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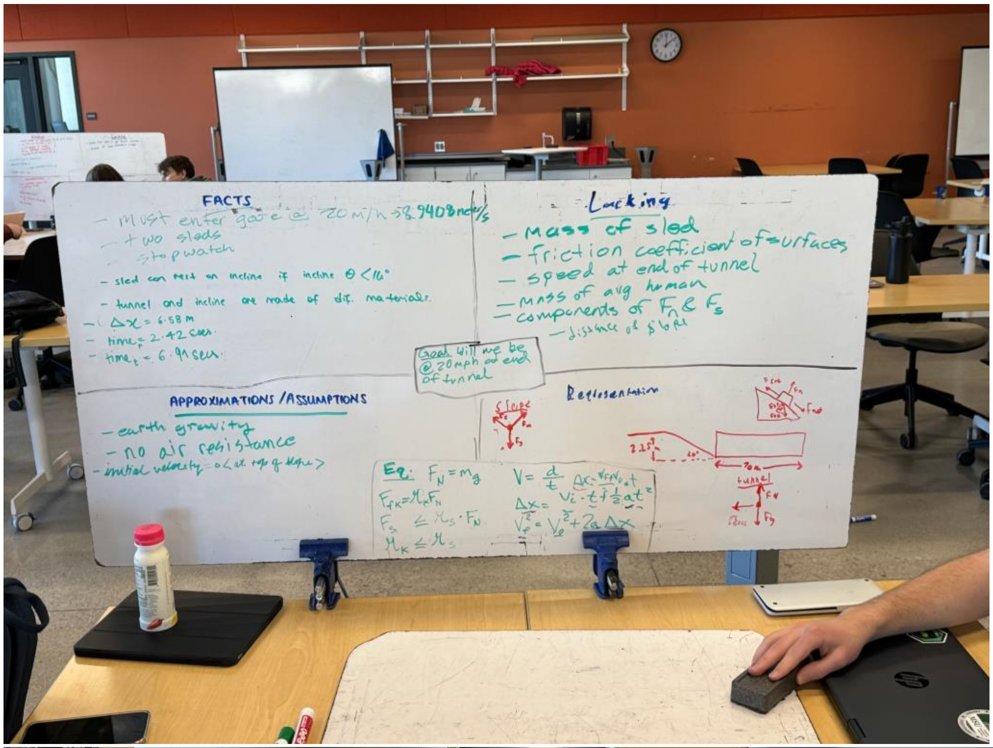
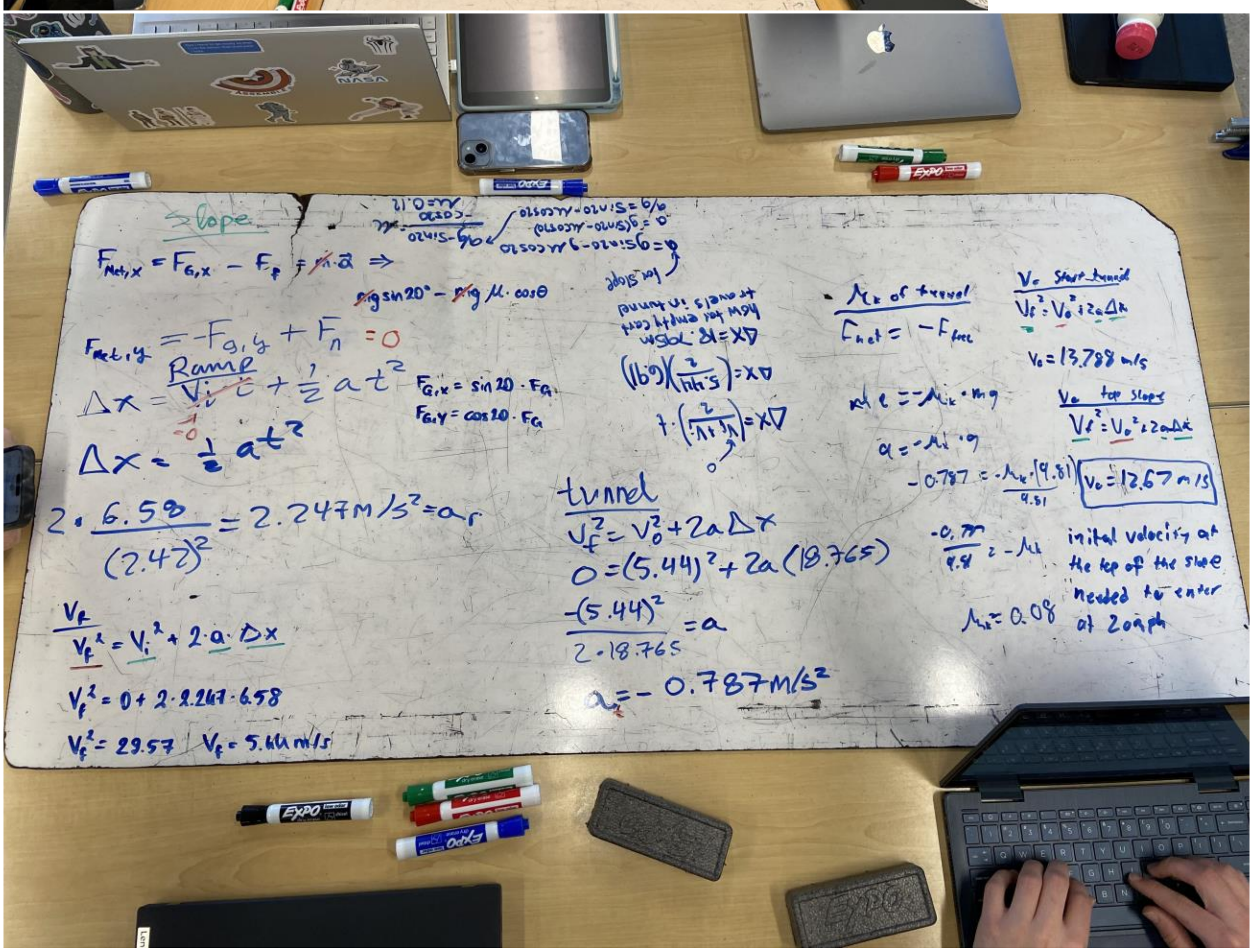
REFLECTION PROMPT:

