

Free-Fall

Lab

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| Names of Group Members | | | |
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Objective: To analysis the behavior of objects when they are in free fall using video analysis.

Background: We have been looking at examples of objects in free-fall for the last few classes. The measurements that you as a group take today are going to be uploaded to iSense so that they can be compared to all the other group measurements.

Procedures: During this your group is going to analysis the path of a ball being dropped along with a ball being tossed in the air. In both cases your group should look at the motion of the ball just after it leaves the throwers hand till just before it hits the ground, thus for the time it is in free fall. Use the same ball for both trials.

The procedures to gather and get the data into LoggerPro are the same as the last couple of motion labs so I will not bore with them here. (If you need the instructions the last couple of motion labs are still in the folders.

One thing that might help with this lab is to use a larger ball and if someone in your group can video with a faster frame rate this can increase your accuracy. If you use a different frame rate you just need to set this in LoggerPro in the Options Menu, Movie Options.

Data & Analysis:

What is the mass of the ball you are using? _____ Kg

What is the weight of the ball? (Show work here)

_____ N

Dropping the ball:

Click on the graph to bring it to the front of the window. You may at this point want to make your video smaller and your graph larger.

On the graph click on the vertical axis label and change it to Y. The graph now shows the position of the ball in meters in the Y direction. (We are not going to worry about what is happening in the x direction until our next unit.) Resize the axis scales as needed so that all points are displayed and as much of the graph is used as possible. If you created points when the ball was not in free fall, either before it left the hand or after it was caught you will need to ignore those data points.

Screenshot your graph and put it into this box.

- Indicate on the graph where the slope is positive, negative, and zero.
- Indicate on the graph where the slope is increasing, constant and decreasing.

On the graph click on the vertical axis label and change it to Y Velocity. The graph now shows the velocity of the ball in meters per second in the Y direction. Resize the axis scales as needed so that all points are displayed and as much of the graph is used as possible.

If you created points when the ball was not in free fall, select only the data that was taken while the ball was in free fall. This can be done by clicking and dragging over the data points that you want to select.

Once you have the correct data points select the Analyze menu and pick Linear fit. This will create a best fit line for your data.

Screenshot your graph and put it into this box.

Include the value of the slope clearly marked on the graph with correct units.

The slope of the velocity time graph is the _____ of the ball.

What direction is the acceleration? Provide an explanation from your data.

Throwing the ball upwards:

Click on the graph to bring it to the front of the window. You may at this point want to make your video smaller and your graph larger.

On the graph click on the vertical axis label and change it to Y. The graph now shows the position of the ball in meters in the Y direction. (We are not going to worry about what is happening in the x direction until our next unit.) Resize the axis scales as needed so that all points are displayed and as much of the graph is used as possible. If you created points when the ball was not in free fall, either before it left the hand or after it was caught you will need to ignore those data points.

Screenshot your graph and put it into this box.

- Indicate on the graph where the slope is positive, negative, and zero.
- Indicate on the graph where the slope is increasing, constant and decreasing.

On the graph click on the vertical axis label and change it to Y Velocity. The graph now shows the velocity of the ball in meters per second in the Y direction. Resize the axis scales as needed so that all points are displayed and as much of the graph is used as possible.

If you created points when the ball was not in free fall, select only the data that was taken while the ball was in free fall. This can be done by clicking and dragging over the data points that you want to select.

Once you have the correct data points select the Analyze menu and pick Linear fit. This will create a best fit line for your data.

Screenshot your graph and put it into this box.

Include the value of the slope clearly marked on the graph with correct units.

The slope of the velocity time graph is the _____ of the ball.

What direction is the acceleration? Provide an explanation from your data.

Use iSENSE to enter your data so that you can compare all the data from multiple groups. The link to the project is <https://isenseproject.org/projects/1648> the key is Free, the contributor name is Fall.

Use manual Entry and once in to contribute data make sure you enter a data set name with all group members and block. When contributing data please use Kg for mass, Newtons for weight and m/s/s for acceleration. Just include the magnitude not the direction on the weight and acceleration.

Return to iSENSE once at least 2 classes have entered data, you may have to wait a couple of days, and look at a visualization of the data. Take a screen shot of the visualization.

What does the data gathered show about free-fall?