Work energy power continued

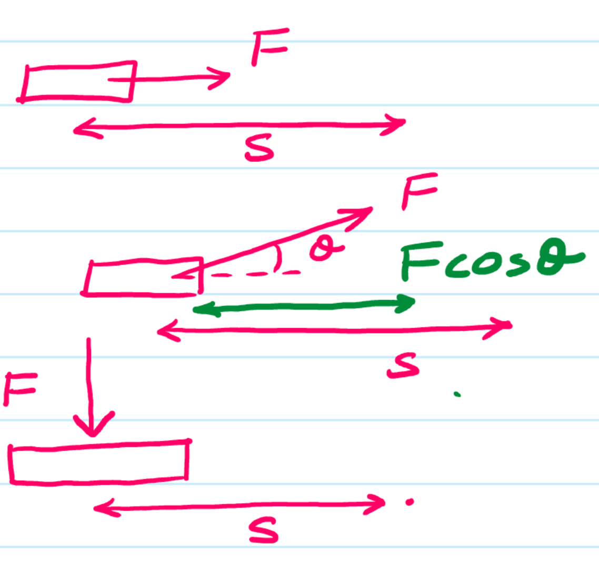
06 December 2020 16:59

formula

① $W = F \cdot s$

② $W = (F\cos\theta) \cdot s$

③ $W = 0$

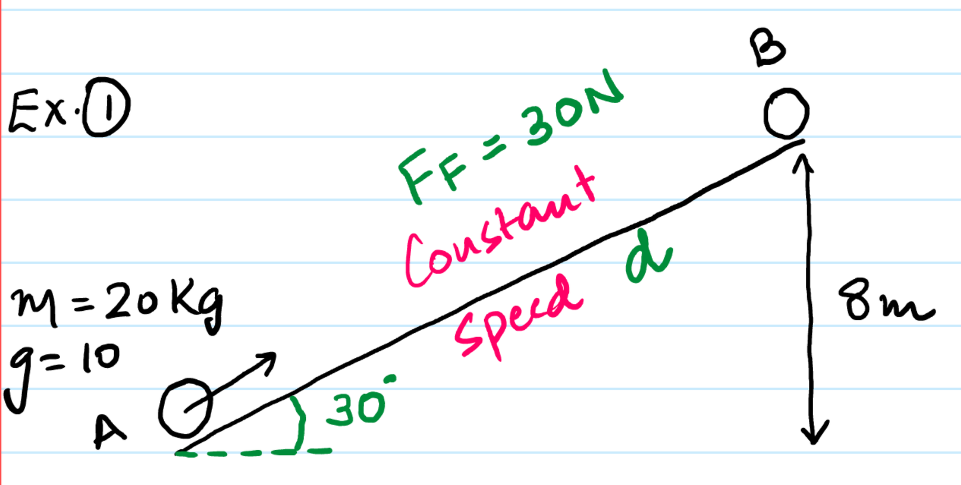


• W.done in mechanics gets converted into diff. forms of energies. i.e

W. done

- Kinetic Energy $\frac{1}{2}mv^2$
- G.P.E mgh
- Heat Energy W.done against friction $F_F \cdot d$

Ex.①



$\sin 30 = \frac{8}{d}$

$d = 16m$

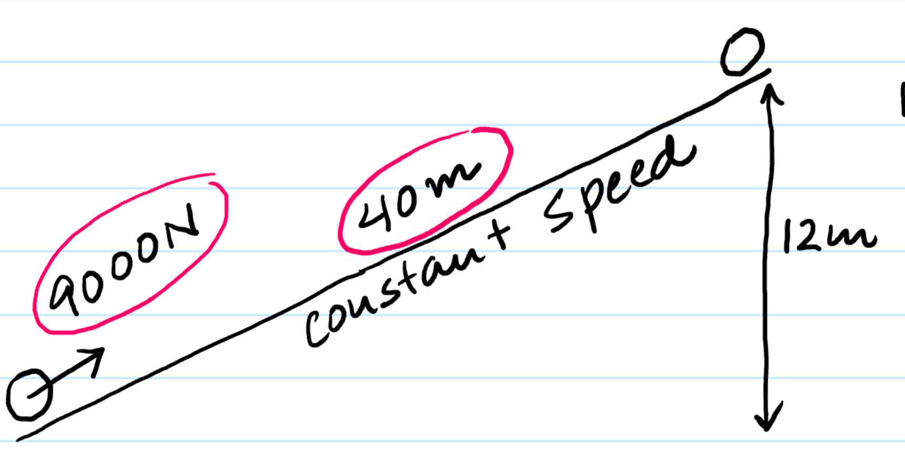
Cal. the W.done in moving the object from A to B.