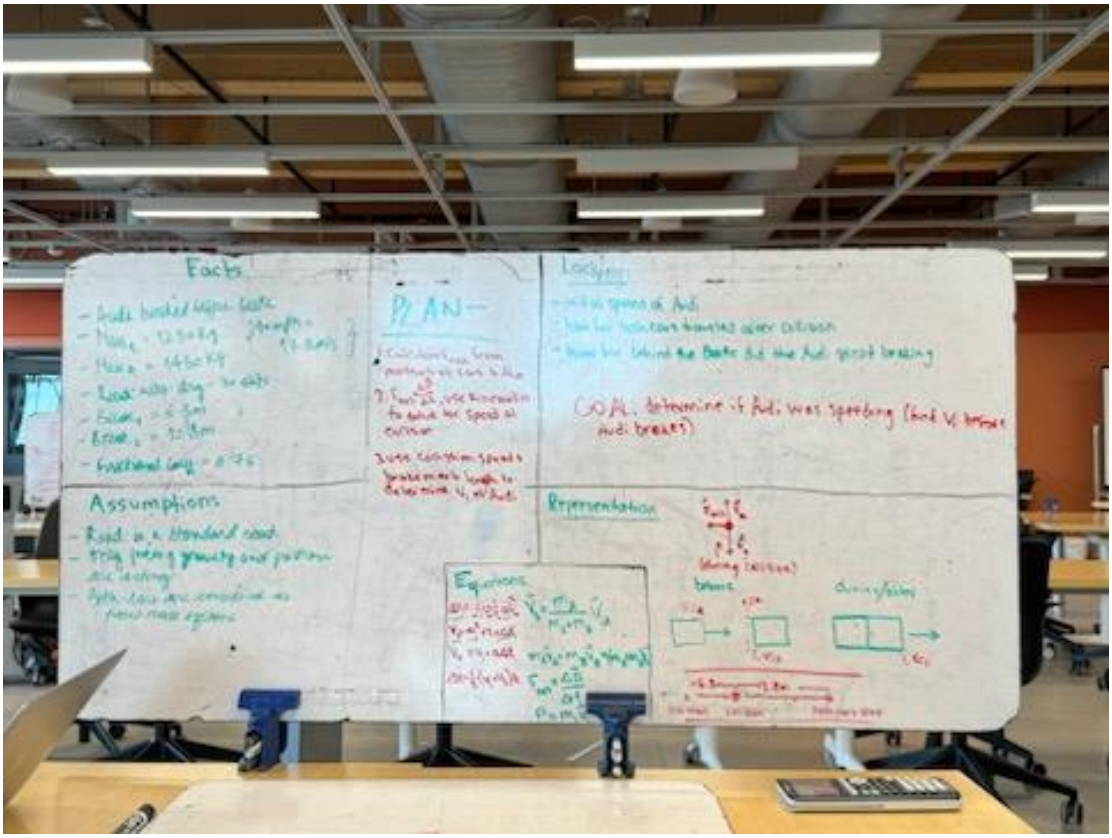
How did this first week with your new group go?
This week with our new group went pretty well. Our group was very engaged and made sure that everyone was on the same page for all steps of the problem solving process. Compared to my previous group, our process was even more organized and legible, clearly defining our four quadrants, as well as equations we would need for solving and we generated a clearly outlined goal before we even moved to solving. For our solving process we all shared the work equally and took turns writing out each step. I felt this was an effective strategy to keep us all involved and engaged, as well as helped us really learn how to apply the material we had learned in the lectures.

