Forces Lab
By
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Purpose: To analyze force and acceleration
Materials:
      Computer
      Logger Pro 3.5
      Cart
      Fan Cart
      Track For Cart
      Sound Depth Measurer
      Note Card
      Metal Bookshelf Holder Upper Thingy
      Weight

Procedure:
(for non propelled cart)
1. Set up cart track at and angle on the table or the ground and measure that angle and put a note card on the front of the cart.
2. Set up the depth measurer facing towards the cart.
3. As you press the record button in logger pro release the cart.
4. Then repeat with a higher angle of slope for the ramp

(for propeller cart)
1. Set up the fan cart about a meter to two meters away from the depth measurer.
2. Turn fan on low and let go of cart as you press record button
3. Turn fan on high and repeat
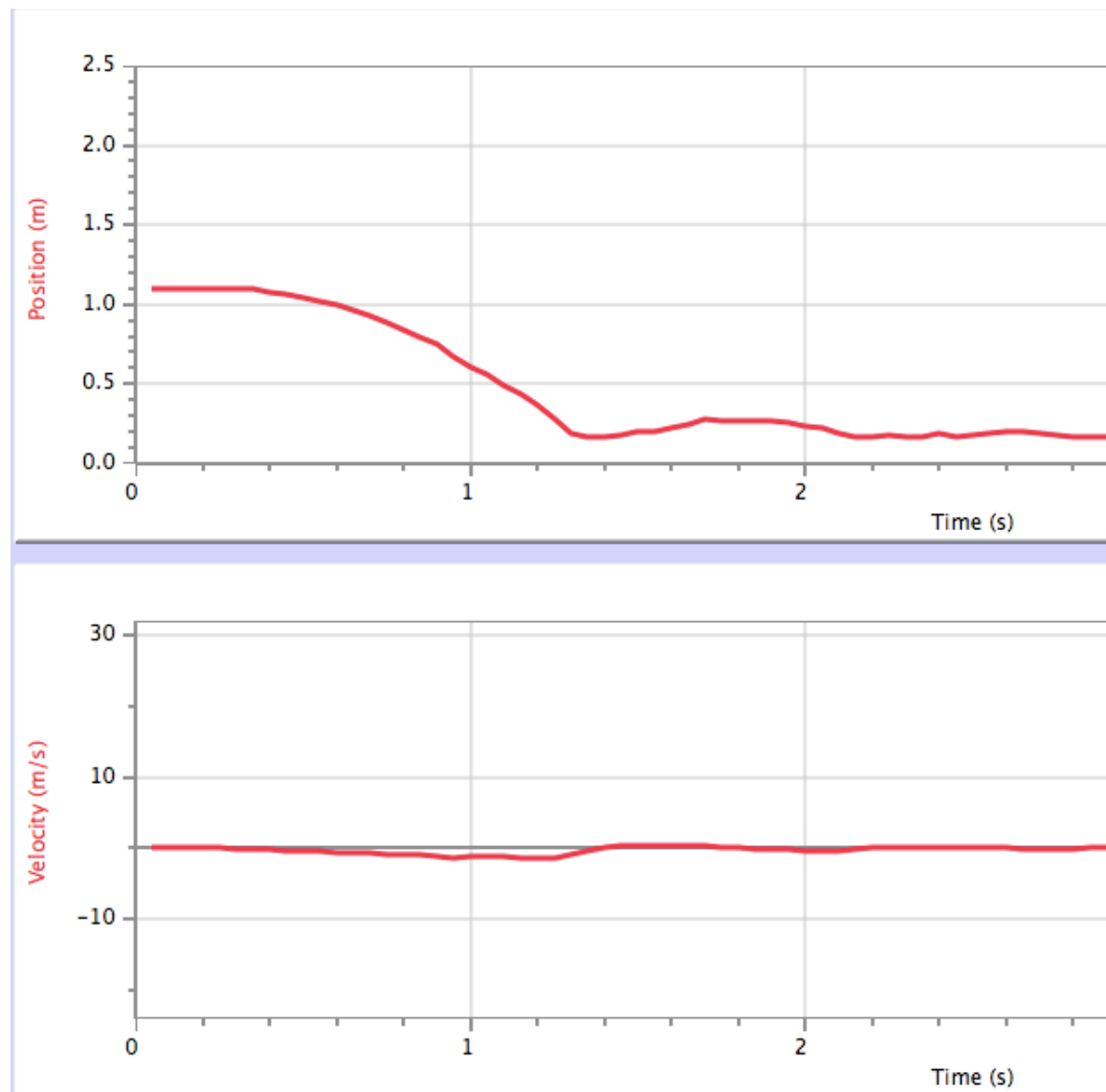4. Repeat steps two and three with the weight

Data:
Low Incline

	Latest			
	Time (s)	Position (m)	Velocity (m/s)	acc (m/s^2)
