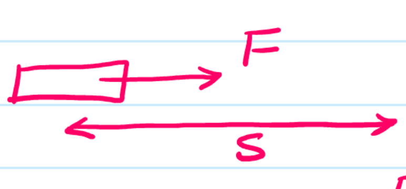
Work energy power continued

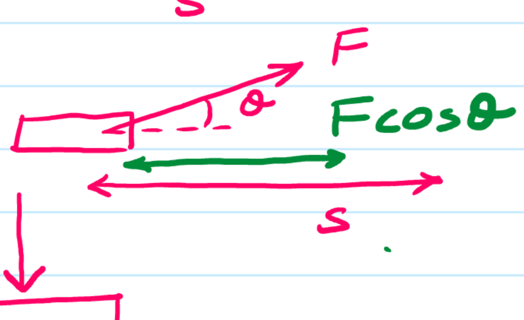
06 December 2020 16:59

formula

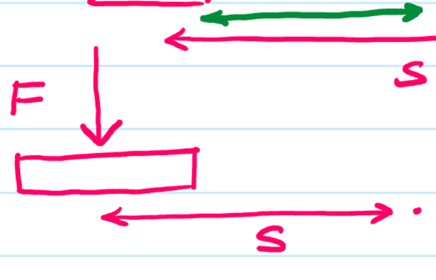
① $W = F \cdot s$



② $W = (F\cos\theta) \cdot s$



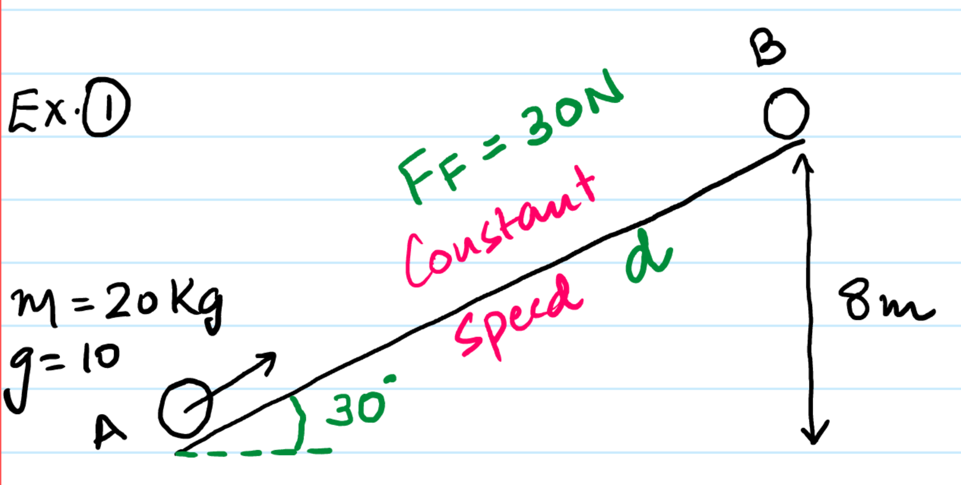
③ $W = 0$



• 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



$\sin 30° = \frac{8}{d}$

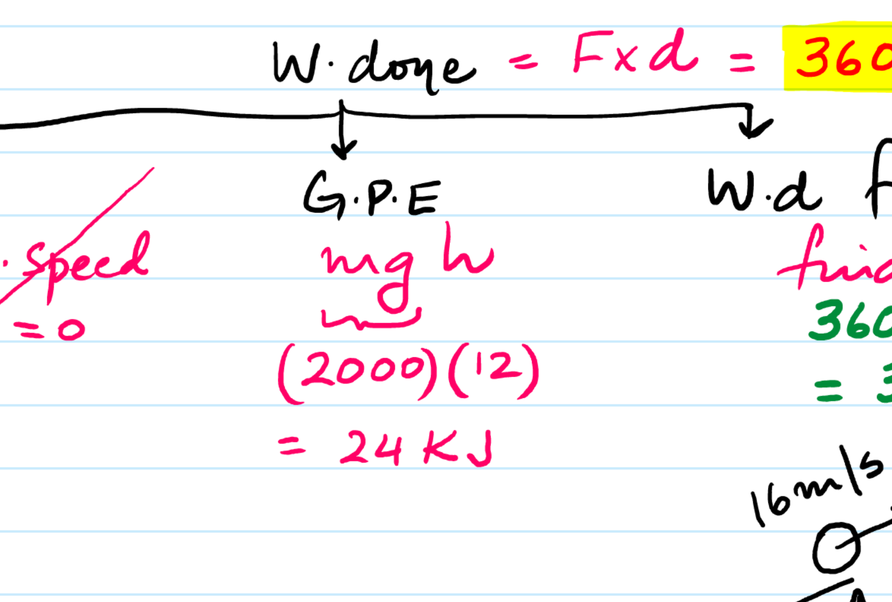
$d = 16m$

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

W.done (find)
- K.E: ~~const. speed, ΔK.E = 0~~
- G.P.E: $mgh = (20)(10)(8) = 1600J$