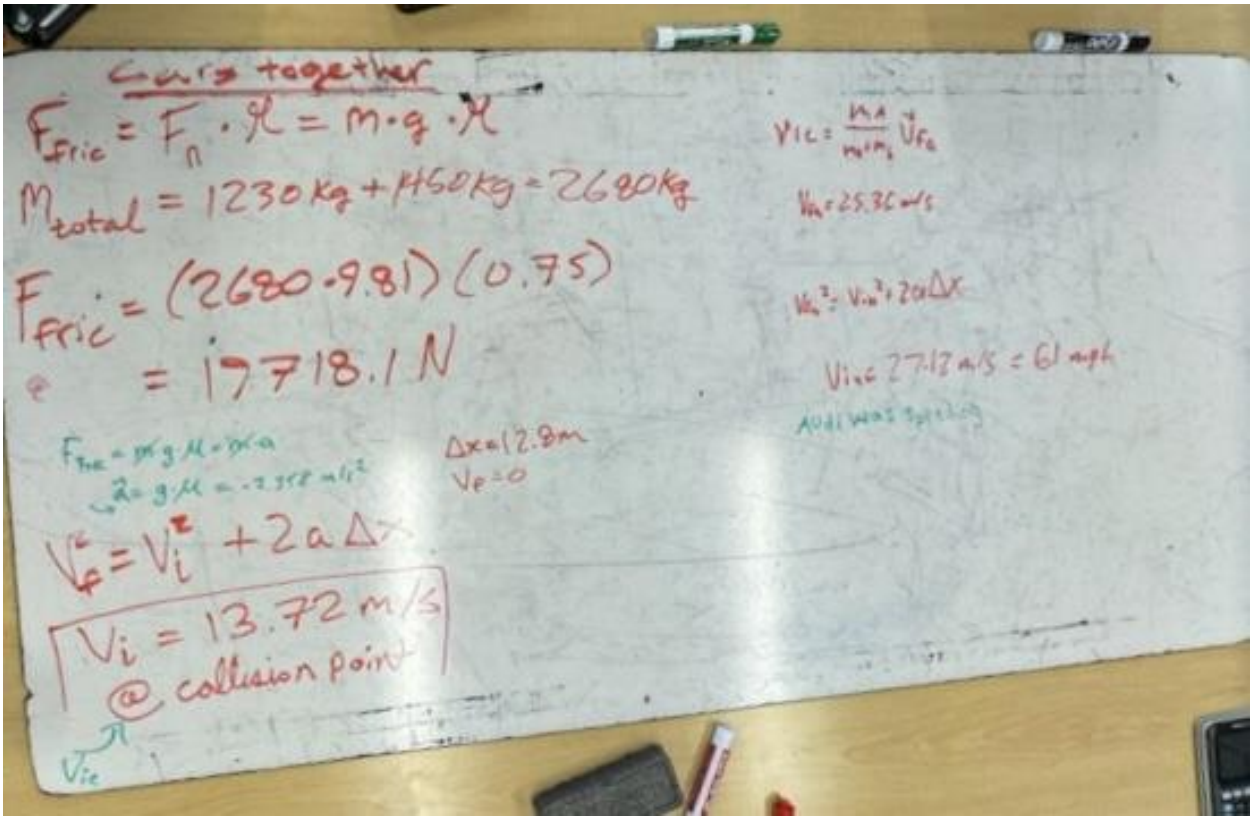
What went well for you as an individual in this group?
I felt that I was more involved this week than I had been previously because we shared our work. I really enjoyed breaking down the problem and solving algebraically first and then plugging in our values and solving for the solution. This really helped represent our process for me and I think will make our solution and steps a bit less ambiguous.

