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Projectile Motion Lab
Per. F Physics
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Title: Projectile Motion

Purpose: To analyze projectile motion using video analysis.

Background: We will throw a basketball up into the air and record its path with a video camera. Then using the program Logger Pro we will be able to figure out the speed, height, velocity, and its acceleration.

Materials: Basketball, meter stick, laptop with video recorder, 2 Arizona Green tea cans.

Procedure:
Step 1- First set up your laptop. Open Logger Pro and set it to video capture, then aim the camera towards you or your partner, whoever is going to throw the ball.
Step 2- Lay the meter stick at the feet of the person throwing the ball and mark the ends of it with the two Arizona Green Tea cans.
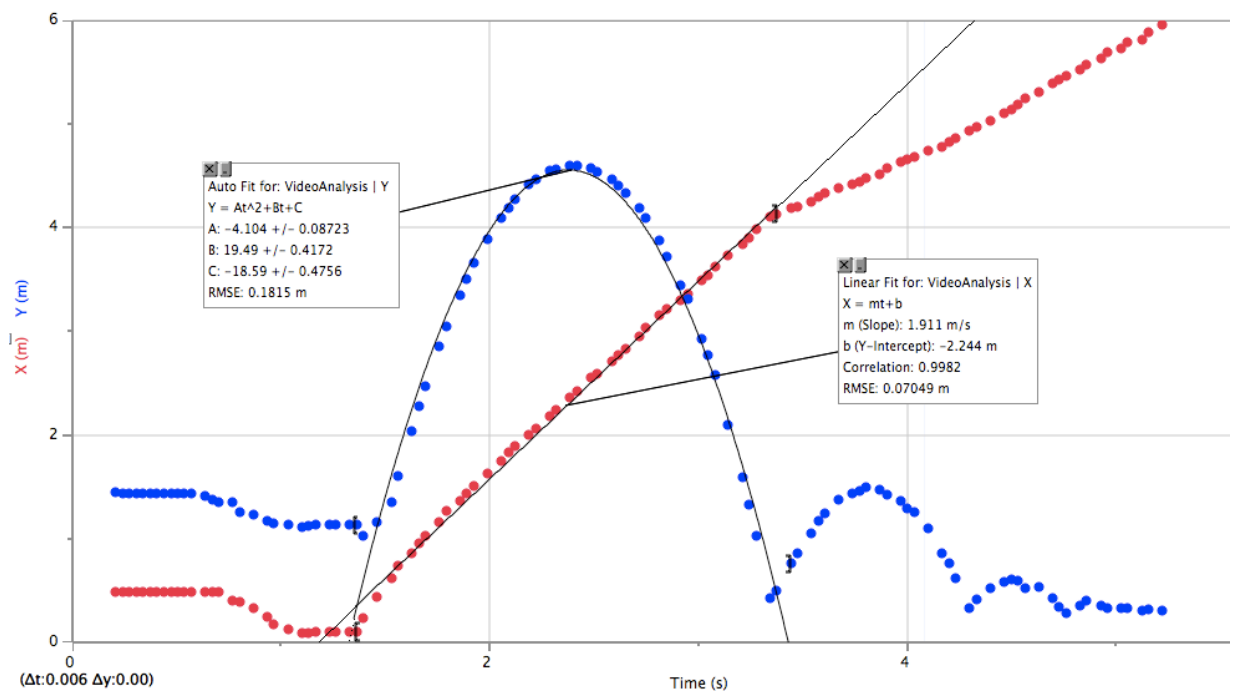Step 3- Start recording and throw the basketball into the air so it lands about 4-5 meters in front of you. When it stops bouncing stop recording and clean up your materials.
Step 4- Depending on weather you were inside or outside take your laptop back to your desk and analyze your data.
Step 5- Now to find the data of the arc of the ball click on the trace button and trace the path of your ball. Now you will want to find the exact distance it went so you will want to click on the measuring stick and measure your meter stick you placed on the ground in front of you. This will give you accurate data and take out the variable of how far you were from the camera.
Data:

Auto Fit for: VideoAnalysis | Y
Y = At^2+Bt+C
A: -4.104 +/- 0.08723
B: 19.49 +/- 0.4172
C: -18.59 +/- 0.4756
RMSE: 0.1815 m

Linear Fit for: VideoAnalysis | X
X = mt+b
m (Slope): 1.911 m/s
b (Y-Intercept): -2.244 m
Correlation: 0.9982
RMSE: 0.07049 m