- W.d (friction): $F_F \times d = 30 \times 16 = 480J$

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

Ex.2

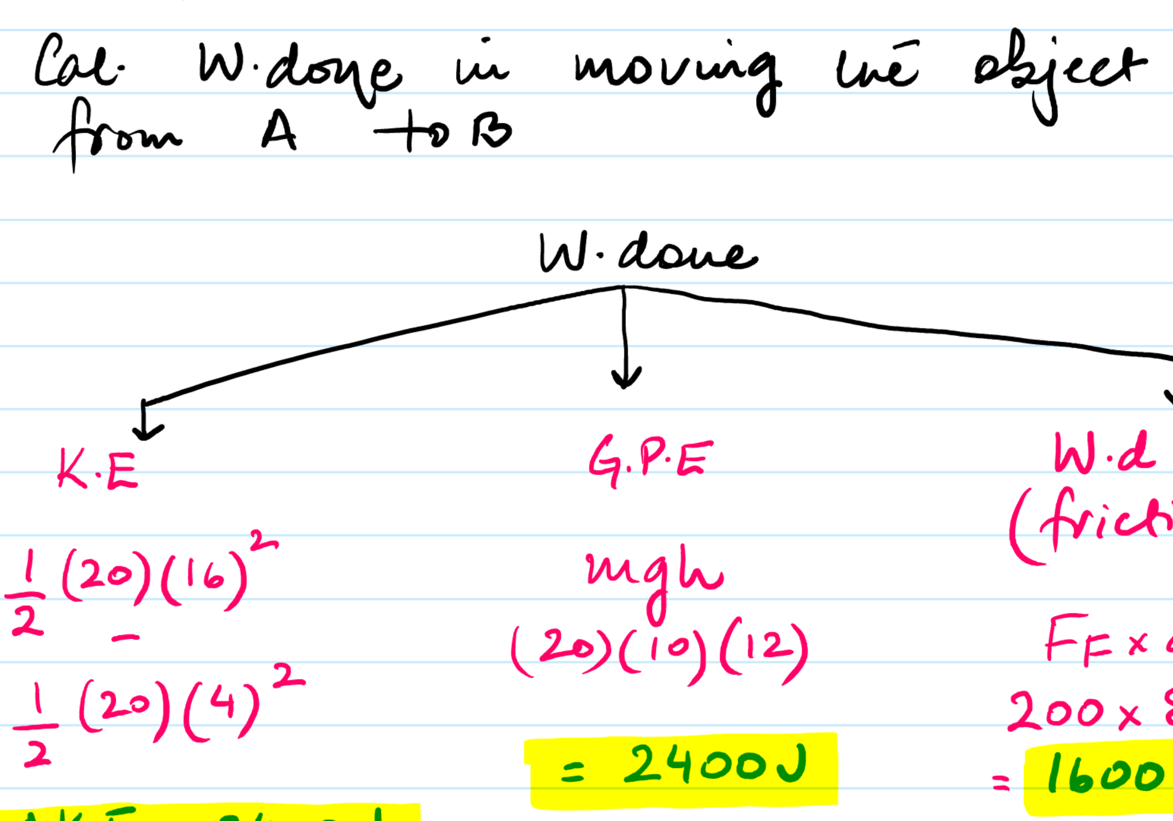


W=2000N

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

W.done $= F \times d = 360 KJ$.
- K.E: ~~const. speed, ΔK.E = 0~~
- G.P.E: $mgh = (2000)(12) = 24KJ$
- 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: $\frac{1}{2}(20)(16)^2 - \frac{1}{2}(20)(4)^2$, $\Delta K.E = 2400J$
- G.P.E: $mgh = (20)(10)(12) = 2400J$
- W.d (friction): $F_F \times d = 200 \times 80 = 16000J$