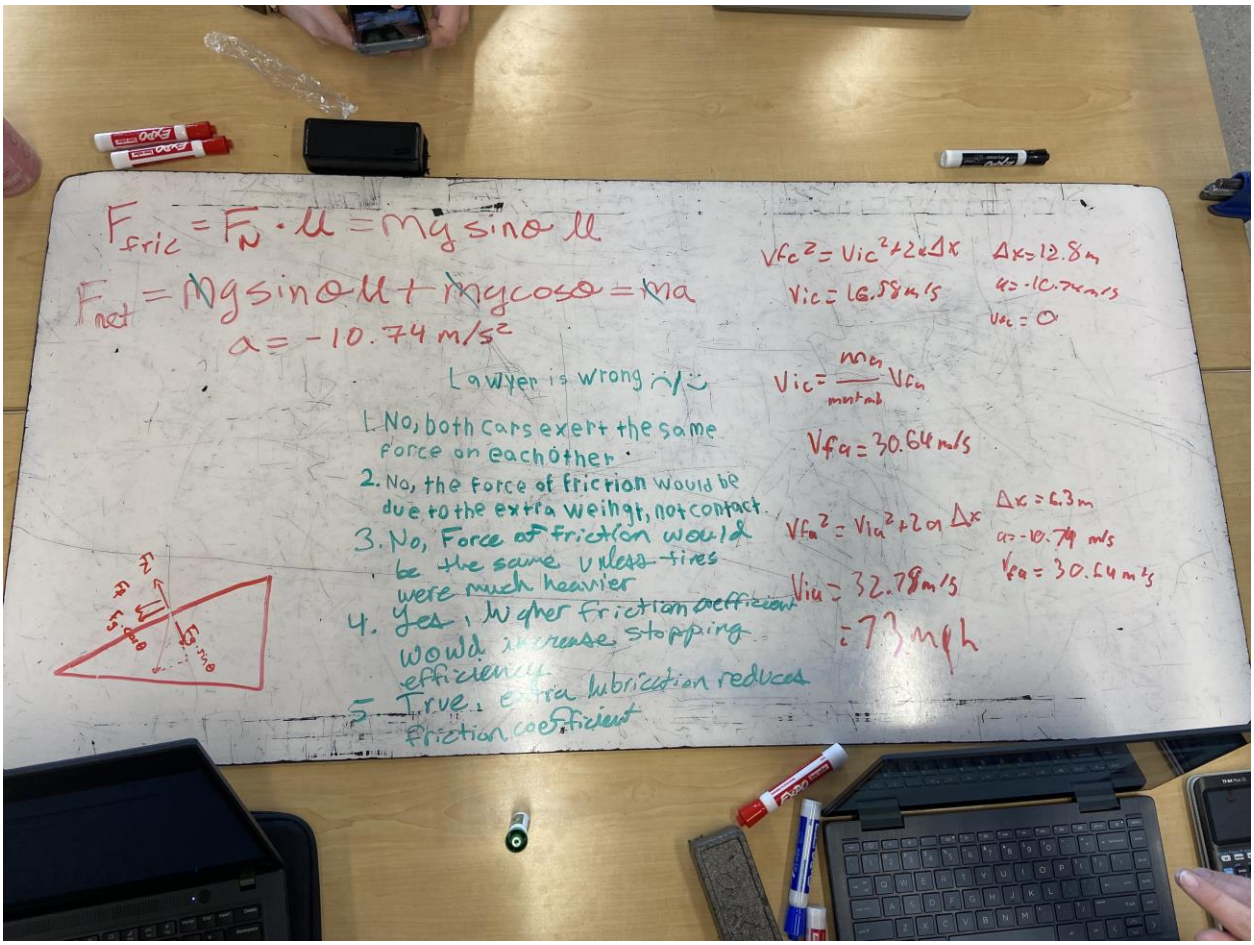
What area(s) could you improve on for next week and how might you work to improve those next week? Be specific and include supporting examples for this week's classes.
For myself, I would like to try to stay as engaged and involved as possible. Even though we shared the work, I felt like it was other members of the group who were most instrumental in setting up the problems using our applicable equations. Next week I'll make sure I have a really good understanding of the content in the notes so I'm ready to apply the knowledge in the labs, specifically in setting up the problem using the appropriate equations.

