## Title: Projectile Motion

Purpose: Analyze projectile motion using video analyisis
Background: Projectile motion is defined as a motion without wings, propulsion, friction(air resistance), under the influence of gravity. Formula is $\mathrm{V} 0^{\wedge} 2 / \mathrm{g} * \sin \left(2^{*}\right.$ theta) Materials: laptop computer with camera, logger pro, meter stick, cones, basketball. Procedure:

1. Setup cones with meter stick.
2. Setup laptop facing throw.
3. Film the throw.
4. Use logger pro to analyze it.
5. Analyze the graph $x$ vel. And vel. Gravity forms $s=1 / 2 a t^{\wedge} 2$

Observations: They threw the ball into the air the ball decelerated and reached its highest point and then it accelerated towards the ground. Catching the ball was difficult. The balls arc was hard to keep in the frame. It may be difficult to watch the video. Make sure you log into admin o the laptop or you will not be able to use them on the student accounts.

Analysis: The conditions were good and there was no wind. The data was very accurate. The x velocity looked to be about $-6 \mathrm{~m} / \mathrm{s}$. I used a curve fit for the y velocity. And found half of gravity to $\mathrm{b}-4.93 \mathrm{~m} / \mathrm{s}^{\wedge} 2$ which means gravity was $-9.8 \mathrm{~m} / \mathrm{s}$. The meter stick was hard to see with the camera they used. Having the ball bounce threw some of the data off but all in all it was pretty good.

Conclusion: I did not throw the ball myself I had to use another groups film and plot my own graph. My data was very accurate I was shooting for $-4.9 \mathrm{~m} / \mathrm{s}^{\wedge} 2$, I came out with $4.93 \mathrm{~m} / \mathrm{s}^{\wedge} 2$. I would have done a few things differently. I would have liked to have done the experiment myself and I would have liked $t$ get a better camera.

|  | VideoAnalysis |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | Time <br> (s) | $\begin{gathered} \hline \mathrm{X} \\ (\mathrm{~m}) \end{gathered}$ | $\begin{gathered} \hline \mathrm{Y} \\ (\mathrm{~m}) \end{gathered}$ | $\begin{gathered} V x \\ (\mathrm{~m} / \mathrm{s}) \end{gathered}$ | $\begin{gathered} \mathrm{Vy} \\ (\mathrm{~m} / \mathrm{s}) \end{gathered}$ |
| 20 | 0.9350 | 23.14 | 9.195 | 0.984 | -0.090 |
| 21 | 1.000 | 23.23 | 9.225 | 2.223 | -1.208 |
| 22 | 1.065 | 23.53 | 9.015 | 2.185 | -2.225 |
| 23 | 1.098 | 23.50 | 8.955 | 0.555 | -2.442 |
| 24 | 1.132 | 23.53 | 8.835 | -0.191 | -2.000 |
| 25 | 1.198 | 23.44 | 8.715 | -0.062 | -1.068 |
| 26 | 1.232 | 23.50 | 8.775 | 0.592 | -0.961 |
| 27 | 1.297 | 23.53 | 8.655 | 0.678 | -1.557 |
| 28 | 1.330 | 23.59 | 8.595 | 0.322 | -1.710 |
| 29 | 1.395 | 23.56 | 8.505 | -0.102 | -2.045 |
| 30 | 1.428 | 23.56 | 8.325 | -0.168 | -1.104 |
| 31 | 1.495 | 23.56 | 8.385 | -0.502 | 0.014 |
| 132 | 1.528 | 23.50 | 8.385 | -0.651 | 0.258 |
| 33 | 1.593 | 23.50 | 8.385 | -0.828 | 0.965 |
| 34 | 1.627 | 23.41 | 8.445 | -0.962 | 2.589 |
| 35 | 1.660 | 23.41 | 8.595 | -0.419 | 3.223 |
| 36 | 1.725 | 23.44 | 8.745 | -1.036 | 4.014 |
| 37 | 1.792 | 23.23 | 9.105 | -1.228 | 5.036 |
| 38 | 1.825 | 23.29 | 9.255 | -1.010 | 6.685 |
| 39 | 1.858 | 23.26 | 9.525 | -3.796 | 9.770 |
| 40 | 1.892 | 23.05 | 9.915 | -6.122 | 11.677 |
| 41 | 1.957 | 22.60 | 10.72 | -6.754 | 12.008 |
| 42 | 2.022 | 22.15 | 11.50 | -6.924 | 11.765 |
| 43 | 2.055 | 21.91 | 11.89 | -6.753 | 10.920 |
| 44 | 2.088 | 21.70 | 12.22 | -6.545 | 10.278 |
| 45 | 2.155 | 21.25 | 12.91 | -6.331 | 9.928 |