18	0.90	0.543	−0.011	−0.009
19	0.95	0.540	0.000	−0.187
20	1.00	0.543	0.001	−1.085
21	1.05	0.543	−0.067	−2.753
22	1.10	0.542	−0.263	−4.467
23	1.15	0.524	−0.595	−4.590
24	1.20	0.476	−0.803	−3.111
25	1.25	0.437	−0.879	−1.907
26	1.30	0.390	−0.958	−1.270
27	1.35	0.341	−1.021	−0.361
28	1.40	0.285	−1.027	1.259
29	1.45	0.235	−0.935	3.594
30	1.50	0.183	−0.659	5.582
31	1.55	0.163	−0.279	5.676
32	1.60	0.163	−0.024	4.276
33	1.65	0.165	0.115	3.173
34	1.70	0.168	0.324	1.750
35	1.75	0.214	0.262	1.061
36	1.80	0.190	0.289	2.785
37	1.85	0.225	0.606	3.456
38	1.90	0.263	0.731	2.377
39	1.95	0.301	0.816	1.332
40	2.00	0.341	0.904	−0.496
41	2.05	0.401	0.804	−2.661
42	2.10	0.431	0.533	−2.825
43	2.15	0.445	0.413	−1.033
44	2.20	0.461	0.493	−0.242
45	2.25	0.500	0.488	−1.242
46	2.30	0.517	0.353	−2.143
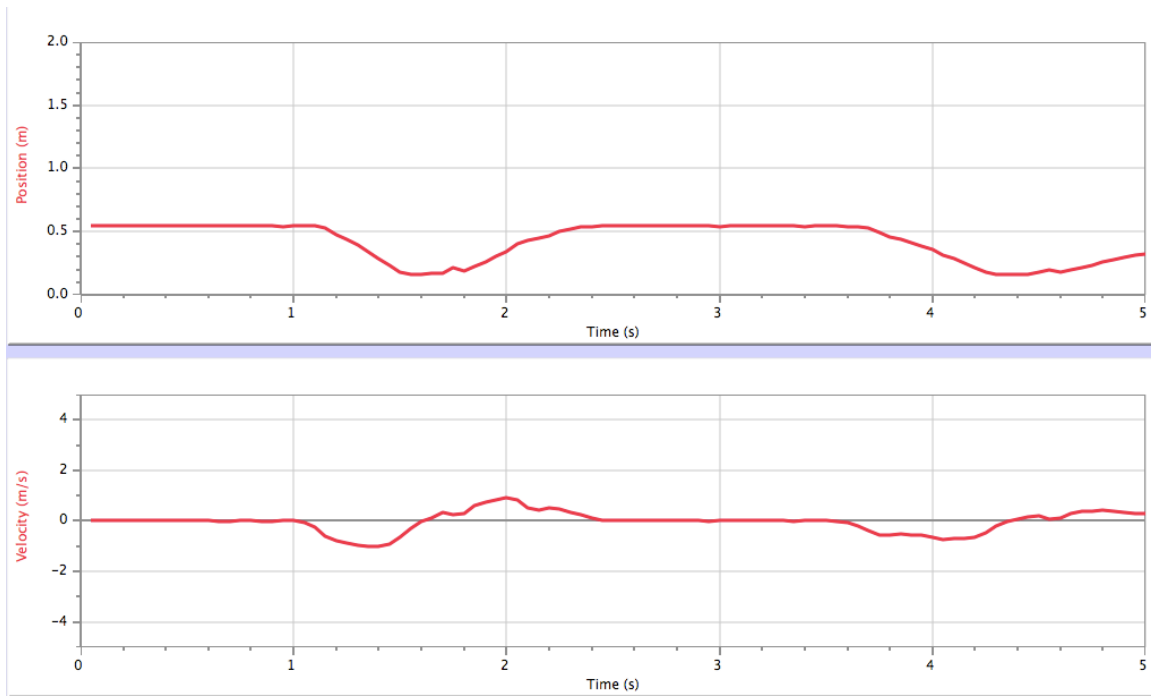
High incline

| | Latest | | |
	Time (s)	Position (m)	Velocity (m/s)	acc (m/s²)
1	0.05	1.100	−0.001	−0.029
2	0.10	1.100	−0.002	−0.060
3	0.15	1.100	−0.005	−0.145
4	0.20	1.099	−0.012	−0.347
