

## **How to Grade a Student Laboratory Report**

We've redefined the quality of writing based on the general writing factors, and how these factors relate to the rubric used to grade physics laboratory reports. We've also evaluated the sample laboratory report from the laboratory manual. Now we will go through an example of how to grade a student laboratory report.

### **Individual Tasks:**

1. *Individually* read through the example student laboratory report.
2. Follow closely as we go over the grading of the example student laboratory report.
3. Mark down any and all comments made during the presentation on the example student laboratory report.

**Time:** 30 minutes

Note: This activity is to show you how to grade student laboratory reports, so follow along closely.

<b>SAMPLE COVER SHEET</b>
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PHYSICS \_\_\_\_ LABORATORY REPORT  
LABORATORY I

Name and ID#: \_\_\_\_\_

Date performed: \_\_\_\_\_ Day/Time section meets: \_\_\_\_\_

Lab Partners' Names: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Problem # and Title: \_\_\_\_\_

Lab Instructor Initials: \_\_\_\_\_

Grading Checklist	Points
<b>LABORATORY JOURNAL:</b>	
<b>PREDICTIONS</b> (individual predictions completed in journal before each lab session)	
<b>LAB PROCEDURES</b> (measurement plan recorded in journal, tables and graphs made in journal as data is collected, observations written in journal)	
<b>PROBLEM REPORT:</b>	
<b>ORGANIZATION</b> (clear and readable; correct grammar and spelling; section headings provided; physics stated correctly)	
<b>DATA AND DATA TABLES</b> (clear and readable; units and assigned uncertainties clearly stated)	
<b>RESULTS</b> (results clearly indicated; correct, logical, and well-organized calculations with uncertainties indicated; scales, labels and uncertainties on graphs; physics stated correctly)	
<b>CONCLUSIONS</b> (comparison to prediction & theory discussed with physics stated correctly ; possible sources of uncertainties identified; attention called to experimental problems)	
<b>TOTAL</b> (incorrect or missing statement of physics will result in a maximum of 60% of the total points achieved; incorrect grammar or spelling will result in a maximum of 70% of the total points achieved)	
<b>BONUS POINTS FOR TEAMWORK</b> (as specified by course policy)	

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Lab report of lab 2 problem #1

**MASS AND THE ACCELERATION OF A FALLING BALL**

The purpose of this lab is to determine if the acceleration of an object depend on its mass. We use a baseball and a plastic orange ball (1/3 mass of baseball). These two objects have different mass but almost the same size. They are use to be dropped so we can calculate the acceleration for each of them. A camcorder is used to record the different intervals of the balls. From the information received, we can determine the change of distance and the change of time of each interval. The software program "Lab View" guides us in our analysis of the change of velocity of each interval as it goes down the screen.

**Prediction**

It is understand that any object regardless of its mass will be pull towards the earth at a constant acceleration of  $9.8 \text{ m/s}^2$ . This is only true in a vacuum room. We predicted that the acceleration of an object would have a factor from its mass. The free-fall acceleration of an object will increase as the mass of the object increase. This change of acceleration is depending on the air acting on the ball. If the object has more mass then the object is able to reduce the pressure acting upon it but if the object is light, air will be a factor and it will not accelerate as fast.

**Data and Results**

We use a meter stick to ensure a vertical path for the ball to follow. The ball is being dropped from the top of the meter stick to the floor (bottom). We use the video camera to record a movie of the free-fall. The movie capture individual intervals of the fall, each time frame if capture every 1/30 sec. We then use the intervals to determine the change of distance over change of time.

The starting time for the baseball was 0.80sec and ended at 1.02 sec. The total time is 0.22 seconds to travel 100 cm. The average velocity is 454 cm/sec. The weight of this ball (baseball) is 140 grams and 7cm in diameter.

The starting time for the orange ball is at 0.6 seconds and ends at 0.9 seconds. The total time is 0.3 seconds over a distance of 100 cm. The average velocity of the free-fall is 333.33 m/s. The weight of the ball is 47.7 grams and a diameter of 6.5 cm.

From the data above, we can see that the velocity of the baseball is higher than the Orange ball.

**Baseball:**

(Interval 2)  $140\text{cm} / 0.26\text{sec} = 538\text{ m/s}$

(Interval 1)  $125\text{cm} / 0.24\text{sec} = 520\text{ m/s}$

$$18.46\text{ m/s} / 0.02\text{ sec} = 923\text{ cm/s} = \mathbf{9.23\text{ m/s}^2}$$

