Elevator Dynamics Lab

Investigation question: Can the maximum and minimum acceleration of an elevator be determined using only rocks, a scale, and a stopwatch (or other method to monitor time)
Hypothesis: The maximum and minimum acceleration of an elevator can be determined with only rocks, a scale, and a stopwatch.
Variables: Varied: weight of rock Measured: apparent weight Calculated: acceleration

Strategy:

1. Rock is individually weighed while the elevator isn't moving.
2. Apparent weight of the rock as the elevator moves from the 4th to 1st floor in an elevator is recorded.
3. Steps 1 and 2 are then repeated for each rock.
4. Using found data points, acceleration is found when the apparent weight is the greatest and when it is the least for each rock. The accelerations of each rock are compared against each other to determine whether or not the accelerations are accurate.

Data:

Figure 1: Rock Z

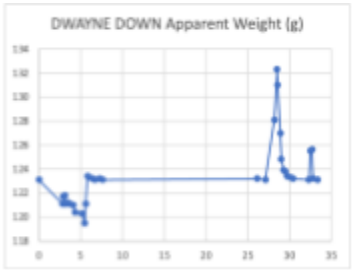

Figure 2: Rock Dwayne

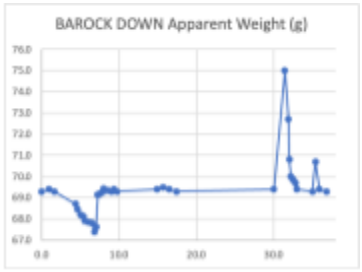

Figure 3: Rock Barock

We followed the above steps for three rocks (Z, Dwayne, and Barock). Data taken was then the most significant figures were graphed, these graphs are figures 1-3. The actual weight and greatest and least apparent weights are shown in Table 1.

Analysis:

	Min(m/s^2)	Max(m/s^2)
Z	-0.2684	0.6859
Dwayne	-0.2866	0.7324
Barock	-0.2687	0.8061

Table 2: Accelerations

Figure 4: Free Body Diagram

Acceleration can be accurately found using the rock masses. The normal force is equal to the apparent weight times the force of gravity. So we derived the equation: ma = m(apparent)g - mg, from Figure 4. Then, solved for a. Results can be seen in Table 2. To calculate percent error we used the average of the min and max as the expected acceleration. The percent error for minimum is 4.37% and for maximum it is 8.71%. This may be due to inconsistencies in the elevator, placement of weight throughout the elevator, and delay in the scale updating.