5	0.25	1.099	−0.027	−0.808
6	0.30	1.099	−0.082	−1.428
7	0.35	1.093	−0.185	−1.750
8	0.40	1.079	−0.278	−1.679
9	0.45	1.064	−0.350	−1.611
10	0.50	1.045	−0.433	−1.623
11	0.55	1.021	−0.516	−1.584
12	0.60	0.993	−0.593	−1.537
13	0.65	0.961	−0.663	−1.601
14	0.70	0.927	−0.744	−1.811
15	0.75	0.888	−0.857	−1.864
16	0.80	0.839	−0.934	−1.877
17	0.85	0.794	−1.011	−2.296
18	0.90	0.745	−1.197	−2.035
19	0.95	0.670	−1.302	−0.318
20	1.00	0.602	−1.182	0.541
21	1.05	0.558	−1.156	−0.336
22	1.10	0.490	−1.201	−1.583
23	1.15	0.441	−1.331	−2.199
24	1.20	0.363	−1.539	−0.197
25	1.25	0.278	−1.512	4.801
26	1.30	0.189	−1.035	9.202
27	1.35	0.166	−0.379	9.389
28	1.40	0.163	0.051	6.364
29	1.45	0.180	0.271	2.810

Empty Fan Cart Low

	Time (s)	Position (m)	Velocity (m/s)	acc (m/s²)
		Latest		
1	0.05	1.089	−0.030	−0.111
2	0.10	1.087	−0.036	−0.093
3	0.15	1.085	−0.041	−0.071
4	0.20	1.083	−0.044	−0.054
5	0.25	1.080	−0.044	−0.066
6	0.30	1.079	−0.048	−0.116
7	0.35	1.076	−0.058	−0.137
8	0.40	1.073	−0.063	−0.128
9	0.45	1.070	−0.069	−0.138