$W.d = 2400 + 2400 + 16000$

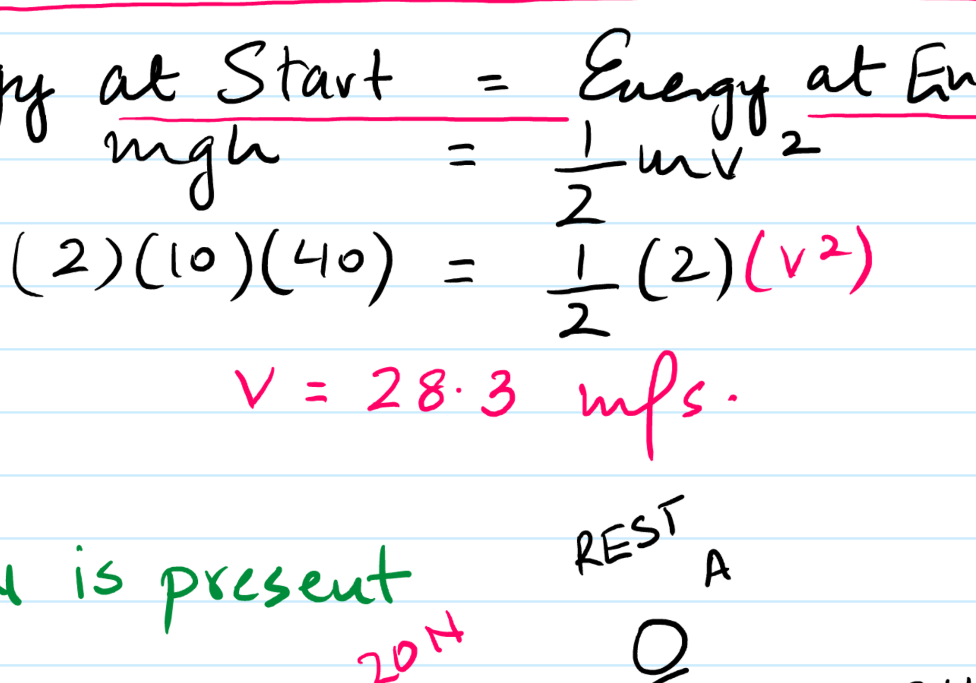
$W.d = 20800J$

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



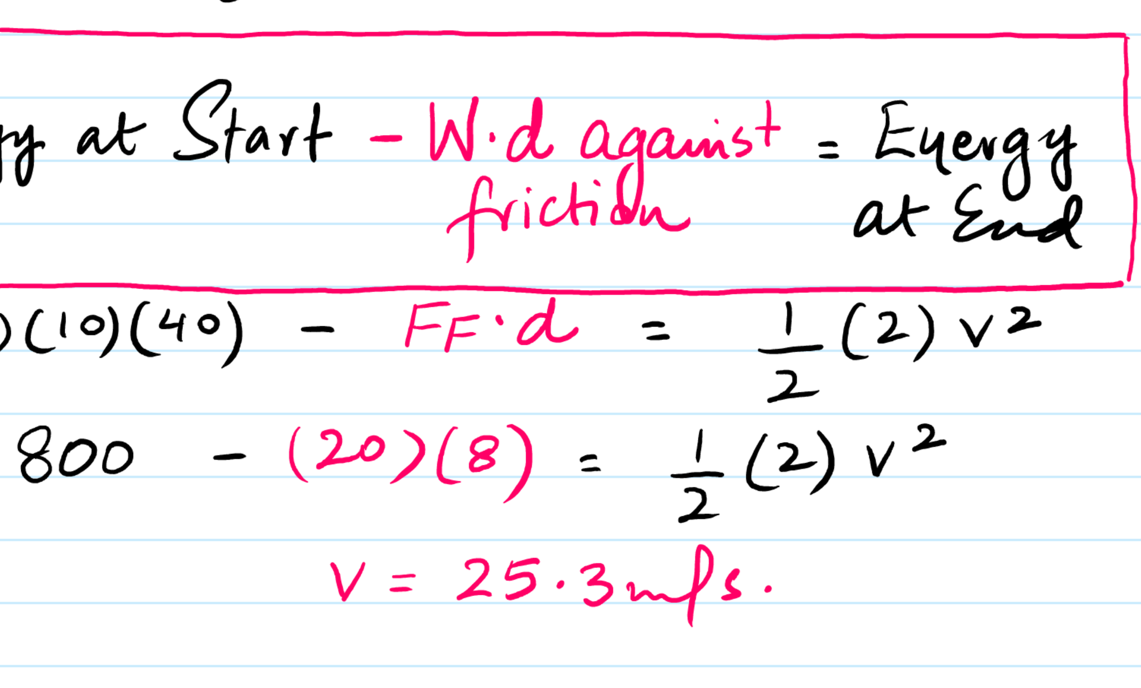
① **Energy at Start = Energy at End**

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

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