**Orange Ball:**

(Interval 2)  $330\text{cm} / 0.22\text{sec} = 1500\text{m/s}$

(Interval 1)  $140\text{cm} / 0.10\text{sec} = 1400\text{m/s}$

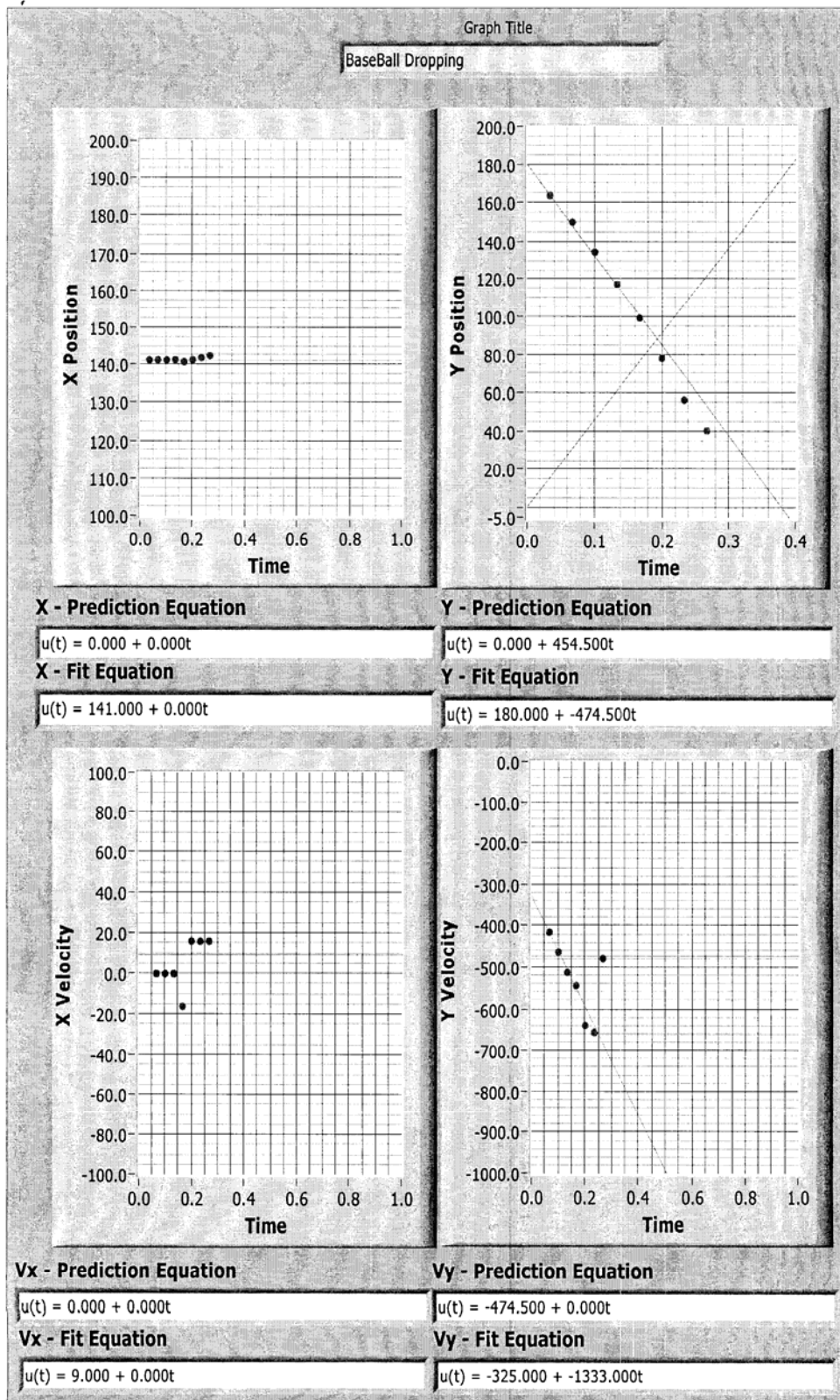
$$100\text{m/s} / 0.12\text{ sec} = 833.33\text{ cm/s} = \mathbf{8.33\text{m/s}^2}$$

Difference of acceleration:

$$9.23\text{ m/sec}^2 - 8.33\text{ m/sec}^2 = 1.10\text{ m/sec}^2$$

**Conclusion**

In conclusion, it took 0.08seconds longer for the orange ball to reach the ground than the baseball and baseball is acceleration  $1.10\text{ m/sec}^2$  faster than the orange ball. We predict that if the balls were being evaluated in a vacuum room, the acceleration would be the same even if they have different mass.





## **Grading Two Example Student Laboratory Reports**

Now it's your chance to grade student laboratory reports. Please keep in mind the information from Activities 17 & #18a as you go through the following 2 student laboratory reports.

### **INDIVIDUAL TASKS:**

1. *Individually* read through the 2 example student laboratory reports and grade them using the grading rubric for physics laboratory reports.
2. Mark down any and all comments on the example student laboratory reports as you grade them.
3. Assign points for each student laboratory report on the grading rubric.

### **GROUP DISCUSSION**

**TIME:** 30 minutes

### **PRODUCT**

Grading rubric; comments and feedback on each student laboratory report.

## Activity 18b. Grading Two Example Lab Reports

**SAMPLE COVER SHEET**PHYSICS \_\_\_\_ LABORATORY REPORT  
LABORATORY I

Name and ID#: \_\_\_\_\_

Date performed: \_\_\_\_\_ Day/Time section meets: \_\_\_\_\_

Lab Partners' Names: \_\_\_\_\_

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Grading Checklist	Points
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## Example #1

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Lab Report 2 – Lab 3, Problem 1

### Statement of the problem:

I am a volunteer in the city's children's summer program. One suggested activity is for the children to build and race model cars along a level surface. To ensure that each car has a fair start, my co-worker recommends a special launcher be built. The launcher uses a string attached to the car at one end and, after passing over a pulley, the other end of the string is tied to a block hanging straight down. The car starts from rest and the block is allowed to fall, launching the car along the track. After the block hits the ground, the string no longer exerts a force on the car and the car continues moving along the track. I want to know how the launch speed of the car depends on the parameters of the system that you can adjust. I decide to calculate how the launch velocity of the car depends on the mass of the car, the mass of the block, and the distance the block falls. My ultimate goal was to find the answer to the question – "What is the velocity of the car after being pulled for a known distance?"

### Prediction:

I predicted that, using the equation  $V = \sqrt{(2M_a g h) / (M_a + M_c)}$

and with the data collected during setup, that the velocity at the time the block hit the floor would be 60.5cm/s.