W.done (find)

- K.E: Const. Speed, $\Delta K.E = 0$
- G.P.E: mgh = $(20)(10)(8)$ = **1600 J**
- W.d (friction): $F_F \times d$ = 30×16 = **480 J**

W.done in moving from A to B = 1600 + 480 = **2080 J**

Ex.2



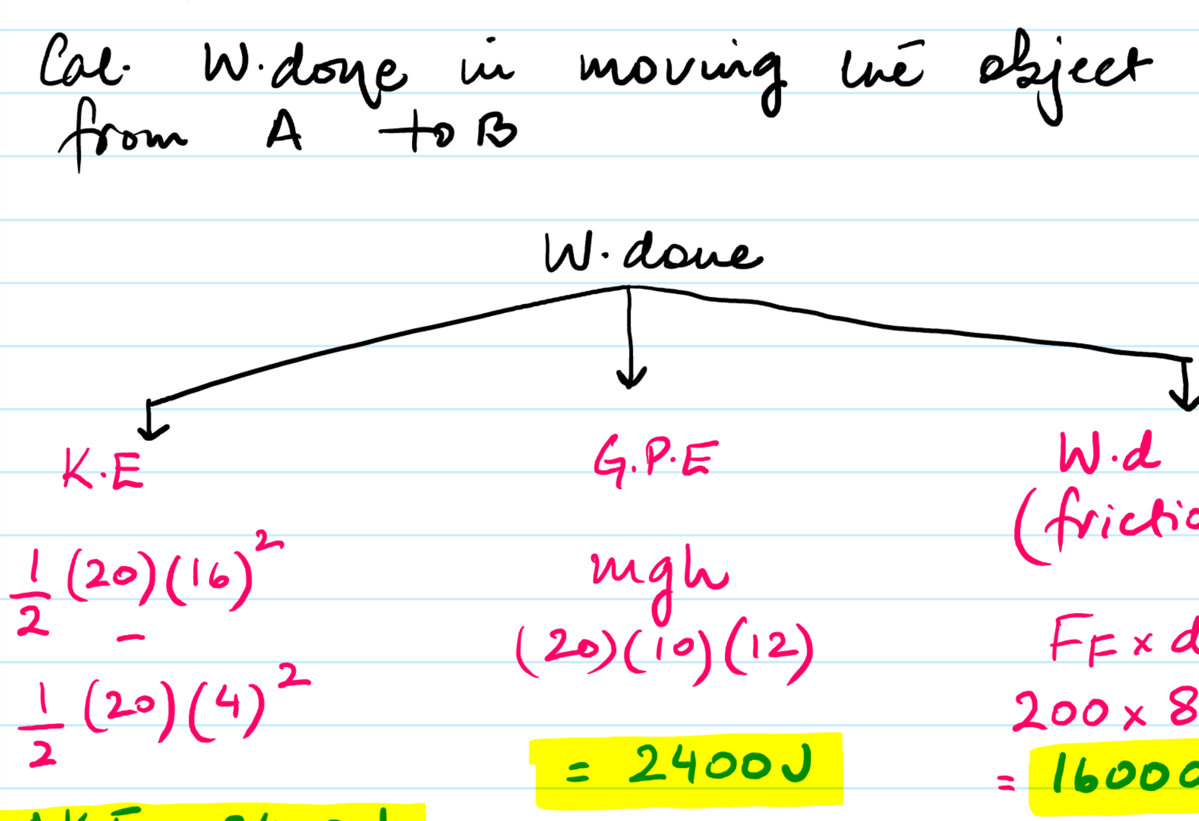
W=2000N

Cal. how much energy is dissapated as heat (W.done against friction).

