Force and Motion

Equipment

- LoggerPro v3.3
- Motion Detector and Force Probe
- Cart, Track, Masses and Pulleys

Objective

Data collection

- Set up and calibrate Force probes

Graphical analysis

- Graph measured quantities with error bars.
- Fit lines and/or find averages in regions of interest.
- Determine acceleration from x(t) or v(t) graphs.
- Find correlations between different variables.

Physics Concepts

- Force as a vector (free-body diagrams)
- Relationship between force and motion

Conceptual (C-Level)

Draw a picture of a cart traveling down an inclined track.

- Draw a schematic diagram labeling the forces on the cart

Draw a picture of a cart traveling down a flat track being pulled by a string (force).

- Draw a schematic diagram labeling the forces on the cart

EXPLORATIONS:

- Set up and calibrate a force probe
- Check calibration with other force detectors
- Imagine you are on a cart being pulled. You have hold of one end of the rope and your friend (the puller) is holding the other end of the rope.
    - You are stationary (you have put your feet down). Is the force you exert on the rope greater than, less than or equal to your friend's force?
    - You are moving (you lifted your feet off the ground). Is the force you exert on the rope greater than, less than or equal to your friend's force?
    - Verify your answers (you may have to work with another group).

Basic Lab (B-level)

Connect a line to a cart on a flat track. Pass the line over a pulley on the end of the track and connect it to a mass hanger. The falling mass will pull the cart down the track.

- Vary the mass that is pulling the cart to determine how force affects motion.
- Plot cart acceleration as a function of pulling force.
- NOTE: You will want a schematic diagram with force vectors as part of your summary.

Advanced/Extended Lab Ideas (A-level)

- What happens if the cart mass increases but the pulling force is constant?
- What are you curious to investigate?