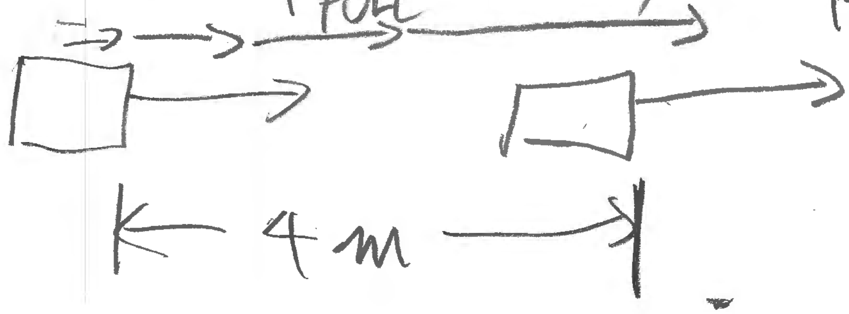
CH 7 — 9-3-13

WORK

speeding up:



WORK = FORCE · DISTANCE

$= (2N)\cdot(4m)$

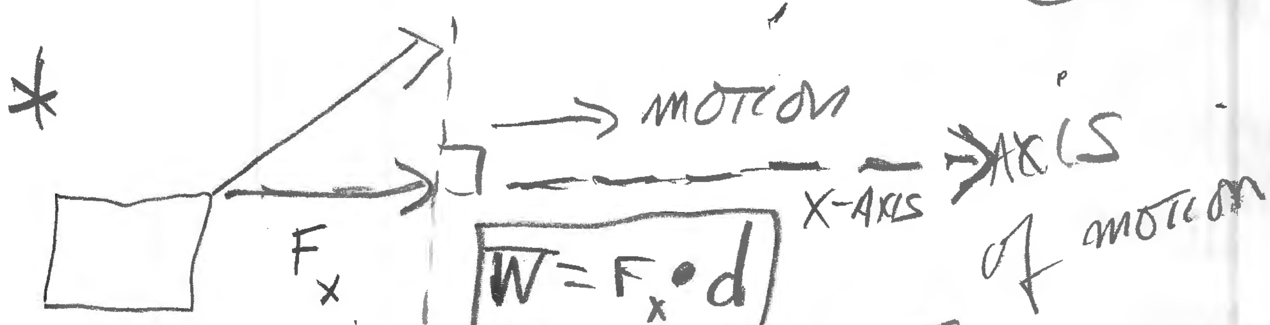
$= 8 N\cdot m$

$= 8$ JOULES

$= 8 (J)$

*

2N, 45°



$\boxed{W = F_x \cdot d}$

* component of FORCE along the motion.

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WORK ENERGY THEOREM

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$$\Delta KE = \frac{1}{2} \cdot mass \cdot speed^2 \;**$$

$$\Delta KE = \frac{1}{2} m v^2 \;*$$

$$F = m \cdot \frac{\Delta v}{\Delta t}$$

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$$F \cdot d = m \cdot \frac{\Delta v}{\Delta t} \cdot d$$

* ASSUMES YOU START FROM REST

note: $a = \frac{\Delta v}{\Delta t}$

THUS:

$F \cdot d = m \cdot a \cdot d$

use $d = \frac{1}{2} a t^2$:

$F \cdot d = m \cdot a \cdot \frac{1}{2} a t^2$

$F \cdot d = \frac{1}{2} m \cdot a^2 t^2$

BUT: $V = at$

THUS: $v = gt$, $a = g =$ constant

$$F d = \frac{1}{2} m v^2$$

THUS

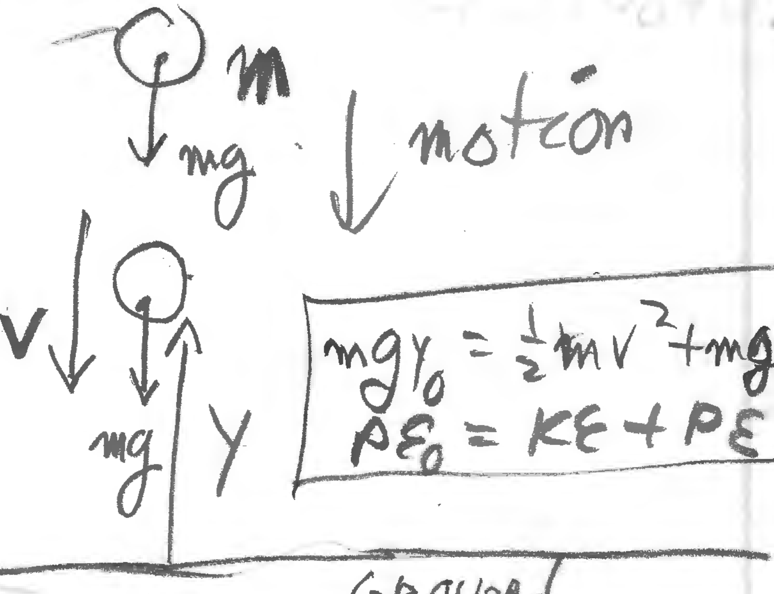
note: $\frac{1}{2} m v^2 =$ kinetic energy