10	0.50	1.066	−0.077	−0.141
11	0.55	1.062	−0.084	−0.137
12	0.60	1.058	−0.092	−0.120
13	0.65	1.053	−0.096	−0.099
14	0.70	1.048	−0.100	−0.099
15	0.75	1.043	−0.108	−0.070
16	0.80	1.037	−0.109	−0.011
17	0.85	1.032	−0.107	0.021
18	0.90	1.026	−0.106	0.030
19	0.95	1.021	−0.104	0.029
20	1.00	1.016	−0.103	0.031
21	1.05	1.011	−0.102	0.050
22	1.10	1.006	−0.097	0.054
23	1.15	1.001	−0.094	0.019
24	1.20	0.996	−0.095	−0.028
25	1.25	0.992	−0.097	−0.077
26	1.30	0.987	−0.104	−0.097
27	1.35	0.981	−0.108	−0.082
28	1.40	0.976	−0.112	−0.069
29	1.45	0.970	−0.117	−0.032
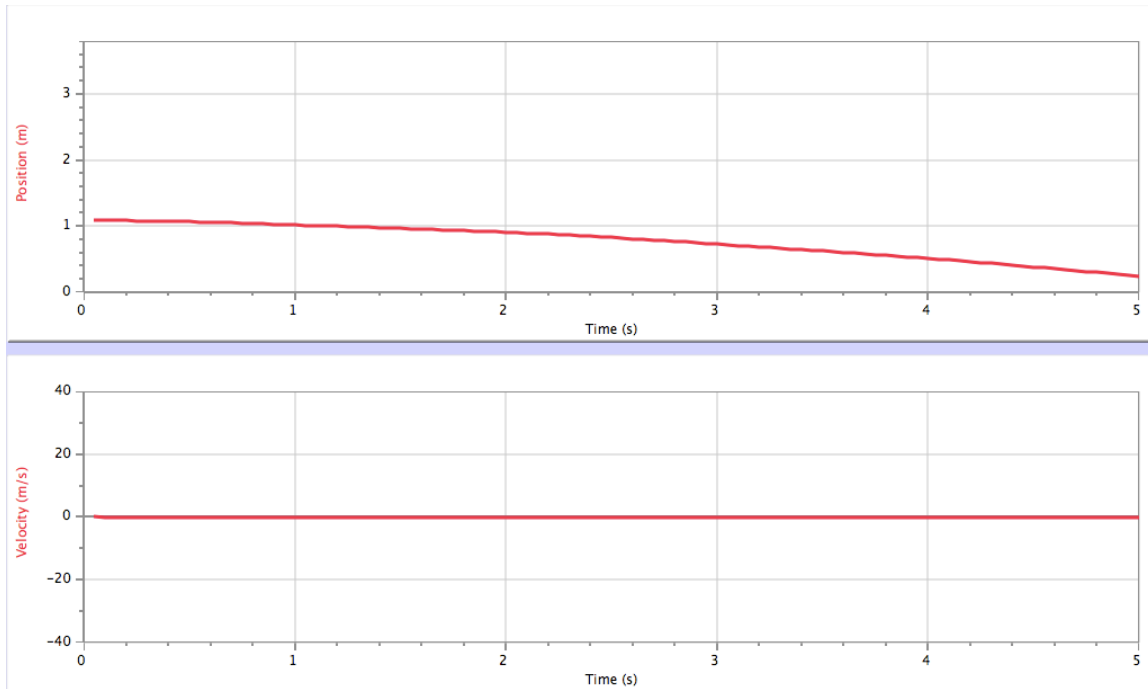
Empty Fan Cart High

	Time (s)	Latest Position (m)	Velocity (m/s)	acc (m/s²)
1	0.05	1.120	−0.075	−0.196
2	0.10	1.117	−0.084	−0.215
3	0.15	1.112	−0.095	−0.222
4	0.20	1.108	−0.107	−0.201
5	0.25	1.102	−0.122	−0.069
6	0.30	1.094	−0.113	0.033
7	0.35	1.091	−0.107	−0.085
8	0.40	1.085	−0.122	−0.209
9	0.45	1.078	−0.134	−0.219
10	0.50	1.071	−0.144	−0.204
11	0.55	1.064	−0.154	−0.193
12	0.60	1.056	−0.164	−0.190