$V = 28.3$ m/s.

Case #2
If FRICTION is present



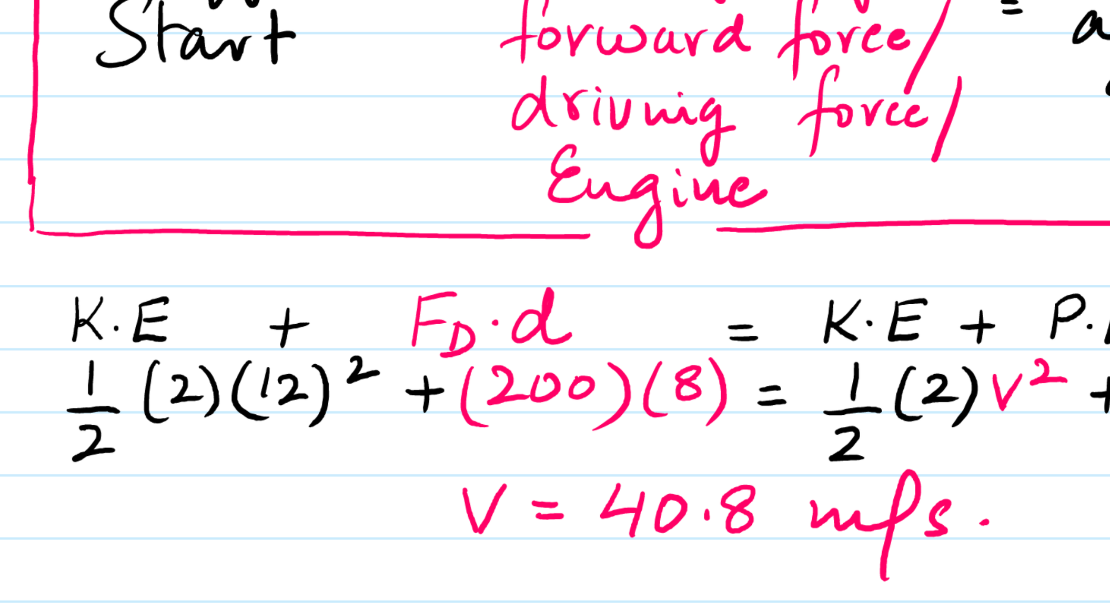
② **Energy at Start − W.d against friction = Energy at End**

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

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

$V = 25.3$ m/s.

