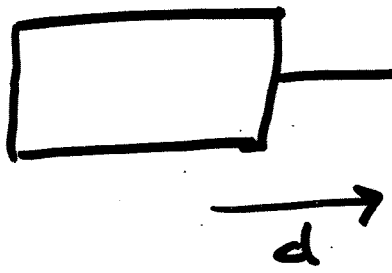
Review

Energy of Motion — Kinetic Energy (KE)

Stored Energy — potential Energy (PE)

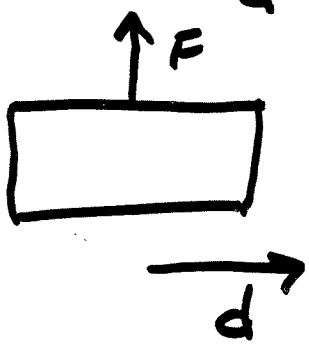
$Work = F_{\parallel} d$

unit (N·m = Joule J)



work = +Fd
positive

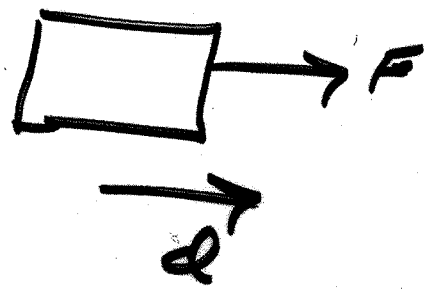
work = −Fd
negative



work = 0

Problem: You push a 28 kg crate 2.3 m across the floor with a horizontal force of 52 N. How much work did you do on the crate?

$W = F_{\parallel} d$



$F = 52\,N$

$d = 2.3\,m$

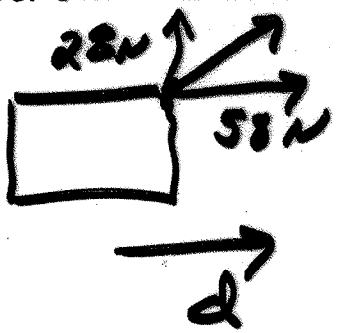
$W = (52\,N)(2.3\,m) = 120\,N \cdot m = \underline{120\,J}$

Problem: You pull a crate for a distance of 6.2 m. The force you exert has a horizontal component of 58 N and a vertical component of 28 N?

(a) How much work does your horizontal force do on the crate?

(b) How much work does your vertical force do on the crate?

(c) How much total work do you do on the crate?



a) $W = F_{\parallel} d = (58N)(6.2m) = 360J$

b) $W = F_{\parallel} d = 0 d = 0J$

c) $360J + 0J = \underline{360J}$

Interactive Question

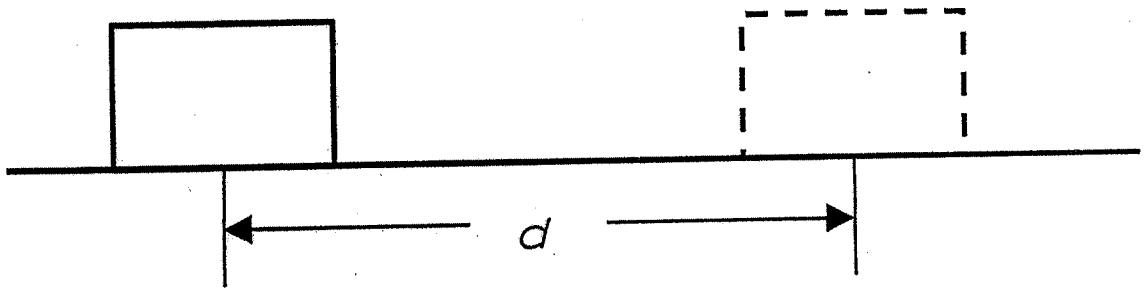
You push a crate across the floor by applying a constant horizontal force. Four forces can be identified on the crate: 1) the horizontal push 2) the gravitational force, 3) the normal force, and 4) the frictional force. Which forces do NO work on the crate?