Conservation of energy:

Suppose I drop an object.

Drop a ball from height y_0 from rest ($v_0=0$)

y_0



$\frac{1}{2}mv^2 = F\cdot d$

$\frac{1}{2}mv^2 = mg\cdot(y_0-y)$

$\frac{1}{2}mv^2 = mgy_0 - mgy$

$\frac{1}{2}mv^2 + mgy = mgy_0$

$$\boxed{\begin{aligned} mgy_0 &= \tfrac{1}{2}mv^2 + mgy \\ PE_0 &= KE + PE \end{aligned}}$$

$y=0$

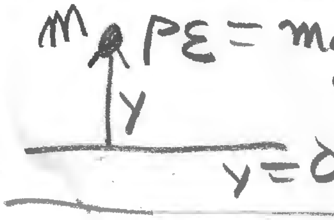
$\Delta KE = F\cdot d$

$\frac{1}{2}mv^2 = W_g$

$= mg\cdot(y_0-y)$

W_g = work done by gravity

$PE = mgy$



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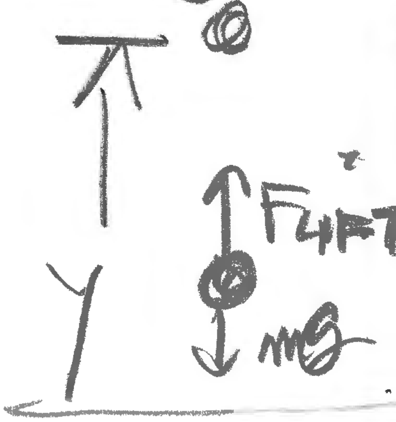
$PE = mgy$

mgy = WORK YOU DO TO LIFT MASS m A DISTANCE Y ABOVE GROUND.

YOUR WORK = STORED ENERGY



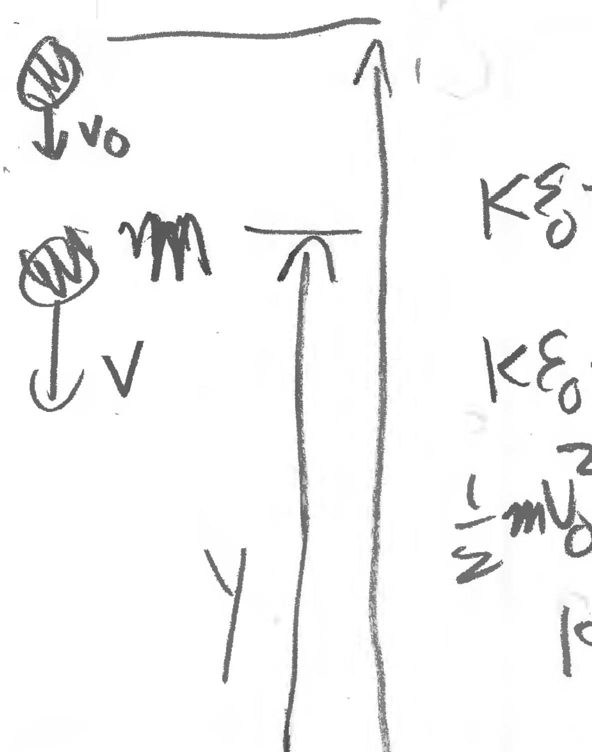
IF YOU <u>THROW</u> DOWN THE BALL:

$KE_0 + PE_0 = \frac{1}{2}mv^2 + mgy$

$KE_0 + mgy_0 = \frac{1}{2}mv^2 + mgy$

$\frac{1}{2}mv_0^2 + mgy_0 = KE + PE$

$KE_0 + PE_0 = KE + PE$



$y = 0$ $\boxed{\frac{1}{2}mv_0^2 + mgy_0 = \frac{1}{2}mv^2 + mgy}$