Friction Mini Labs

Name: _____

For each of these mini labs, complete the task provided and show all work.

The Tools:

PhyPhox

PhyPhox is an app that allows you to access the data gathered by the sensors in your phone or tablet. This will be a really useful tool throughout the year but right now, we are going to use the built-in accelerometers in your phone to collect angle data. This can be done in the app under the "Inclination" program in the Tools section. **Watch this tutorial** for more info.

Equations and Constants

$v_f = v_i + at$	$d = v_i t + \frac{1}{2}at^2$	${v_f}^2 = {v_i}^2 + 2ad$	$d = \frac{(v_f + v_i)t}{2}$	$F_{net} = ma$	$F_f = \mu F_N$	$g = 9.81\ m/s^2$

Tips:

Try your hand at the task first but if you get stuck, check out these hints and sample problems 😊

(Note: these tutorials were recorded for an IB Physics class so the notation might be a little bit different, but the process is still the same)

Part 1

- Sliding to a Stop Calculations (without mass)

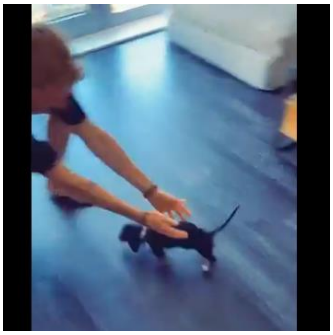
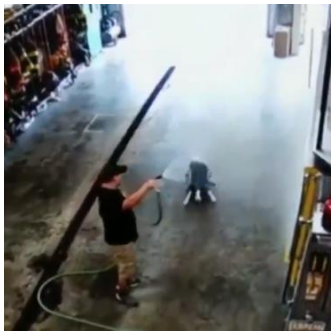
Part 2

- Collecting Angle Data
- Sticky Ramp Procedure Walk Through
- Ramp Calculations (with mass)
- Ramp Calculations (without mass)

Part 1: Sliding to a Stop

There are several famous video clips online starring people or animals coming to a sliding stop thanks to kinetic friction. Choose one of the videos linked below, open it in YouTube, and make some measurements.

Note: there are some useful facts to help you estimate the slide distance in the video. Do your best! 😊

[Puppy Slide]	[Fire Station Dog Slide]	[Risky Business Slide]	[March Madness Slide]
			
A dachshund puppy is about 30 cm long	A medium-sized dog is about 3 ft (91 cm) long	Tom Cruise stands 5’ 7” (170 cm) tall	The 3-point arc is about 6.3 m from the hoop

Your Task: Determine the coefficient of kinetic friction required to slide to a stop

Draw free body diagram, record all assumptions, and show all work below ↓

Part 2: Sticky Ramp

Many phone and tablet cases are rubberized so they don't slip and slide around very much. In this lab, you will be testing this to the limit by placing your device on an incline until it can no longer hold on.

Your Task: Calculate the Coefficient of Static Friction for your phone or iPad

Procedure: (video tutorial)

1. Open up the PhyPhox "Inclination" tool (or iphone "Measure" app)
2. Create an adjustable inclined surface using a board or large hardcover book
3. Place your phone or iPad on the surface and slowly tilt it to greater and greater angles
4. As soon as you see your device start slipping, stop changing the tilt and record the angle
5. Repeat a few times until you get a value that is repeatable.

Data:

Slip Angle	
Device Mass (optional)	

Analysis and Calculations:

Before your phone reached the slip angle, it was happily resting in equilibrium with the parallel component of the weight perfectly supported by the force of static friction. Calculate the coefficient of static friction that makes this possible. Draw a free body diagram, show all work, and report your final value below.

Coefficient of Static Friction (μ_s)	