(Prediction graphs are attached.)

**Procedure:**

First, we gathered supplies. We used a cart, a flat track with a pulley attached, a mass hanger with a mass set to simulate the wooden block, string, and a video camera attached to a computer with video analysis software. We massed the cart and the block, and began to set up the experiment. We placed the cart on the track, and ran the string through the pulley. We hooked our mass onto the end of the string, and held it to a height that we measured and marked. We began recording video and let the mass go. We made 3 runs like this to obtain the best video. When we were satisfied we analyzed the video and came up with a good measurement of the cart's velocity. We printed our graphs and made conclusions based on our data.

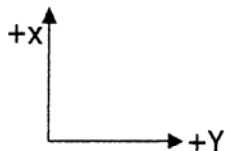
**Data and Results:**

Mass of Cart ( $M_c$ ): 753.8g

Mass of Block ( $M_a$ ): 50g

Height (H): 30cm

Coordinate Axis:



(Graphs of data analysis are attached)

**Discussion:**

The results from the lab were pretty close to the prediction made by plugging the masses of the cart and block and the height of the drop into the equation I wrote in my lab journal.

In the lab, there were a few sources of obvious error. The first major source was the method of getting data. The computer software is a bit inaccurate in measuring the velocity with the method of selecting points in the video frames. The camera we used has a curved lens, which distorts the video. This all leads to data that is off from the expected return. Another possible source of error is the equipment. The set-up we used was not entirely perfect in the fact that we were not taking friction into account, yet there was most likely friction in the cart's wheels. This would matter most during the time after the block has hit the ground, which is the situation we are modeling.

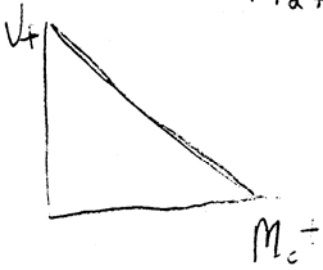
We could have made a few improvements. The main improvement would be to more accurately analyze the data within the computer software to compensate for any distortion in the video. We also could have made sure the cart was properly lubricated before performing the experiment.

**Conclusions:**

In our lab, we discovered the velocity of the car after being pulled a known distance was around 55cm/s. This was close to our initial prediction, so we were satisfied with our results.

The launch velocity of the car does depend on its mass, as well as the mass of the block and the distance the block falls. This is due to the fact that they all affect the forces acting on the car. There are some instances where the mass would not really affect the launch velocity. If the distance dropped were very close to zero, the launch velocity would be near zero no matter what the mass of the block was. If the same block falls the same distance, the force exerted by the block on the cart would not change, no matter the mass of the cart. The force of the block on the cart is always equal to the block's weight.

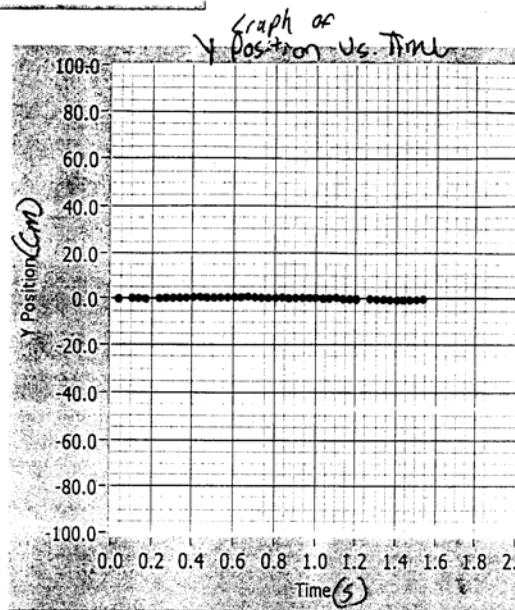
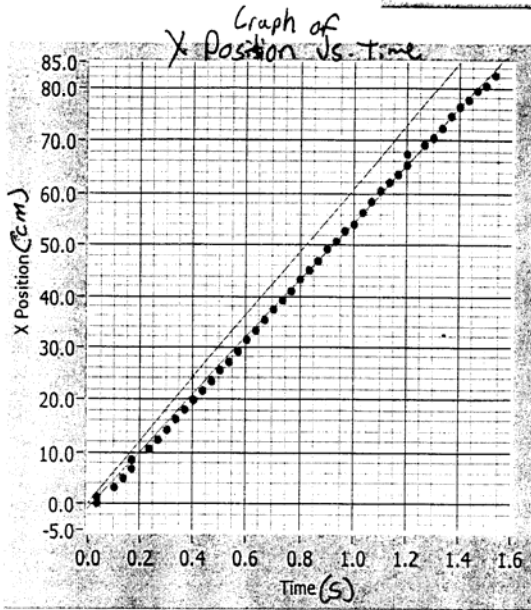
Prediction graphs



