Read 6.6-6.7

H.W Due Friday

Group Thursday

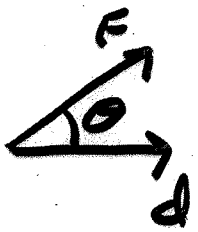
Action Center Thursday
Wagner 145 5-7 p.m

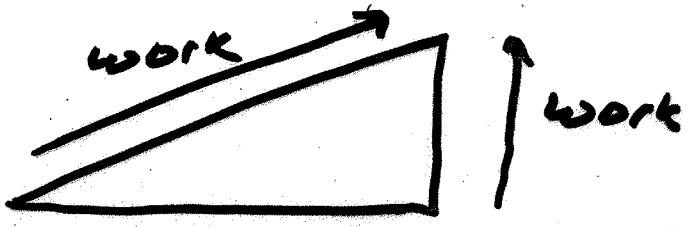
office hours today
9:30-10:30

Exam Monday
ch 4-5
7:30 A.M-9:20 A.M HERE

$work = Fd\cos\theta$

independent of path

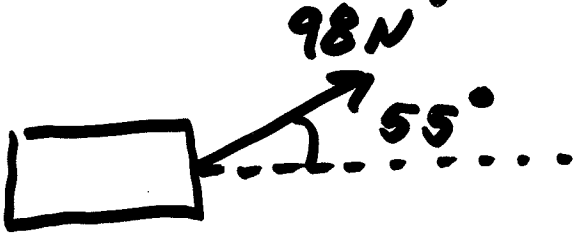



work = work

Frictionless

ex] Pull a crate with a force of 98 N at an angle of 55° above the horizontal for 62 m. What is total work done by me on the crate?





$F = 98\,N$

$d = 62\,m$

$\theta = 55°$

$W = F d \cos\theta$

$98\,N \cdot 62\,m \cdot \cos 55°$

$3490\ N\text{-}m$

New unit Joule (J)

$N\text{-}m$

**3490 J**

There will always be an object or objects doing work on another object. NEED to determine what entity is doing the work on which object

Work is a scalar NOT a vector

SIGN (±) is important

# Kinetic Energy

→ Energy of motion

Relate kinetic Energy to work using Newton's 2nd Law and kinematic equations

$\vec{F}_{net} = m\vec{a}$ $\qquad v_f^2 = v_i^2 + 2a\Delta x$

$W_{net} = F_{net}\, d$ if Force in same direction as displacement (cos θ = cos 0° = 1)

$W_{net} = ma\,d$ $\qquad a = \dfrac{v_f^2 - v_i^2}{2\Delta x}$ ← same as $d$

$$W_{net} = m\left(\frac{v_f^2 - v_i^2}{2d}\right)d$$

$$W_{net} = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$$

Define kinetic energy = $\frac{1}{2}mv^2$ (K)

$W_{net}$ = change in kinetic Energy

$= K_f - K_i$

# Interactive Question

You lift 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

Suppose you wanted to ride your mountain bike up a steep hill. Two paths lead from the base to the top, one twice as long as the other. Compared to the work you would do if you took the short path, the work you do along the longer path is

A) four times as small.
B) three times as small.
C) half as small.
D) the same.
E) it depends on the time taken.

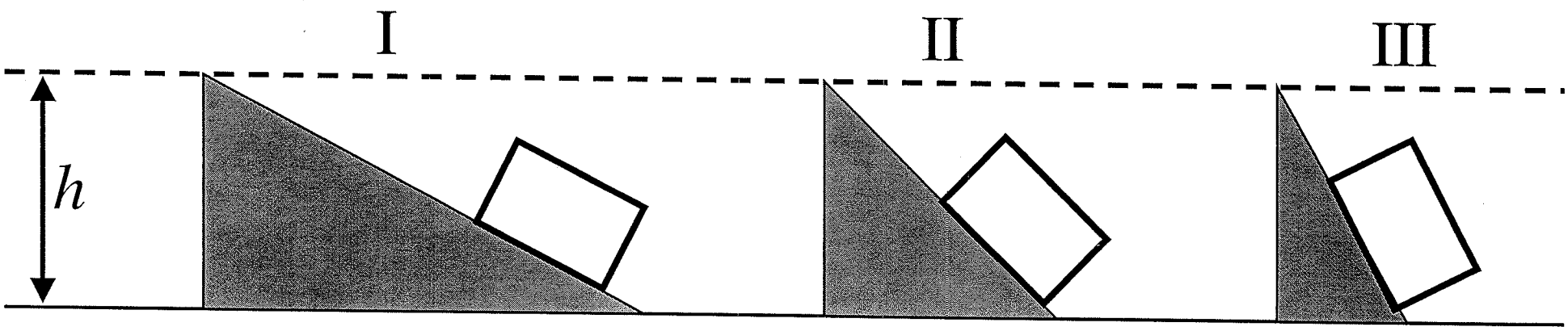
# Interactive Question

Suppose you wanted to ride your mountain bike up a steep hill. Two paths lead from the base to the top, one twice as long as the other. Compared to the average force you would exert if you took the short path, the average force you exert along the longer path is

A) four times as small.
B) three times as small.
C) half as small.
D) the same.
E) it depends on the time taken.

# Interactive Question

Consider the three different frictionless ramps shown below. If you push an identical box up each ramp at constant speed, rank the ramps in order from the one that would take the least work to the one that would take the most work.




A) I, II, III
B) III, II, I
C) II, I, III
D) I, III, II
E) None of the above

# Interactive Question

A weightlifter lifts a heavy weight over his head. The work that the weightlifter does on the bar is:

A) Greater than 0 since he applies a force in the direction of the displacement

B) Equals 0 since the change in Kinetic Energy = 0

C) Equals 0 since he does not apply any force while lifting the bar

D) Less than 0 since the force he applies is opposite in direction to the displacement

E) None of the above