X (m)   Y (m)

Time (s)

VideoAnalysis

	Time (s)	X (m)	Y (m)	Vx (m/s)	Vy (m/s)
1	0.2100	0.4842	1.449	0.000	-0.375
2	0.2433	0.4842	1.432	0.000	-0.210
3	0.2767	0.4842	1.432	0.000	-0.061
4	0.3083	0.4842	1.432	0.000	-0.015
5	0.3417	0.4842	1.432	0.000	0.000
6	0.3750	0.4842	1.432	0.000	0.000
7	0.4083	0.4842	1.432	0.000	0.000
8	0.4417	0.4842	1.432	0.000	0.000
9	0.4750	0.4842	1.432	0.000	0.000
10	0.5067	0.4842	1.432	0.000	-0.019
11	0.5400	0.4842	1.432	0.000	-0.091
12	0.5733	0.4842	1.432	0.000	-0.299
13	0.6383	0.4842	1.406	-0.054	-0.493
14	0.6717	0.4842	1.380	-0.203	-0.709
15	0.7050	0.4842	1.345	-0.708	-0.587
16	0.7717	0.3987	1.345	-0.885	-0.833
17	0.8033	0.3902	1.259	-0.910	-0.998
18	0.8700	0.3219	1.224	-1.109	-0.771
19	0.9350	0.2450	1.172	-1.275	-0.688
20	0.9683	0.1766	1.146	-1.085	-0.405
21	1.035	0.1254	1.138	-0.718	-0.270
22	1.102	0.09123	1.112	-0.427	-0.141
23	1.133	0.08269	1.120	-0.021	0.109
24	1.167	0.09977	1.129	0.088	0.074
25	1.233	0.09977	1.129	0.034	0.025
26	1.265	0.09977	1.129	0.091	-0.060
27	1.332	0.09977	1.129	0.451	-0.195
28	1.365	0.09977	1.129	1.828	-0.609
29	1.398	0.2279	1.025	2.971	0.776
30	1.463	0.4414	1.155	2.996	2.558

VideoAnalysis

	Time (s)	X (m)	Y (m)	Vx (m/s)	Vy (m/s)
30	1.463	0.4414	1.155	2.996	2.558
31	1.530	0.6208	1.354	2.891	4.357
32	1.563	0.7404	1.605	2.524	6.161
33	1.628	0.8600	2.037	2.300	6.593
34	1.662	0.9540	2.271	2.332	6.428
35	1.695	1.022	2.470	2.204	5.973
36	1.760	1.159	2.850	2.267	5.695
37	1.793	1.261	3.049	2.066	5.144
38	1.860	1.364	3.352	1.900	4.753
39	1.892	1.432	3.508	1.998	4.430
40	1.925	1.501	3.655	1.945	3.775
41	1.992	1.629	3.888	1.919	3.336
42	2.058	1.748	4.087	1.967	3.038
43	2.090	1.825	4.182	2.000	2.748
44	2.123	1.885	4.269	1.852	2.338
45	2.188	2.005	4.416	1.780	1.938
46	2.222	2.056	4.468	1.788	1.419
47	2.288	2.184	4.554	1.802	0.966
48	2.322	2.235	4.563	1.835	0.525
49	2.387	2.363	4.597	1.870	0.244
50	2.420	2.423	4.597	1.831	-0.227
51	2.487	2.551	4.571	1.711	-0.633
52	2.518	2.585	4.537	1.690	-1.075
53	2.585	2.714	4.459	1.747	-1.410
54	2.618	2.765	4.398	1.753	-1.856
55	2.652	2.825	4.329	1.909	-2.157
56	2.717	2.953	4.191	2.002	-2.525
57	2.750	3.030	4.096	1.936	-3.118
58	2.817	3.149	3.879	1.803	-3.715
59	2.848	3.209	3.724	1.642	-4.227

Observations: We did our experiment outside but it was not affected by wind or rain, it was a calm, clear day. With a camera with a faster frame rate we would have been able to get a more consistent data points, the ones we have now are spaced out unevenly

Analysis: Because we put a meter stick at our feet when we threw the ball we were able to measure it with Logger Pro, and get accurate data. the measurement of the meter stick must not have been accurate because when we did the curve fit it told us that half of our acceleration was 4.1 and when we double that we get 8.2. the actual acceleration should be 9.8.

Conclusion: We were able to analyze projectile motion using video analysis. The data we recorded showed what we wanted to see and we found the height, velocity, and speed we wanted to know.