W.done = $F \times d$ = **360 KJ.**

- K.E: const. speed, $\Delta K.E = 0$
- G.P.E: mgh = $(2000)(12)$ = 24 KJ
- W.d friction): find ?? $360 - 24$ = 336 KJ

Ex.3



Cal. W.done in moving the object from A to B

W. done

- K.E: $\frac{1}{2}(20)(16)^2 - \frac{1}{2}(20)(4)^2$, **ΔK.E = 2400J**
- G.P.E: mgh = $(20)(10)(12)$ = **2400J**
- W.d (friction): $F_F \times d$ = 200×80 = **16000J**

W.d = 2400 + 2400 + 16000

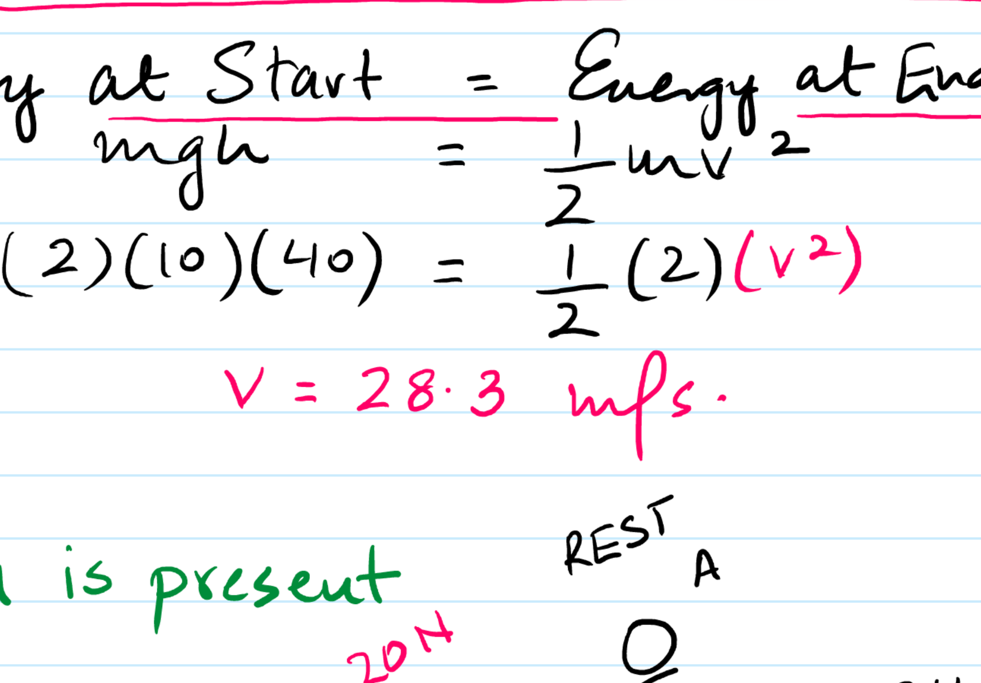
W.d = **20800 J**

Formulas for Energy ::

Energy :: ability to do work.

Law of Conservation of Energy:: Energy can neither be created nor destroyed but it can be converted from one form to another form