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



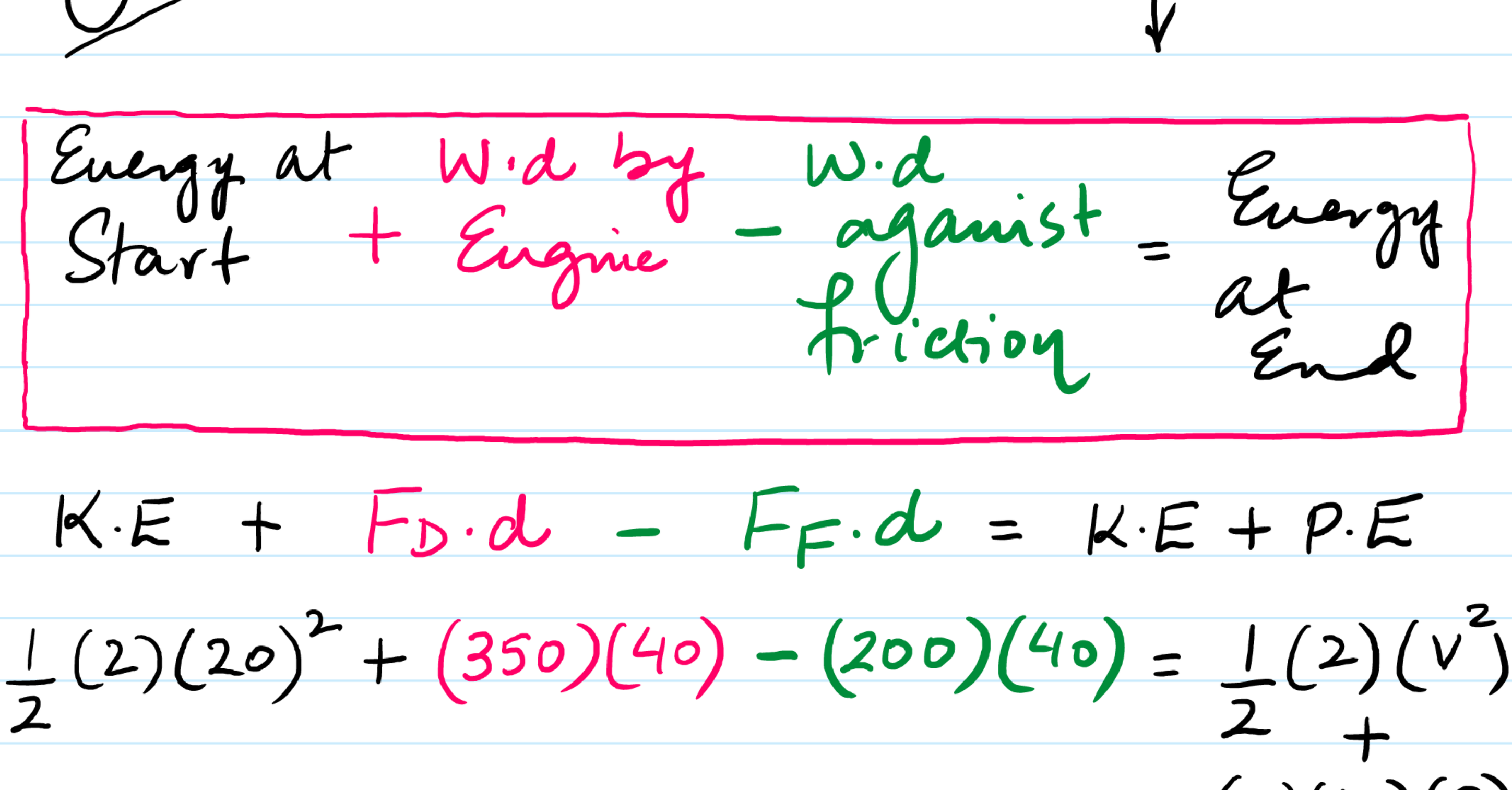
Energy at Start + W.done by forward force/ driving force/ Engine = Energy at End.

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

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

$V = 40.8$ 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.

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formula's for Power.

Power = Rate of work done.

① Power $= \frac{W.done}{time}$

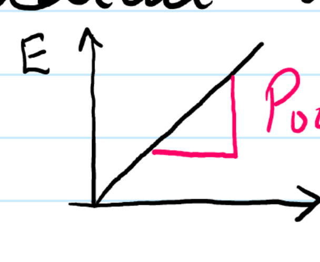
② Power $= \frac{Energy}{time}$

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 $= Js^{-1}$ = Power