Graph Title

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Lab 3 Problem 1



**X - Prediction Equation**

$u(t) = 0.000 + 60.500t$

**X - Fit Equation**

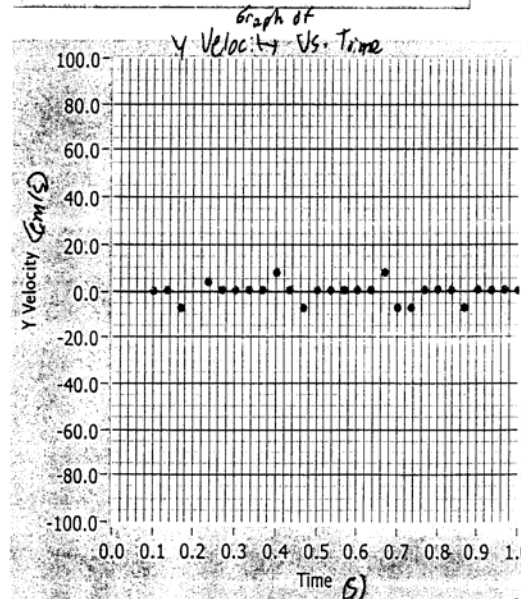
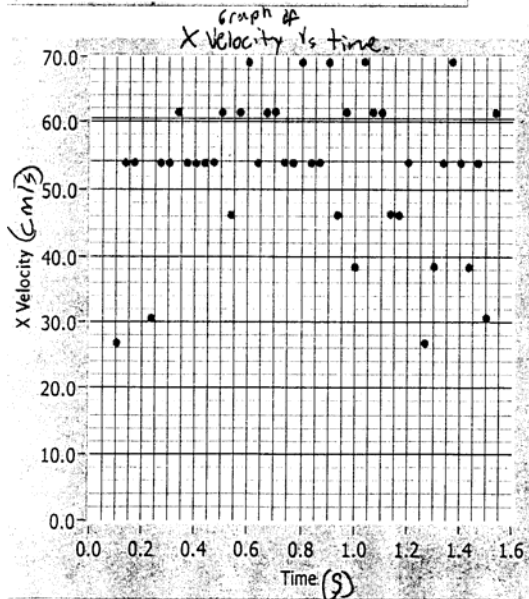
$u(t) = -1.000 + 55.000t$

**Y - Prediction Equation**

$u(t) = 0.000 + 0.000t$

**Y - Fit Equation**

$u(t) = 0.000 + 0.000t$



**Vx - Prediction Equation**

$u(t) = 60.500 + 0.000t$

**Vx - Fit Equation**

$u(t) = 54.000 + 0.000t$

**Vy - Prediction Equation**

$u(t) = 0.000 + 0.000t$

**Vy - Fit Equation**

$u(t) = 0.000 + 0.000t$

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## Example #2

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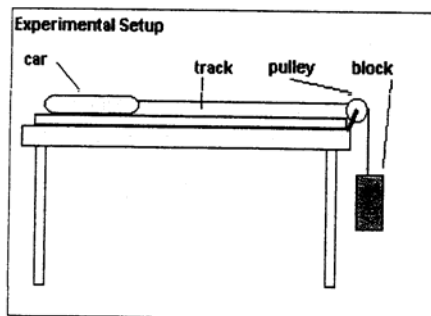
### Lab III Problem 1: Force and Motion

**1. Statement of the Problem** -- According to the lab manual, my group members and I were asked to test the velocity of a toy car launched down a track. The car is attached to a string at the end of the track, which goes over a pulley and is then attached to a block. When the block is released, the string pulls the car down the track. After the block hits the ground, the car is no longer pulled but keeps going. We were asked to find how the car's speed after the block hits the ground depends on the mass of the car, the mass of the block, and the distance the block falls before hitting the ground. The question we answered in this lab is:

What is the velocity of the car after being pulled a known distance?

We used a toy car with a string attached to it, a block, a pulley, and a track to conduct our experiment. We recorded the motion of the car and the block using a video analysis application written in LabVIEW™, then analyzed the video to find the position, velocity and acceleration of the car while it was being pulled by the falling block and after the block reached the ground.

The block (called object A) has a significantly shorter distance to fall than the car has to travel along its track. In this experiment, we ignored the friction between the car and the track and between the pulley and the string. We also ignored the mass of the string.

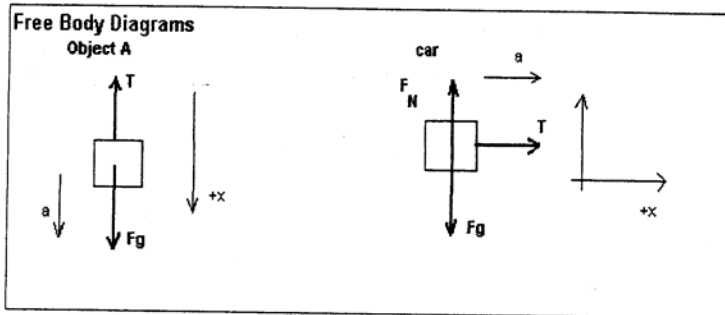


**2. Prediction** --



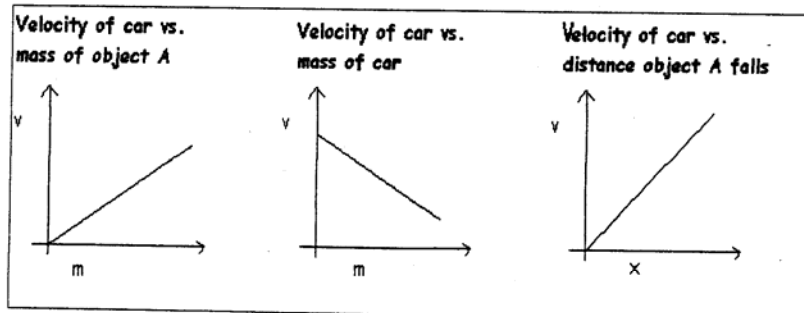
The first question asked me to calculate the cart's velocity after the block had hit the ground. I predicted that  $v_c = \sqrt{2xg[m_a/(m_c + m_a)]}$ . I solved the first kinematics equation,  $x_c = x_{0c} + v_{0c}t + 1/2at^2$  for  $t$ , assuming that  $x_0 = 0$ ,  $v_0 = 0$  and  $a_c = a_A$ , and that the magnitude of the car's displacement was the same as the magnitude of the block's, (since the string did not stretch), yielding  $t = 2x/a$ . Since  $v = at$ ,  $v = a\sqrt{2x/a}$  and  $v^2 = 2ax$ . Solving for  $a$  gives  $a = v^2/2x$ .