13	0.65	1.047	−0.172	−0.208
14	0.70	1.039	−0.185	−0.220
15	0.75	1.029	−0.196	−0.183
16	0.80	1.019	−0.203	−0.134
17	0.85	1.008	−0.208	−0.110
18	0.90	0.998	−0.214	−0.104
19	0.95	0.987	−0.218	−0.115
20	1.00	0.976	−0.224	−0.148
21	1.05	0.965	−0.232	−0.198
22	1.10	0.953	−0.244	−0.245
23	1.15	0.940	−0.259	−0.242
24	1.20	0.927	−0.271	−0.177
25	1.25	0.913	−0.278	−0.091
26	1.30	0.899	−0.279	−0.040
27	1.35	0.885	−0.278	−0.064
28	1.40	0.872	−0.283	−0.129
29	1.45	0.857	−0.293	−0.161
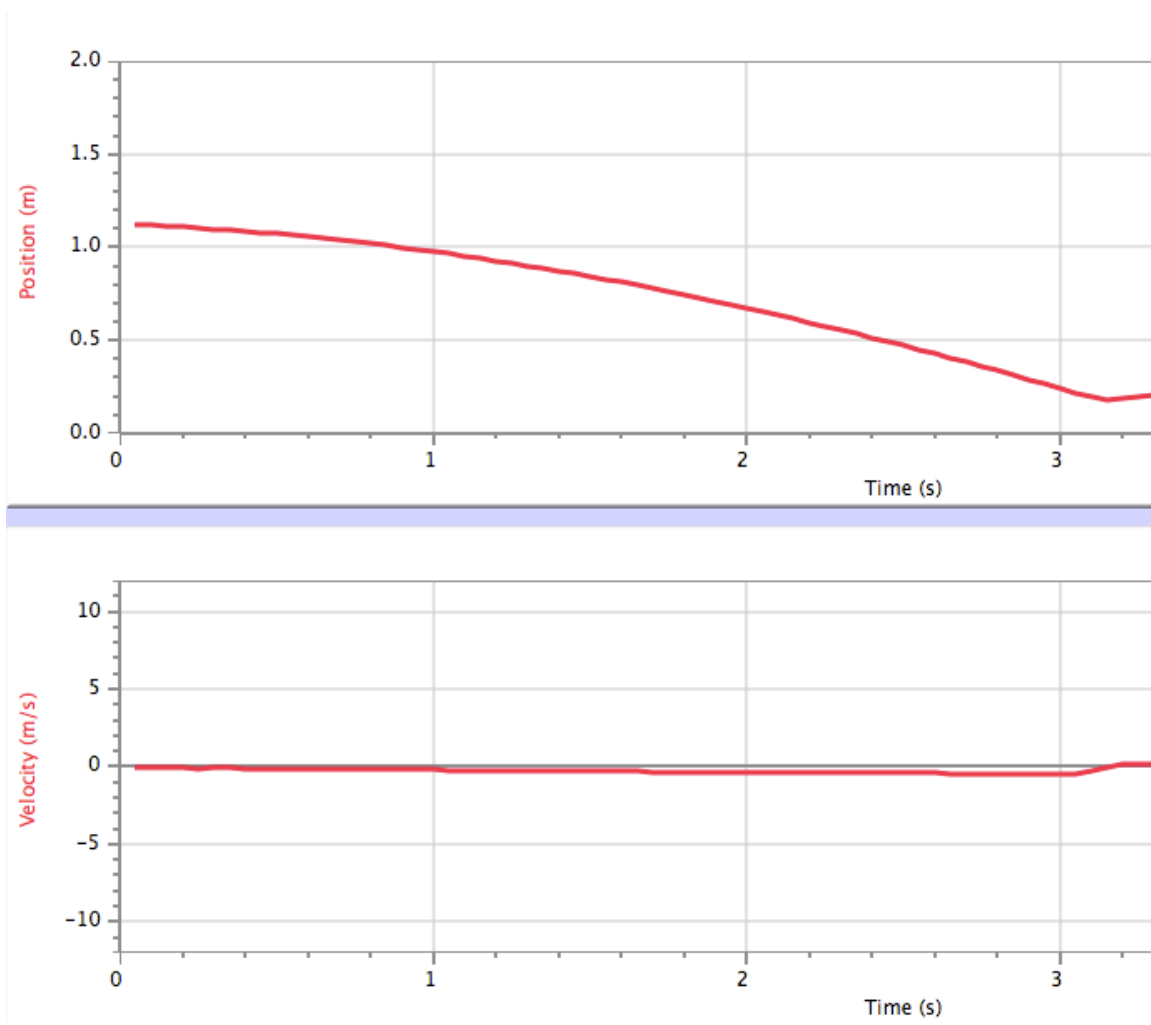
1020 g Fan Cart Low

	Latest			
	Time (s)	Position (m)	Velocity (m/s)	acc (m/s²)
1	0.05	1.118	−0.030	0.105
2	0.10	1.117	−0.026	0.095
3	0.15	1.115	−0.016	0.012
4	0.20	1.116	−0.017	−0.177
5	0.25	1.114	−0.037	−0.290
6	0.30	1.112	−0.059	−0.174
7	0.35	1.107	−0.059	0.040
8	0.40	1.106	−0.046	0.100
9	0.45	1.103	−0.042	0.031
10	0.50	1.102	−0.046	0.011
11	0.55	1.099	−0.047	0.083
12	0.60	1.097	−0.037	0.140
13	0.65	1.095	−0.028	0.111
14	0.70	1.094	−0.020	−0.015
15	0.75	1.094	−0.035	−0.054