Case #1 :-
NO FRICTION



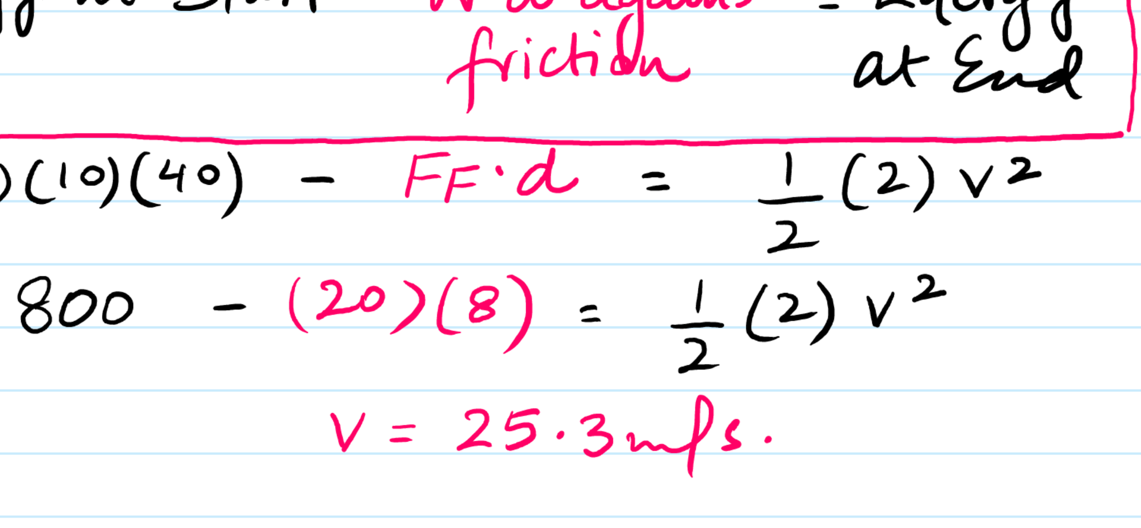
① Energy at Start = Energy at End

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

$(2)(10)(40) = \frac{1}{2}(2)(v^2)$

$V = 28.3$ m/s.

Case #2
If FRICTION is present



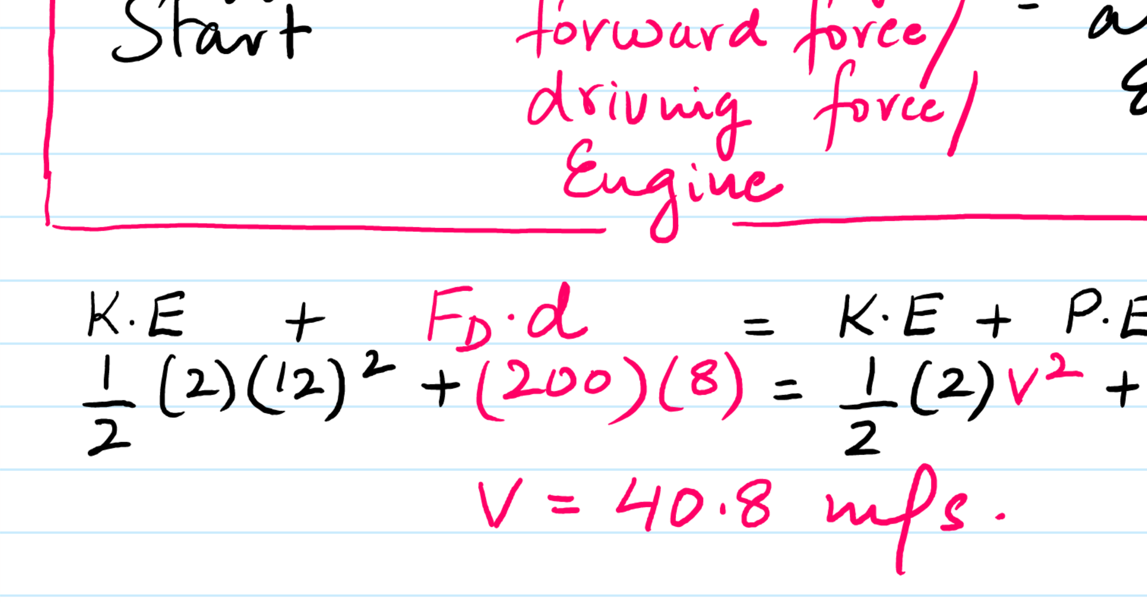
② Energy at Start − W.d against friction = Energy at End

$(2)(10)(40) - F_F \cdot d = \frac{1}{2}(2)v^2$

$800 - (20)(8) = \frac{1}{2}(2)v^2$

$V = 25.3$ m/s.

③ Case #3.
what if frictional force is NOT present but instead Driving force (forward force) is present.