Variables	
x	position
x <sub>0</sub>	initial position
v	velocity
v <sub>0</sub>	initial velocity
a	acceleration
t	time
m	mass of object A
m	mass of car
F	Force
g	gravity
N	Normal Force
T	tension force



Since the objects are attached to the same string, the tension forces acting upon them are equal to each other. The sum of the forces acting on Object A in the x direction is  $\Sigma F_A = Fg - T$ . The sum of the forces acting on the car in the x direction is  $\Sigma F_c = T$ . Since  $F = ma$ ,  $M_A a = M_A g - T$  and  $M_c a = T$ . Using  $a = v^2/2x$ ,  $M_A(v^2/2x) = M_A g - T$ , and  $M_c(v^2/2x) = T$ . Combining these equations gives  $M_A(v^2/2x) = M_A g - M_c(v^2/2x)$ , and solving for  $v$  gives  $v_c = \sqrt{2xg[m_a/(m_c + m_a)]}$ .

The next three prediction problems asked us to draw a graph of the car's velocity vs. time as a function of the mass of object A, mass of the car, and distance object A falls, respectively. The other two variables are kept constant in each graph.



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The velocity would increase as the mass of object A or the distance object A falls increased, and would decrease as the mass of the car increased. The velocity would increase at a greater rate with the increase in distance than it would with the increase in mass of object A. Another way this could be said is that the graph of velocity vs. distance would have a greater slope than the graph of velocity vs. mass of object A.

**3. Procedure** – We set up the experiment according to the experimental setup picture above. The mass of the car we used was 252 g, and the mass of object A was 50 g. The distance from object A to the ground was 0.41m and the total distance the car was able to travel was 1m. There was 0.59m for the car to travel after object A hit the ground.

We placed the camera about 1.5m away from the table holding the track so that the entire length of the track could be seen as well as object A. We recorded the car's motion and then analyze it in LabVIEW™. We divided the motion of the car into two parts -- motion before object A hit the ground and motion after object A hit the ground -- and analyzed each part separately. We predicted the equations for the position vs. time graphs, plotted data points of both the horizontal and vertical motion of the graphs, and then found the best-fit equations for them. We did the same for the car's velocities.

**4. Data and Results** – SEE ATTACHED GRAPHS

We predicted that there would be no motion, and hence no velocity, in the y direction for any of the graphs, and our prediction was correct.

Before object A hit the ground --When we predicted the equation for the x position vs. time of the car before object A hit the ground, we didn't really know what we were doing. We should have used the equation  $x = x_0 + v_0t + 1/2at^2$  to make our prediction. The values for  $x_0$  and  $v_0t$  would both have been equal to zero and we could have predicted the acceleration using  $a = v^2/2x$ :  $(\sqrt{2xg[m_a/(m_c + m_a)]})^2/2x = [m_a/(m_c + m_a)]g = a$ . This would have given us an acceleration of 1.49 m/s\*s, and a predicted equation of  $x = 0 + 0(t) + 0.75\text{m/s}^2(t^2)$ . The value of 0.897 m/s\*s in the best-fit equation is reasonably close to this. Since the slope of a velocity vs. time graph is equal to the acceleration and since 0.897 m/s\*s was equal to  $1/2 a$ , we predicted that the slope of the acceleration vs. time graph would be equal to 1.80 m/s\*s, and our prediction fit the actual value of 1.70 m/s\*s well.

After object A hit the ground—We predicted that the car would have zero acceleration during this portion of its motion and that its velocity would be equal to its final velocity, just as object A hit the ground. Again, we used the equation  $x = x_0 + v_0t +$

$1/2at^2$  to describe the predicted motion, with  $x_0$  and  $a$  both equal to zero. We predicted the velocity to be  $v = \sqrt{2xg[m_a/(m_c + m_a)]}$ , or 1.167m/s. This prediction was very close to the actual value. We predicted that for the velocity vs. time graph, the velocity would stay constant at 0.167m/s, and our prediction was very close to the actual best-fit line equation.

### 5. Discussion--

**Results-** The acceleration of the car in the experiment is dependant on the block falling. Before the block hits the ground, the car accelerates because of the falling block. The acceleration of the block and the car is the same because the same tension force acts them upon. Their accelerations are equal to  $[m_a/(m_c + m_a)]g$ , where  $m_a$  is the mass of object a (the block),  $m_c$  is the mass of the car, and  $g$  is the acceleration due to gravity,  $9.8\text{m/s}^2$ . The velocity of the car and of object a at the time when object a hits the ground is equal to  $\sqrt{2xg[m_a/(m_c + m_a)]}$ .

After the block hit the ground there would no longer be any tension in the string and the sum of the forces on the car would be equal, (since  $T=0$  and  $F_g = -F_N$ ). Because  $F=ma$ , the car would have no acceleration. Its velocity would continue to be equal to  $\sqrt{2xg[m_a/(m_c + m_a)]}$ .