A) 2 only
B) 1 and 4 only
C) 2 and 3 only
D) 2, 3, and 4
E) 1, 2, and 3

Interactive Question

D

If there is a frictional force opposing the motion of a block as it slide across the ground to the right does this frictional force do work on the block?



A) No, the frictional force does no work.
B) Sort of, only part of the frictional force does work.
C) Yes, the frictional force does positive work.
D) Yes, the frictional force does negative work.

Interactive Question

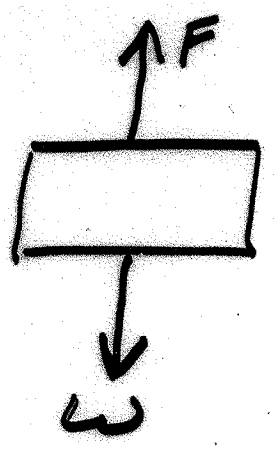
You raise a 10 N physics book up in the air a distance of 1 meter at a constant velocity of 0.5 m/s. The work done by gravity is

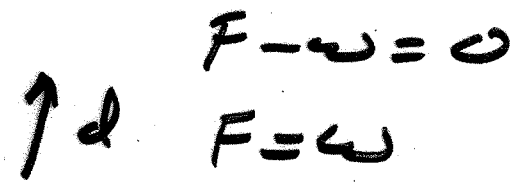
A) +10 J
B) –10 J
C) +5 J
D) –5 J
E) zero

Interactive Question

(A)

You raise a 10 N physics book up in the air a distance of 1 meter at a constant velocity of 0.5 m/s. The work done by you is





A) +10 J
B) –10 J
C) +5 J
D) –5 J
E) zero

Interactive Question

C

In which of the following situations will there be an increase in kinetic energy?

A) A projectile approaches its maximum height
B) A box is pulled across a floor at a constant speed.
C) A child is pushing a merry-go-round causing it to rotate faster.
D) A satellite travels in a circular orbit around a planet at a fixed altitude.
E) A stone at the end of a string is whirled in a horizontal circle at a constant speed.

Interactive Question

Two marbles, one twice as heavy as the other, are dropped to the ground from the roof of a building. Just before hitting the ground, the heavier marble has

A) as much kinetic energy as the lighter one.
B) twice as much kinetic energy as the lighter one.
C) half as much kinetic energy as the lighter one.
D) four times as much kinetic energy as the lighter one.
E) impossible to tell.

Interactive Question

Compare the kinetic energy of two objects: The first has a mass of m and a speed of $2v$. The second has a mass of $2m$ and a speed of v.

A) $KE_1 = KE_2$
B) $2KE_1 = KE_2$
C) $KE_1 = 2KE_2$
D) $KE_1 = 4KE_2$
E) $4KE_1 = KE_2$

Problem: A 1500 kg car moving at a speed of 35 m/s comes to a stop over a distance of 82 meters.

a) What is the car's initial kinetic energy?

b) What is the car's final kinetic energy?

c) How much work was done to stop this car?

d) What was the net average force stopping the car?

$m = 1500\ kg$ $\quad d = 82\ m$

$v_i = 35\ m/s$

$v_f = 0\ m/s$

a) $\frac{1}{2} m v_i^2 = \frac{1}{2}(1500\ kg)(35\ m/s)^2 = 9.19 \times 10^5\ J$

b) $\frac{1}{2} m v_f^2 = \frac{1}{2}(1500\ kg)(0\ m/s)^2 = 0\ J$

c) $W_{net} = KE_f - KE_i = 0\ J - 9.19 \times 10^5\ J = -9.19 \times 10^5\ J$

d) $W_{net} = F_{net}\, d$

$F_{net} = \frac{W_{net}}{d} = \frac{-9.19 \times 10^5\ J}{82\ m} = -1.12 \times 10^4\ N$