

Janine Pizzimenti
 Physics – A
 Force Lab

Data:

Different Mass:

Mass (g)	Acceleration (m/s ²)
100	4.12
100	4.44
100	5.52
100	4.69
200	4.79
200	3.53
200	3.56
200	3.96
300	3.40
300	3.52
300	3.90
300	3.61

Different Stretches:

Stretch (cm)	Acceleration (m/s ²)
20	2.80
20	4.28
20	3.90
20	3.64
25	3.96
25	3.61
25	2.99
25	3.40
30	2.28
30	1.37
30	5.13
30	2.93

Different # of Bands:

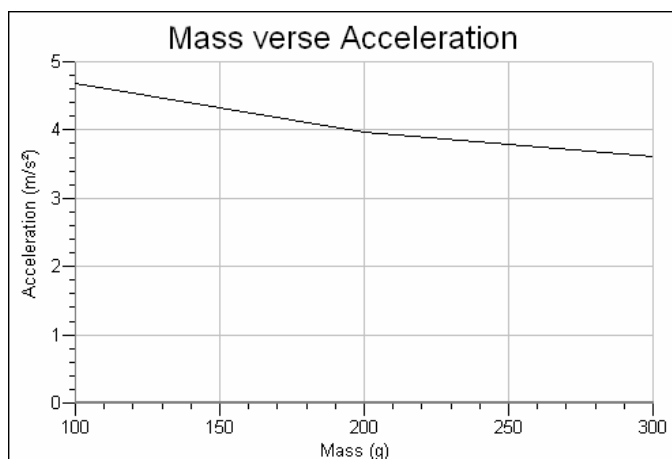
Number Bands	Acceleration (m/s ²)
1	2.80
1	4.28
1	3.90
1	3.64
2	4.64
2	4.46
2	4.84
2	4.65
3	4.72
3	5.83
3	4.39
3	4.81

Different Angles:

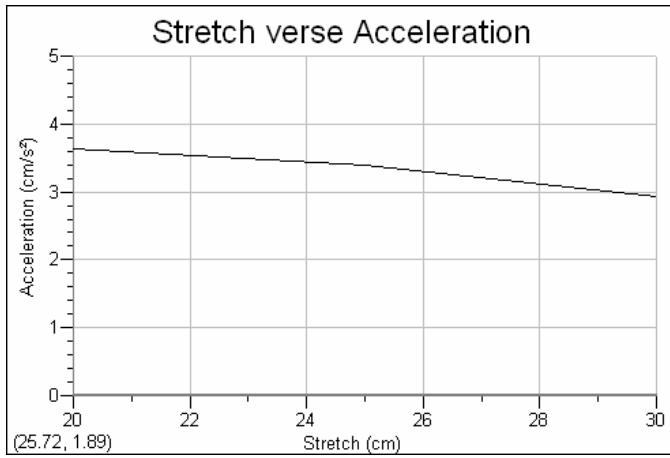
Angle (deg)	Acceleration (m/s ²)
30	4.09
30	4.82
30	3.34
30	4.08
60	4.33
60	4.20
60	3.87
60	4.13
90	4.40
90	4.03
90	4.43
90	4.29

Graphs:

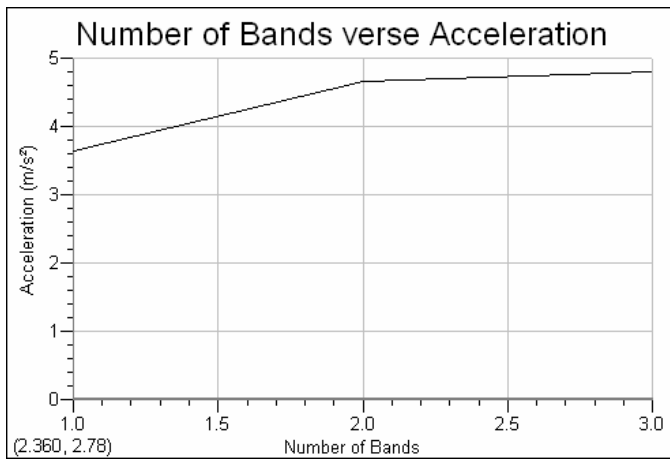
Different Mass:



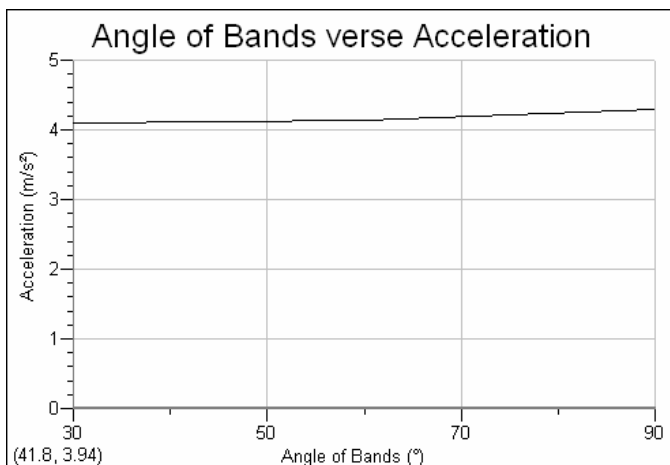
Different Stretches:



Different # of Bands:



Different Angles:



Calculations:

Linear Fit Equations from Logger Pro:

Mass: acceleration = $-.0054 \cdot \text{mass} + 5.167$

Stretch: acceleration = $-.071 \cdot \text{stretch} + 5.098$

Number: acceleration = $.585 \cdot \text{number} + 3.197$

Angle: acceleration = $-.0033 \cdot \text{angle} + 3.970$

Finding Mu ($\mu = -a/g$):

Mass - 100: $\mu = -4.69/9.8 =$

- 200: $\mu = -3.96/9.8 =$

- 300: $\mu = -3.61/9.8 =$

Stretch - 20: $\mu = -3.64/9.8 =$

- 25: $\mu = -3.40/9.8 =$

- 30: $\mu = -2.93/9.8 =$

Number- 1: $\mu = -3.64/9.8 =$

- 2: $\mu = -4.65/9.8 =$

- 3: $\mu = -4.81/9.8 =$

Angle - 30: $\mu = -4.08/9.8 =$

- 60: $\mu = -4.13/9.8 =$

- 90: $\mu = -4.29/9.8 =$

Finding the String Constant ($k = m \cdot g / d$):

Stretch - 20: $k = 9.8 / (.20 - .18) = 490$

- 25: $k = 9.8 / (.25 - .18) = 140$

- 30: $k = 9.8 / (.30 - .18) = 81.67$

Summary and Conclusions:

In this lab, four affects on acceleration were tested: mass of cart, stretch of rubber band, number of rubber bands, and the angle between two rubber bands. The affect of friction was also supposed to be tested, but there was not enough time to test this, because the first set of data was inconsistent, and required retests. The experiment was set up with a cart traveling across a horizontal ramp on a table, away from a motion detector. One person had to run with the cart to ensure that the rubber band was held at a constant stretch. While testing mass, the one rubber band was kept at a constant stretch of 20cm. While testing stretch of rubber band, only one rubber band was used. While testing the number of rubber bands, the stretch of all of the rubber bands was kept to 20 cm. While testing angle, the stretch of the band was still always equal to 20 cm.

When the mass of the cart increased, the acceleration decreased. Because the mass is greater, the normal force is also greater; this slows down the acceleration. When the stretch is increased, the acceleration decreases. This is because the string constant increases. When the number of bands is increased, the acceleration increases. Lastly, when the angle is made larger, the acceleration increases.