**Error-** Error resulted from our collection of data points again. It is difficult to click on exactly the same point of the car each time and to click on the same y value along the track each time as well. This results in distortion of the position measurements and velocities calculated. There is not much that can be done about this, except that we should try to be very precise in future collection of data points. Also, the camera could have caused a slight distortion of the collected data values. In this experiment, we neglected the friction between the car and the track and between the pulley and the string. This made the calculations a lot easier, but it caused our predicted value for the acceleration of the car and the block to be different than the actual value.

**Improvements-** It would be optimal to do many trials of this experiment, using different values for  $m_c$ ,  $m_a$  and  $x$ , to check that the equations really fit, but time is an issue. With more precise data collection, we could have eliminated some of the movement and velocity seen along the y-axis.

**6. Conclusions--** Using physics principles and equations, we predicted that the velocity of car pulled a known distance by a falling object would be equal to  $\sqrt{2xg[m_a/(m_c + m_a)]}$ ,

where  $x$  is equal to the distance the object falls,  $g$  is equal to gravity ( $9.8\text{m/s}^2$ ),  $m_a$  is the mass of the object falling and  $m_c$  is equal to the mass of the car being pulled. Since the tension forces on each object are the same, they have the same acceleration and this can be predicted using Newton's second law and kinematics equations. The results of our experiment confirmed this.

In each case but one, the predicted values for the components of the equations of the graphs were the same or close to the actual ones. When we predicted the value for acceleration of the car before the block hit the ground, we didn't figure any friction into the calculations. We based all of our future predictions off of the actual values we got for this graph's equation and they all matched the actual values well.

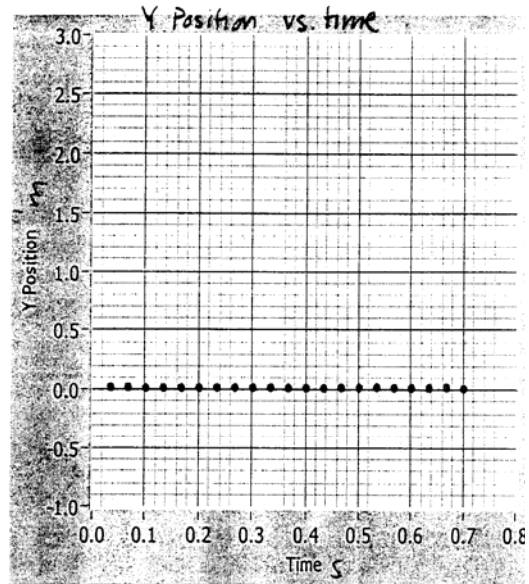
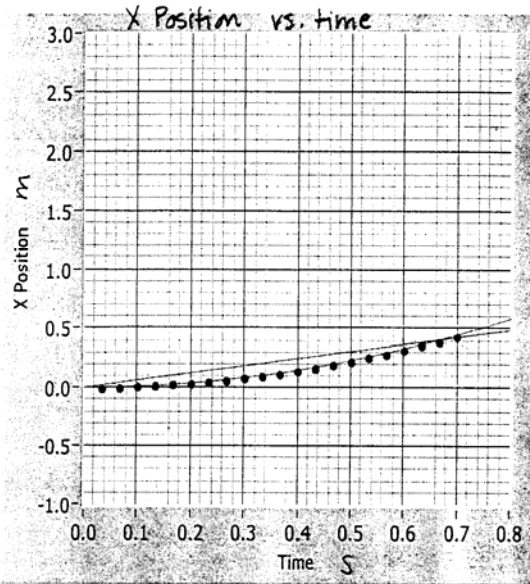
The launch velocity of the car does depend on the mass of the car, the mass of the block and the distance the block falls, according to  $v = \sqrt{2xg[m_a/(m_c + m_a)]}$ . For values of  $m_a$  that are much larger than  $m_c$ ,  $m_c$  does not affect  $v$  very much, since  $[m_a/(m_c + m_a)]$  becomes very close to 1.

The tension force upon the car and the block is dependent on the masses of both objects. Changing the mass of either one will change the tension force exerted on both. The tension force on the block is equal to its weight if the block has no net acceleration; in other words, when  $T = F_g$ . This would happen if the mass of the block was zero, and since it could never have zero mass, it would never happen in a frictionless system. It may come close to zero though, and would reach zero in a system with friction. We could test this experimentally by using a car with a very large mass and using blocks of decreasing masses. The acceleration of the car should go toward zero as the mass of the blocks decrease.