16	0.80	1.089	−0.033	0.037
17	0.85	1.090	−0.022	−0.016
18	0.90	1.089	−0.034	−0.088
19	0.95	1.086	−0.037	−0.055
20	1.00	1.085	−0.039	−0.017
21	1.05	1.083	−0.039	0.025
22	1.10	1.081	−0.036	0.052
23	1.15	1.079	−0.032	0.050
24	1.20	1.077	−0.030	0.025
25	1.25	1.076	−0.030	0.001
26	1.30	1.075	−0.031	0.005
27	1.35	1.073	−0.030	0.028
28	1.40	1.071	−0.028	0.037
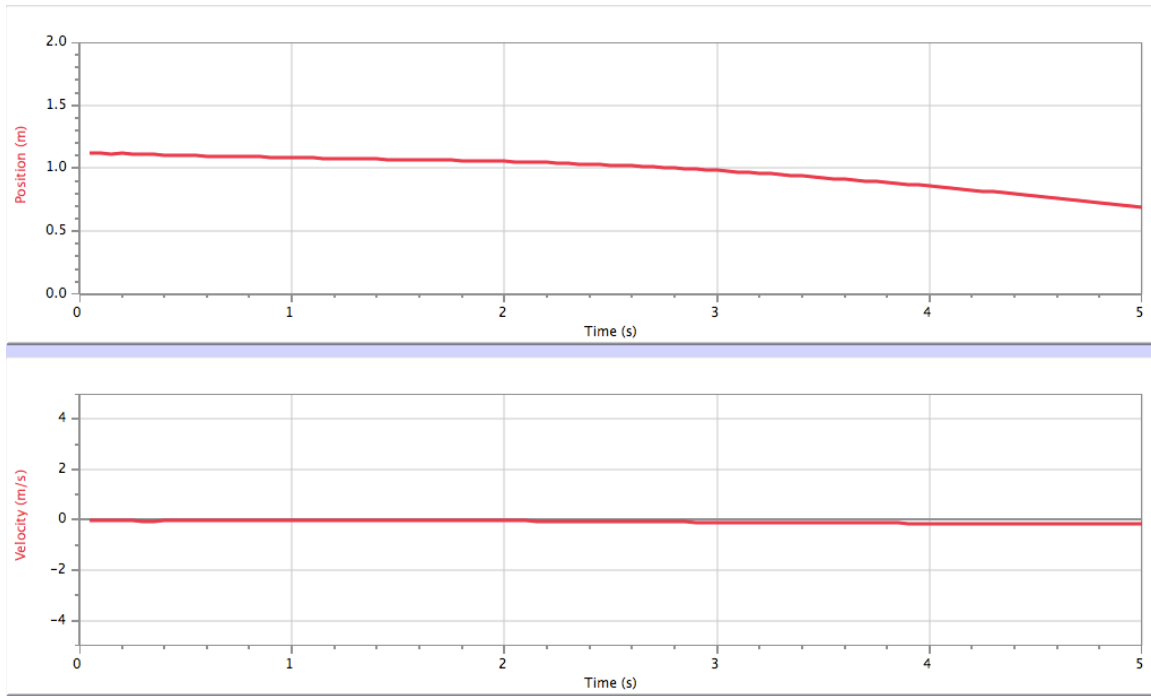
1020g Fan Cart High

		Latest	
	Time	Position	Velocity
	(s)	(m)	(m/s)
1	0.05	1.118	−0.074
2	0.10	1.113	−0.052
3	0.15	1.113	−0.044
4	0.20	1.109	−0.054
5	0.25	1.107	−0.057
6	0.30	1.104	−0.064
7	0.35	1.100	−0.068
8	0.40	1.097	−0.069
9	0.45	1.093	−0.069
10	0.50	1.090	−0.070
11	0.55	1.086	−0.076
12	0.60	1.082	−0.078
13	0.65	1.079	−0.078
14	0.70	1.074	−0.077
15	0.75	1.071	−0.076
16	0.80	1.067	−0.078
17	0.85	1.063	−0.081
18	0.90	1.059	−0.082
19	0.95	1.055	−0.082
20	1.00	1.051	−0.083
21	1.05	1.046	−0.083
22	1.10	1.043	−0.084
23	1.15	1.038	−0.088
24	1.20	1.034	−0.091
25	1.25	1.029	−0.094
26	1.30	1.024	−0.095