What strategies might you try to improve next week?
I really enjoyed the process of our new group in setting up a goal and a separate section of the four quadrants specifically for equations. If there's one thing I felt we could improve on it might be in writing out our solution. Instead of plugging in numbers halfway through, it may be best to solve totally algebraically and then plug in at the very end. In this process it would also be helpful to make sure that our variables are clearly defined to make sure that others may clearly see what they represent. Such as writing out the applied equations along with our representations with the correct subscripts attribute to the corresponding values, which would then carry through to our solving process.


FACTS
- two sleds
- stopwatch
- sled can rest on incline if incline θ < 16°
- tunnel and incline are made of dif. materials.
- Δx = 6.58 m
- time = 2.42 secs
- time = 6.91 secs
Lacking
- Mass of sled
- friction coefficient of surfaces
- speed at end of tunnel
- Mass of avg human
- components of Fn & Fs
Goal: will we be @ 20mph at end of tunnel
APPROXIMATIONS / ASSUMPTIONS
- earth gravity
- no air resistance
Representation
Eq: F_N = mg
Δx = V_i·t + ½at²
Vf² = Vi² + 2aΔx

Slope
F_Net,x = F_G,x − F_f = m·a
F_net,y = −F_G,y + F_n = 0
Ramp
Δx = V_i t + ½at²
Δx = ½at²
F_G,x = sin 20 · F_G
F_G,y = cos 20 · F_G
2 · 6.58 / (2.42)² = 2.247 m/s² = a_r
V_f
V_f² = V_i² + 2·a·Δx
V_f² = 0 + 2·2.247·6.58
V_f² = 29.57   V_f = 5.44 m/s
tunnel
V_f² = V_0² + 2aΔx
0 = (5.44)² + 2a(18.765)
−(5.44)² / 2·18.765 = a
a = −0.787 m/s²
μ_k of tunnel
F_net = −F_fric
a = −μ_k·g
−0.787 = −μ_k(9.81)
μ_k = 0.08
V_0 start tunnel
V_0 = 13.788 m/s
V_0 top slope
V_0 = 12.67 m/s
initial velocity at the top of the slope needed to enter at 20mph


Facts
PLAN
Assumptions
Representation
Equations
GOAL: determine if Audi was speeding (find V_i before Audi breaks)


Cars together
$F_{fric} = F_n \cdot \mu = m \cdot g \cdot \mu$
$M_{total} = 1230\,kg + 1450\,kg = 2680\,kg$
$F_{fric} = (2680 \cdot 9.81)(0.75)$
$= 19718.1\,N$
$F_{net} = ma$
$g \cdot \mu = -7.358\,m/s^2$
$\Delta x = 12.8m$
$V_f = 0$
$V_f^2 = V_i^2 + 2a\Delta x$
$V_i = 13.72\,m/s$ @ collision point
V_{ic}
$V_{ic} = \frac{m_A}{m_A + m_B} V_{fA}$
$V_{fA} = 25.36\,m/s$
$V_{fA}^2 = V_{iA}^2 + 2a\Delta x$
$V_{iA} = 27.12\,m/s = 61\,mph$
Audi was speeding


$F_{fric} = F_N \cdot \mu = mg\sin\theta\,\mu$
$F_{net} = mg\sin\theta\mu + mg\cos\theta = ma$
$a = -10.74\ m/s^2$
Lawyer is wrong :/
1. No, both cars exert the same force on each other.
2. No, the force of friction would be due to the extra weight, not contact.
3. No, Force of friction would be the same unless tires were much heavier
4. Yes, higher friction coefficient would increase stopping efficiency
5. True, extra lubrication reduces friction coefficient
$v_{fc}^2 = v_{ic}^2 + 2a\Delta x$
$v_{ic} = 16.58\ m/s$
$\Delta x = 12.8\ m$
$a = -10.74\ m/s^2$
$v_{fc} = 0$
$v_{ic} = \frac{m_a}{m_{total}} v_{fa}$
$v_{fa} = 30.64\ m/s$
$v_{fa}^2 = v_{ia}^2 + 2a\Delta x$
$\Delta x = 6.3\ m$
$a = -10.74\ m/s$
$v_{fa} = 30.64\ m/s$
$v_{ia} = 32.78\ m/s$
$= 73\ mph$