Graph Title

7

Lab III Problem 1: Before [A] hit the ground



**X - Prediction Equation**

$$u(t) = 0.000 + 0.600t$$

**X - Fit Equation**

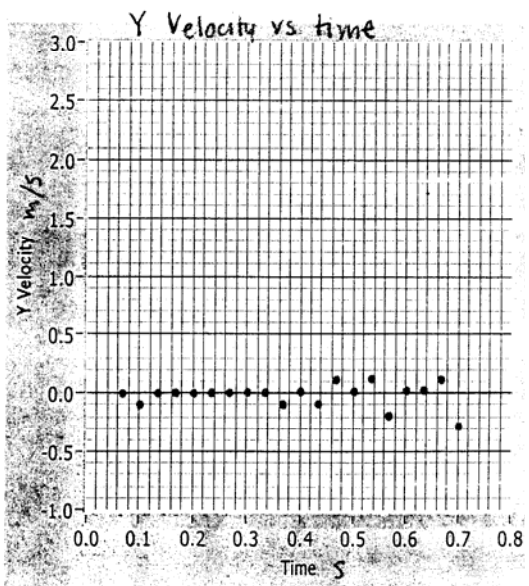
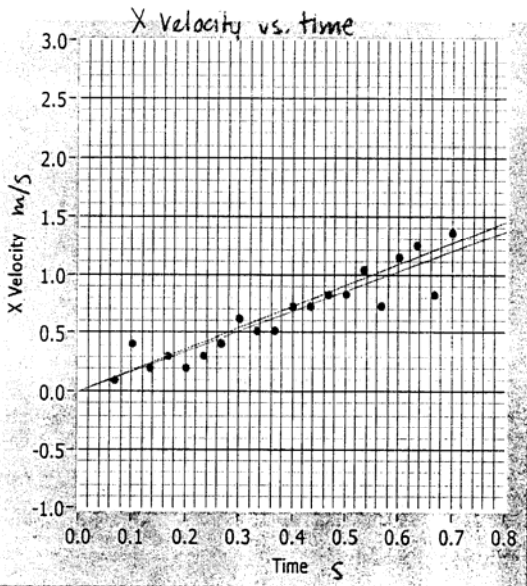
$$u(t) = 0.000 + 0.000t + 0.897t^2$$

**Y - Prediction Equation**

$$u(t) = 0.000 + 0.000t$$

**Y - Fit Equation**

$$u(t) = 0.000 + 0.000t$$



**Vx - Prediction Equation**

$$u(t) = 0.000 + 1.800t$$

**Vx - Fit Equation**

$$u(t) = 0.000 + 1.700t$$

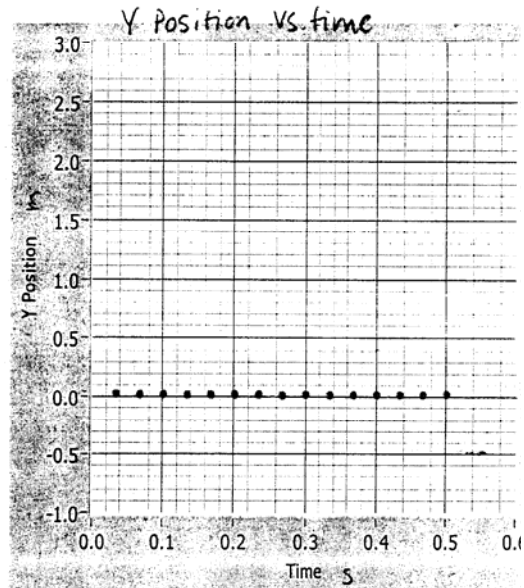
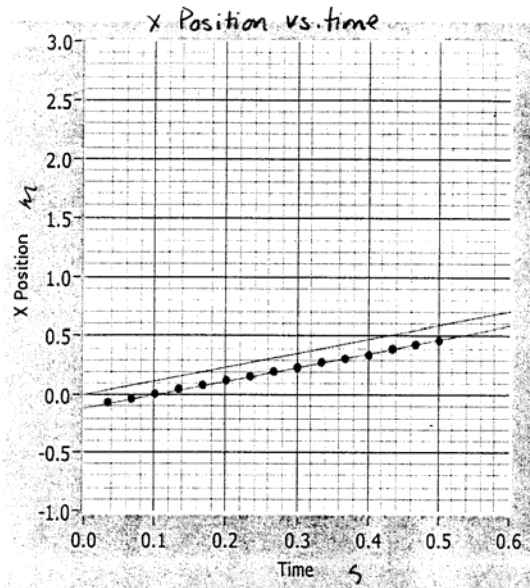
**Vy - Prediction Equation**

$$u(t) = 0.000 + 0.000t$$

**Vy - Fit Equation**

$$u(t) = 0.000 + 0.000t$$

Graph Title  
 Lab III Problem 1: After [A] hit the ground



**X - Prediction Equation**

$$u(t) = 0.000 + 1.167t$$

**X - Fit Equation**

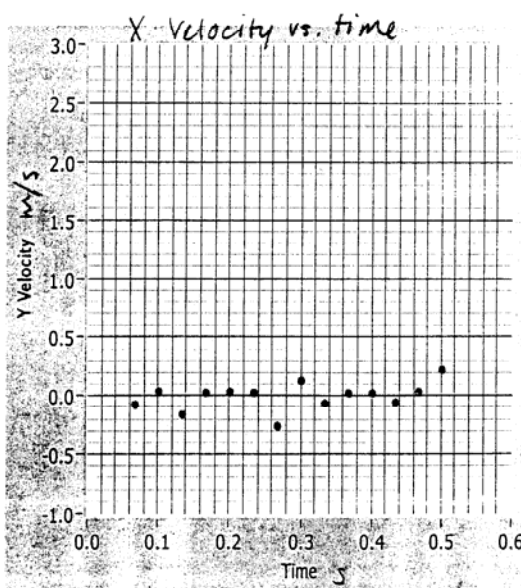
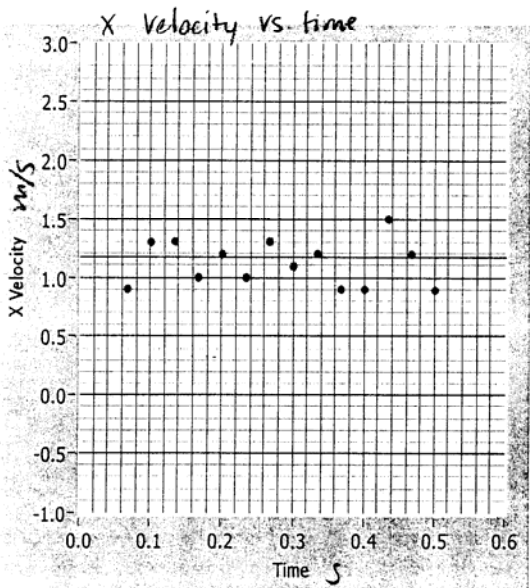
$$u(t) = -0.120 + 1.167t$$