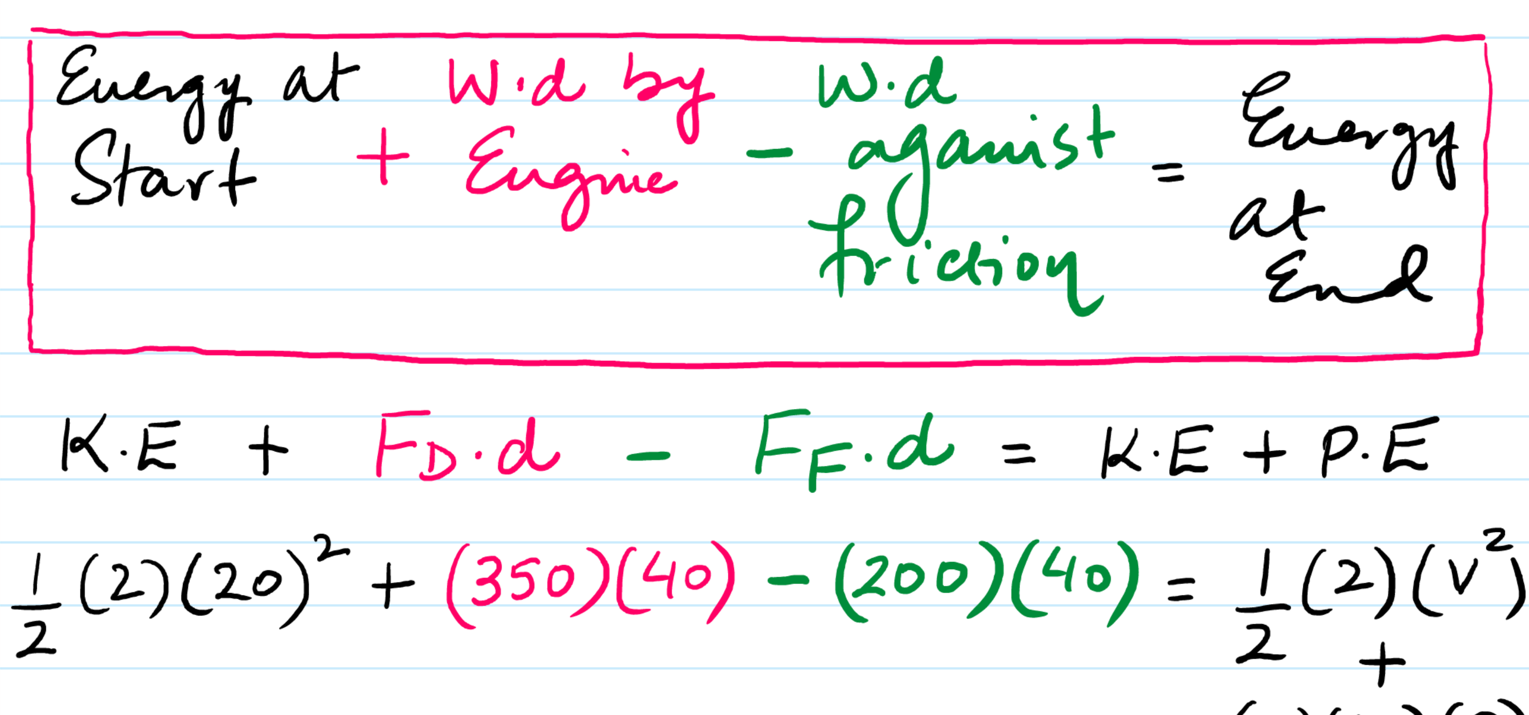
Energy at Start + W.done by forward force/ driving force/ Engine = Energy at End.

K.E + $F_D \cdot d$ = K.E + P.E

$\frac{1}{2}(2)(12)^2 + (200)(8) = \frac{1}{2}(2)v^2 + (2)(10)(4)$

$V = 40.8$ m/s.

Case #4 ::
what if F_F is also present & F_D is also present.



④ Energy at Start + W.d by Engine − W.d against friction = Energy at End

K.E + $F_D \cdot d$ − $F_F \cdot d$ = K.E + P.E

$\frac{1}{2}(2)(20)^2 + (350)(40) - (200)(40) = \frac{1}{2}(2)(v^2) + (2)(10)(8)$

$V = 79$ m/s.

Formula's for Power.

Power = Rate of work done.

① Power = $\frac{\text{W.done}}{\text{time}}$

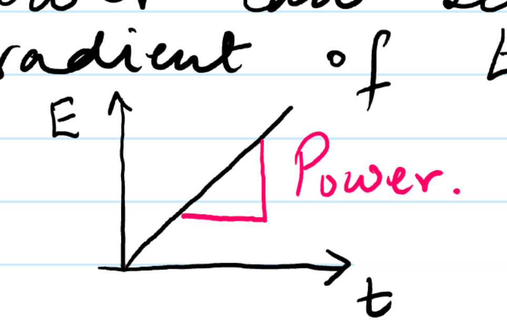
② Power = $\frac{\text{Energy}}{\text{time}}$

③ Power = $\frac{F \cdot s}{t}$

④ Since $\frac{s}{t} = v$ (velocity)

Power = $F \times v$.

* Power can be obtained from the gradient of Energy vs time graph.



grad = $J s^{-1}$ = Power