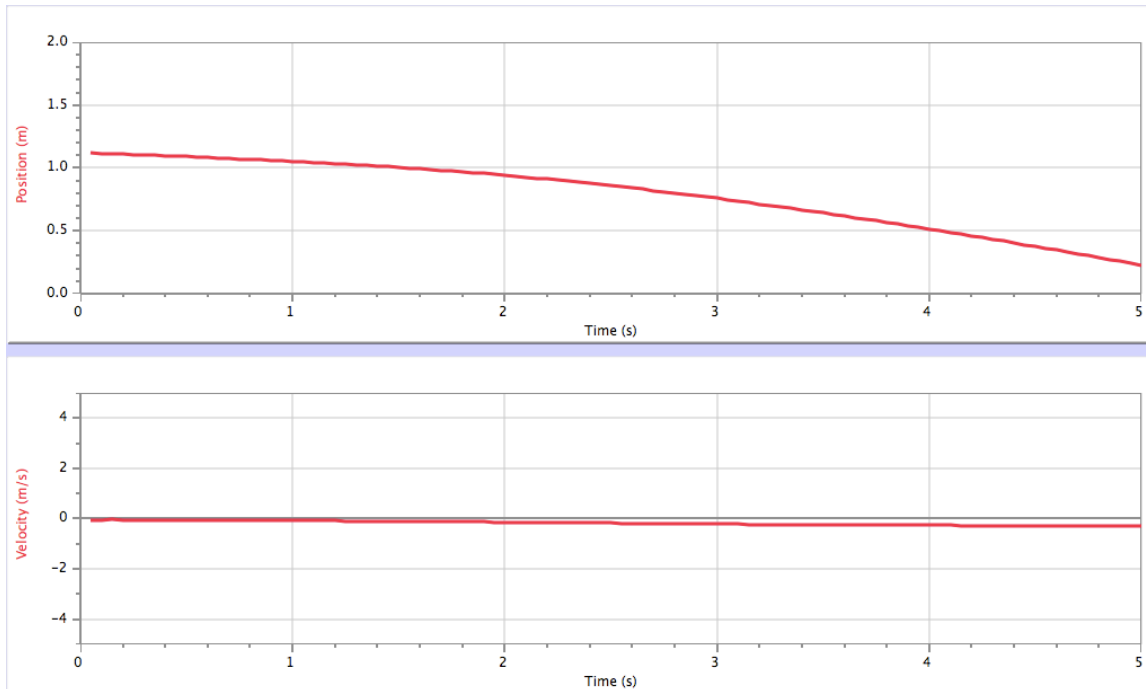
Observations:
      This experiment was pretty accurate. The cart travelled with a constant acceleration. One thing that you should look out for when conducting this experiment is that the cart doesn't hit your research equipment.

Analysis:
      This experiment had some key components that need to be recognized when you look at the results and the error. One of these is that gravity is different around waimea. Also the friction of the carts wheels changes the acceleration and the angle of the ramp could be off due to it being measured my hand.

Conclusions:
      This lab helped me gain a better understanding of F=ma and the way it works in actual life. This lab also showed me why you need to use your parking brakes, because if you don't then your car will hit a large wall at the end of a ramp and since your carr doesn't have a special spring-a-ma-jigger it would explode into thousands of little pieces and the world would come to an end at that exact point in time.