**Y - Prediction Equation**

$$u(t) = 0.000 + 0.000t$$

**Y - Fit Equation**

$$u(t) = 0.000 + 0.000t$$



**Vx - Prediction Equation**

$$u(t) = 1.167 + 0.000t$$

**Vx - Fit Equation**

$$u(t) = 1.170 + 0.000t$$

**Vy - Prediction Equation**

$$u(t) = 0.000 + 0.000t$$

**Vy - Fit Equation**

$$u(t) = 0.000 + 0.000t$$

### **Campus Resources for Writing Support**

**Writing Support Network.** The Writing Support Network is a web page that lists support services for students in writing classes. All writing centers home pages are listed.

See: <http://www.writinghelp.umn.edu/>

**Center for the Interdisciplinary Studies of Writing.** CISW offers workshops for TAs and faculty teaching writing-intensive courses. You can also find on their website sources for sample courses, syllabi, and assignments that are writing-intensive.

See: <http://CISW.cla.umn.edu/>

**Writing-Intensive Resources for Scientific and Technical Disciplines.** This web site provides information for faculty and students in scientific and technical disciplines. Faculty information includes suggestions for evaluating written reports, integrating writing in assignments, and incorporating revision and peer review. Student information provides a number of online handouts on writing topics such as writing and revising, editing, oral presentations, and student collaboration. Student can also find helpful links to other resources about writing such as other writing centers and sources for documentation.

See: <http://www.agricola.umn.edu/writingintensive/>

## Writing Support Network

Example – <http://cisw.cla.umn.edu/wsn.html>

Welcome to the Writing Support Network! Do you need help with your writing? The Centers listed below are rich sources of information for you. You can take your assignment to a walk-in center, submit a question to an online center, or explore handouts on everything from how to organize a paper to how to document sources.

Writing Centers provide help for all students: writers at *all* levels of ability and experience, those who would like help with English as a second language, and those who want assistance because of learning or physical disabilities.

### **Student Writing Center**

This center provides walk-in assistance with all aspects of writing. Consultants can help students with writing assignments and writing process skills. Located in the English Department, 306B Lind Hall, hours are generally Monday through Thursday 9:00 a.m. to 4:00 p.m. and Friday 9:00 a.m. to 2:00 p.m. Check the Web site or call 612-625-1893 for updated hours of operation. Students can either make appointments or just walk in and can request help once or twice or request an ongoing weekly appointment. Instructor referrals are also accepted.

### **Online Writing Center**

This online resource provides personalized online writing service for both undergraduate and graduate students, including consulting, interactive skills exercises, and specialized help for students in the sciences or technology. Since this service is online, student can submit their questions at any time and receive answers within several days. It is especially useful for students who cannot be on campus for face-to-face tutoring. This service is provided by the Rhetoric Department.

### **Center for Interdisciplinary Studies of Writing**

The Center primarily encourages faculty research into writing across the curriculum. Though it does not have tutors for undergraduates, it does have a variety of useful writing handouts and resources. The Web site is especially designed to help students, faculty, and researchers enhance their writing. The site contains hundreds of useful links to other writing resources around the country and information on the University's writing-intensive courses. Click on "[Resources for Undergraduates](#)" for this information.



**Composition Program**

Composition is a program of the Department of English. Through its various courses, Composition teaches students to use language effectively and creatively, to construct compelling arguments, and recognize that writing is empowering. Most Composition courses satisfy the Freshman Writing Requirement. Composition also gives students an introduction to life at the university, good study skills, the library and its resources, and the ways knowledge is created. The Composition Web has information, resources, and links for students, instructors, and visitors.

**General College Writing Center**

This is a walk-in center with undergraduate consultants who can work with students at any stage of the writing process. The center also accepts writing questions through email. Instructors may also refer students to the Center for one or two visits or for ongoing help. Located in the Academic Resource Center in 11 Appleby Hall, hours are 9:00 a.m. to 4:00 p.m. Monday through Thursday and 9:00 a.m. to 3:00 p.m. on Friday.

**Minnesota English Center**

The Minnesota English Center (MEC) provides noncredit composition and reading/composition classes for nonnative speakers of English who want to improve their English for academic, business, or personal reasons. The MEC also offers classes in other skills and provides referrals to qualified tutors who charge by the hour for short-term or long-term tutoring. For information on course offering and fees, call 612-624-1503. e-mail [mec@tc.umn.edu](mailto:mec@tc.umn.edu), or visit the MEC website, <http://www1.umn.edu/mec/>

## Writing Intensive Coursework Requirements

1. Course grade is directly tied to the quality of the student's writing as well as to knowledge of the subject matter, so that ***students cannot pass the course who do not meet minimal standards of writing competence***
2. Courses requiring a significant amount of writing – ***minimally ten to fifteen finished pages*** beyond informal writing and any in-class examinations. Note that the page guidelines may be met with an assortment of short assignments that add up to the total
3. Courses in which ***students are given instruction on the writing*** aspect of the assignments
4. Courses in which ***assignments include at least one for which students are required to revise a draft and resubmit*** after receiving feedback from the course instructor or graduate teaching assistant. Otherwise, writing assignments may be of various kinds and have various purposes, as appropriate to the discipline